PREVALENCE AND ECONOMIC BURDEN OF MALARIA AMONG FAMILY HOUSEHOLDS IN BOKKOS L.G.A, PLATEAU STATE, NIGERIA

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CERTIFICATION

I certify that this work "**Prevalence and Economic Burden of Malaria among Family Households in Bokkos L.G.A, Plateau State, Nigeria**" was carried out by ACHWAI ISAAC HEZEKIAH (Reg. No: 20124767398) in partial fulfillment of the requirements for the award of Master's Degree (MPH) in Public Health, Post Graduate School, Federal University of Technology, Owerri.

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DEDICATION

This research work is dedicated to God Almighty, who in His infinite mercy sustained me up to this time with good health.

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ABSTRACT

This study was undertaken to investigate the prevalence and economic burden of malaria among family households in Bokkos L.G.A, Plateau State, Nigeria. This study employed purposive and simple random sampling techniques to select 120 respondents from three (3) health facilities namely; Primary Health Center, Richa; General Hospital, Bokkos and Church of Christ in Nations (COCIN) Dispensary, Daffo. Two sources of data were used for the study; primary data and secondary data. Primary data was elicited with the aid of well-structured questionnaire on the demographic characteristics of respondents, malaria incidence and willing to pay for malaria eradication. Secondary data were obtained from the health records of three health facilities and the information sought included cost, public expenditure and number of reported cases of malaria and associated treatment. Data analysis was achieved using both descriptive and inferential statistical tools such as mean, percentages, frequency distribution, cross tabulations, willingness to pay (WTP) approach and multiple linear regressions. The result showed that malaria prevalence was highest among children below 5 years (40.37%), primary education certificate holders (53.05%), artisan/farmers (37.07%), household with size between 14 – 17 persons (43.88%). On average basis, households were willing to pay ₦1,811.31 (±1831.44), ₦811.83 (±₦403.84) and ₦2,623.14 (±₦2152.68) per month for treatment, preventive measures and total eradication respectively. The results of the determinants of the amount the households were willing to pay (WTP) for the malaria eradication showed that the significant determinants were household expenditure, level of education, costs of protection and treatment, indirect cost (value of hours lost at work, transport cost to clinic) and household size. Household size had positive relationship with the malaria prevalence while age, educational level and household expenditure had negative effects with malaria prevalence. Also household expenditure, level of education, costs of protection and treatment, indirect cost (value of hours lost at work, transport cost to clinic) and household size were significant determinants of the amount the households were willing to pay (WTP) for the malaria eradication. The economic burden of malaria was very enormous especially for the poor households who predominated the study area as indirect cost was ₦3,122.41, average willing to pay was in excess of ₦221.09 over the actual amount of treatment of a child was ₦1,414.69 per child per malaria episode, in excess of ₦324.17 over ₦766.34 of the actual expense to treat an adult per malaria episode and willingness to pay for prevention in excess of ₦219.35 over actual payment of ₦1,749.83 per household. It is recommended that public health education especially in local languages should be intensified in the area. In addition**,** government and non-governmental organizations should subsidize the cost of malaria treatment particularly with the new and more expensive artemisinin-based combination therapy and encourage free distribution of treated mosquito nets to the households particularly among the poor income earners.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Malaria is one of the most important challenges to public health with about 300 to 500 million cases reported annually. It is caused by the bite of the female anopheles mosquitoes. The symptoms of malaria include cycles of chills, fever, sweats, muscle aches and headache that recur every few days. There can also be vomiting, diarrhea, coughing and yellowing (jaundice) of the skin and eyes. More than 1 million people die from the disease, most of them children under age 5 years. Over 90.0% of the cases and 75% of the deaths occur in sub- Saharan Africa (SSA). These childhood deaths, resulting mainly from cerebral malaria and anemia, constitute somewhere between 20% and 25% of child mortality in Africa (WHO, 2000; Teklehaimanot and Mejia, 2008).

African countries south of the Sahara bear the heaviest burden of malaria. It is reported that thirty countries in Sub-Saharan Africa account for 90% of global malaria deaths with Nigeria, Democratic Republic of Congo (DRC), Ethiopia and Uganda accounting for nearly 50% of these deaths (Nigeria Malaria Fact Sheet, 2011). These countries are among the poorest in the world and widespread poverty on the continent continues to play a role in the burden of the disease. Malaria cases and deaths have risen steadily in sub-Saharan Africa since the late 1970s, especially in Nigeria. The emergence of resistance to insecticides and chloroquine, the cheap but effective anti-malarial treatment widely used for clinical management of uncomplicated malaria, has been held as a major factor in this trend, aided by a general weakening of health systems. This effect was exacerbated by economic stagnation and decline, which has implications for growth and welfare. For instance, malaria is responsible for about a 1.3 per cent reduction in the average annual rate of economic growth for those countries with the highest burden. In Nigeria, malaria is the major cause of morbidity and mortality, especially among children below age five

(Alaba, 2007). Malaria is also known to be the second leading cause of death from infectious diseases in Africa, after HIV/AIDS and almost 1 out of 5 deaths of children under 5 in Africa is due to malaria (Jimoh *et. al.,* 2007, Nigeria Malaria Fact Sheet, 2011). The consequences of malaria are very grave among children and pregnant women.

Available records show that at least 50 per cent of the population of Nigeria suffers from at least one episode of malaria each year and malaria accounts for over 45 per cent of all out-patient visits (Ejezie *et. al.*,1991; Federal Ministry of Health, 2001). It is reported that malaria prevalence (notified cases) in 2000 was about 2.4 million (Ejezie *et. al.*, 1991). The disease accounts for 25 per cent of infant mortality and 30 per cent of childhood mortality in Nigeria (Ejezie *et. al.*, 1991; Federal Ministry of Health, 2001). Therefore, it imposes great burden on the country in terms of pains and trauma suffered by its victims as well as loss in outputs and cost of treatments (Onwujekwe *et. al.*, 2004). The disease is often treated in Nigeria by self-medication, the use local herbs, use of the services of spiritualists/traditional priests or/and the use of clinic/hospital services. Similarly, common prevention measures include use of medicine (prophylaxis), insecticides (coils and sprays), ordinary mosquito nets, insecticide-treated nets (ITNs) and window and door nets.

According to Federal Ministry of Health (2001), Nigeria can be divided to three major malaria epidemiological zones, namely; forest, savannah and grass-land zones. The forest zone consists of coastal areas stretching from Lagos in the South-Western Nigeria to the forest areas in the Eastern Nigeria up to the Northern portion of the forest zone of Oyo state. The Savannah zone consists of areas north of Oyo state to the central areas of Kogi and Benue states and the Grass-land zones consists of the most northern parts of Nigeria – Katsina state and areas to its North (Jimoh *et. al.*, 2007). The dominant vector in the forest zone is *Anopheles melas* while the dominant vectors in the savannah zone are a combination of *Anopheles melas* and *Anopheles arsbiensis;* the dominant vector in the grass-land zone is *Anopheles arsbiensis*.

1.2 Problem Statement

Malaria morbidity and mortality rate are on the rise worldwide, especially in Africa, which accounted for about 90% of malaria deaths (WHO, 2000). Despite several years of research and efforts by Government in malaria endemic countries and the unprecedented attention to fight the disease, the prevalence continues to increase in these countries. Some macroeconomists have estimated that the annual growth rate of economy of countries with severe malaria are 1.3% lower, even after controlling other factors known to influence economic growth (Usman and Adebayo, 2011). Many studies have also shown that malaria places significant burden on households that have a sick family member (Episodes, 2000, Federal Ministry of Health, 2001, WHO, 2002, Alaba, 2005, Yusuf, *et. al.,* 2010, Nigeria Malaria Fact Sheet, 2011, Ajadi, *et.al.,* 2012,). These include loss of time from work by the sick individual, care giving time spent by other family members, loss of productivity, cost of seeking treatment (including transportation and medical care), and premature mortality. Very few of these studies have treated the impact of malaria on the socio-economic variables and incidence on the various occupational groups. More so, malaria is considered a social and economic problem, which consumes about US$3.5million in government funding and US$2.3 million from other stakeholders in the form of various control attempts in 2003 (WHO, 2005).

Malaria still constitutes a serious public health problem in Nigeria (Jimoh, 2005; FMOH, 2005; Olanrewaju, 2006; Mawah, 2007). Iyun (1987) posited that in Nigeria, between 1973 - 1982 malaria consistently maintained the lion share between 55% and 64.7% among 14 top diseases, and malaria was ranked second killer after measles. Olanrewaju (2006) declared that between 2000 and 2001, malaria still maintained its status as one of the killer diseases that is affecting millions of people in Nigeria. The 16% growth in malaria cases annually made effect of malaria to be more devastating (WHO, 2000). Malaria in Nigeria is currently confined to all parts of the country but with varying incidence and prevalence rate across the nation. Areas such as coastal,

riverine, forested and urban areas are endemic areas. The contributing factors include: abject poverty; large-scale deforestation (about 400,000ha of vegetation cover is lost annually to mineral exploitation, infrastructure development; fuel wood extraction and expansion of settlement); increase in urban agriculture and irrigation farming; increase in urban and watershed flooding due to interference with water ways; presence of surface water bodies and open water storage facilities; indiscriminate dumping of refuse and the spatial pattern of health care facilities and infrastructure (Adesina *et. al.,* 1999; Adesina, 2005; Laah and Zubairu, 2008).

Malaria epidemics had frequently been linked with poverty and reducing the burden of malaria is increasingly becoming a global priority (Filmer, 2005). The economic burden of malaria illness on households accounts for almost 50% of total economic burden of illnesses in malaria holo-endemic communities (Onwujekwe *et. al.,* 2000; Chima *et. al.,* 2003; Russel, 2004). Also, living in malaria-endemic regions places an economic burden on households even if they do not actually suffer an episode of malaria and reducing malaria improves households' living standards (Laxminarayan, 2004). However, it has been noted that poor people bear a disproportionate burden of the disease and have poor health seeking habits (Onwujekwe *et. al.,* 2006; Worrall *et. al.,* 2002; Nuwaha, 2001; Breman *et. al.,* 2004; Kelley *et. al.,* 2001.). The evidence about the differential occurrence of malaria amongst different socio-economic status groups is mixed and it is not clear why malaria should affect certain Socio-economic Status (SES) groups especially the poor more than others. Poor people are reported to be at increased risk both of becoming infected with malaria and of becoming infected more frequently (WHO/UNICEF, 2003).

There have been some global responses to the devastating effects of malaria. These include the establishment of the Roll Back Malaria partnership by the World Health Organization (WHO) and the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM). The government of Nigeria has subscribed to some known malaria control and prevention measures, including the free distribution of insecticide treated nets (ITNs) to the vulnerable groups. Although, the first

goal of the Millennium Development Goal (MDGs) is to half and afterwards reverse the incidence of malaria and other major diseases by 2015. However, with less than one year to the due date, there is no indication that the war against malaria is close to being won, it is also not clear whether the replica of MDGs in the National Economic and Empowerment and Development Strategy (NEEDS) will be able to achieve the target set of MDGs and the Roll Back Malaria program (RBM) (Usman and Adebayo, 2011).

In spite of previous studies on the epidemiology and socioeconomic burden of malaria in Nigeria, there is scanty information on the burden of malaria in Bokkos LGA, Plateau State. The aim of the present study therefore is to investigate the prevalence and socioeconomic impacts of malaria on households in Bokkos L.G.A of Plateau State, Nigeria.

1.3: Objectives of the Study

The main objective of this study is to investigate the prevalence and economic burden of malaria among family households in Bokkos L. G.A, Plateau State, Nigeria.

The specific objectives of the study are:

i. To describe the prevalence of malaria among the socio-economic status (SES) in the study area.
ii. To determine the impact of socio-economic status on malaria prevalence in the study area.
iii. To estimate the economic burden and hence isolate the factor influencing their willing to pay for malaria prevention and control.

1.4: Research Questions

i. What is the level of prevalence of malaria among the various socio-economic groups in the area?

ii. Do households social economic status affects the prevalence of malaria among them?

iii. How much are they willing to pay for malaria control and what factors influenced it?

1.5 Justification for the study

A major policy issue is how to put in place a programme of malaria treatment, control and prevention that is fiscally sustainable (Onwujekwe *et. al*, 2005). Resolving such a policy issue will be facilitated if the malaria burden is quantified and public willingness to pay for the respective components of malaria programmes are known, however, such evidence have been scanty or unavailable (Onwujekwe, 2000). Also, Evidence on the magnitude of the malaria burden in Plateau state, Nigeria is scanty and their value for generalization limited because of their limited scope. Besides, there is currently no measure of the intangible burden of malaria in Nigeria. The study would help in measuring the burden of a disease using the Willingness To Pay (WTP) approach which is particularly suitable for evaluating the economic burden (or cost) of malaria prevention and control in Nigeria and Bokkos L.G.A of Plateau state in particular.

The study would apply multi-linear regression method to analyse the socio-economic factors associated with malaria incidence among various socio-economic household in rural areas so as to ascertain whether any relationship exists between malaria incidence and socio-economic characteristics of the total number of members in a household in the study area. There are quite a good number of attempts to analyse the economic effects of malaria in the literature (Teklehaimanot, 2008; Alaba, 2007; Alaba, 2002; 2009; Anyanwu, 2007). Most of the studies are limited to determining the mathematical significance of malaria. However, a comprehensive analysis of malaria and poverty remains scarce. The links between malaria and poverty are multiple and complex. Therefore a better understanding of the direction and magnitude of the causal relationship is needed, along with better understanding of the nature of poverty that is related to malaria. For example, understanding whether the relationship between malaria and

poverty is related to household factors, community, or larger regional factors would help to identify whether further investigation and action is needed at one or more of these levels.

A meaningful relationship between malaria and poverty should consider the effect of both individual and cluster where individual belongs. This approach requires a multilevel analysis incorporating variables at different levels of aggregation. In this study, the relationship between poverty and malaria in Nigeria was analyzed using a multi-level logistic model.

Information on social and economic burden of malaria in the study area is unavailable or limited. This study however attempts to fill this knowledge gap by connecting the various socio-economic factors of the households with malaria infestation, epidemics and control by helping to provides new information that will help in a better appreciation of inequalities in burden and control of malaria amongst different population groups and highlight areas that require interventions to decrease the burden to all population groups in the study area and would be essential empirical literature, information for researchers. It would provide necessary recommendation for policy makers and governments at all levels for implementation to address issues of malaria prevention and control in Nigeria.

The result of the study is expected to serve as guide to policy makers, ministry of health, non-governmental organizations (NGO), donor agencies (WHO, USAID, UNICEF, Bill and Medina Gates Foundation, Rockfellers Foundation and development workers, and members of the academia in their future design, formulation and implementation of malaria prevention and control programmes in Nigeria.

1.6: Hypotheses Testing

The following null hypotheses were tested:

The socio- economic status (SES) of the household such as literacy level, household size, wealth index and state of environmental sanitation does not influence malaria incidence and their willingness to pay for malaria prevention and control measures.

1.7 Plan of the study

This research is organized into five chapters. Chapter one consists of the background information, statement of the problems, objective of the study, justification of the study and the plan of the study.

Chapter Two consists of the literature review.

Chapter Three discusses methodologies of the study which consists of research design, area of study, population of the study, sample size, sampling techniques, instrument for data collection, validation of the instrument, reliability as well as methods of data collection and analysis.

Chapter Four presents the results of the study, data analysis results and discussion.

The Final chapter which is chapter five presents discussion, conclusion and recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Literature of Social and Economic burden of Malaria

Some Microeconomic studies have focused on impact of malaria at the level of the productive unit, such as the household or firm. The common method of estimation employed was been to sum the direct costs of expenditure on prevention and treatment and the indirect costs of productive labor time cost. Evidence on direct costs suggests that household can spend quite substantial sums on prevention and especially treatment. However the overall evidence on the microeconomic impact of malaria is patchy and weak, and there are many problems in using such data to reflect the burden to society or the potential benefits from control. Most studies have generally focused on febrile illness, overestimating the costs of uncomplicated malaria but underestimating the costs of severe illness.

Malaney *et. al.,* (2004), explained that macroeconomic analyses indicate that malaria inhibits long-term growth and development to a degree that was previously unimagined. There are at least three potential explanations for the magnitude of this effect and for the discrepancy between these results and those of microeconomic studies. First, although some hypothesis states that malaria causes poverty, causation runs in the other direction as well. Many countries are too poor to afford the kinds of malaria interventions that enabled such wealthier countries as the United States and Italy to eliminate transmission of this infection from within their borders. The causal effect of malaria on poverty cannot readily be isolated from the effect of poverty on malaria. A second econometric problem lies in the effect of such confounding factors as climate that may drive both poverty and malaria. A third explanation for the gap lies with a failure of traditional microeconomic methods to incorporate broad costs of the disease.

Most studies assumed that value of a day of work lost could be treated as the gain that would result if malaria were reduced or eliminated. There are problems with this assumption. First, the potential for substitution of labour crucially affects whether or not the loss of time is translated into a loss of output. At times of the years when there is underemployment or unemployment, substitution may be feasible without any consequential loss of output, since the marginal productivity of unemployed labour is zero. However, a study on the Gezira, in Sudan showed a contrary. Nur and Mahian (1988) found that malaria affect productivity through its effect on; Work capacity (Since repeated malaria attacks may cause disability); Decisions on land use (in terms of extent of land cultivated and choice of crop); Labour quality (Since malaria can affect the cognitive development school performance of children).

2.2 Overview of Malaria Control Activities and Programmes in Nigeria

Malaria is major public health problem of Nigeria, with stable transmission throughout much of the country and with the largest population at risk in Africa. The coverage of the key Roll Back Malaria (RBM) interventions remains unacceptably low. Malaria control and finances are decentralized in Nigeria. At the National level, with the collaboration of RBM partners, the emphasis is placed on development of key control policies and guidelines, allocation of resources and resources mobilization, monitoring and supervision. At the state level efforts are centered on interpreting policy, resources mobilization, support and supervision for implementation and also establishing link between local government agencies and National Malaria control programme (NMCP) At the local level, they focus on resources mobilization and implementing community–based activities. All the three levels of government are involved in monitoring and evaluation. A country strategic plan of action for 2001-2005 was develop that outlines six priority for malaria control and these focused on Case management; Prevention; Information, education and

mobilization; Partnerships and overall health system development; Operational research, and Monitoring and evaluation.

At the international level, in September 2000 the United Nations Millennium summit endorsed the Millennium development Goals (MDGs) in what was called the "Millennium Declaration". More than one hundred eighty countries were signatories to this declaration. The main objective of the Millennium summit was to set quantifiable and times bound global development goals to end human suffering from hungers, destitution and disease mainly in developing countries. Since its inception, MDGs have been embedded in several international and regional initiatives and have continued to increasingly influence policy decision throughout the developing world. The MDGs consist of 8 goals, 18 targets and 48 indicators that are agreed upon by 180 member states of the united nation at the Millennium declaration in 2000. Malaria eradication is an important target in Goals 6.

In Nigeria, in a bid to control malaria, in April 2007, the government, supported by development partners in conjunction with private sectors had distributed over 10 million insecticide treated nets (ITN) to pregnant women and children under Five years. In plateau State, the state government also distributed 700,000 long lasting insecticides treated bed nets (LLITNS) to the group identified as vulnerable to malaria in the Local councils in the State. Drugs were also procured and distributed to 16,500 pregnant women in the state as intermittent preventive treatment (IPT) during the second and third terms trimester of pregnancy. 487,000 children under the age of five have enjoyed free distribution of Artemisinin combination therapy. These no doubt has significantly reduced cost on malarial treatment to the household, but the incidence and impact of the remaining cost on the household yet unknown.

2.3 Empirical Literature of economic burden of malaria in Nigeria

Many approaches have been employed to measure the economic burden of malaria in Nigeria but the most recent is the Willingness to Pay Approach (WTPA) by Jimoh, *et al.,* (2007). The study indicates that malaria imposes great burden on the society as its adverse effect is on the mental, physical and social well-being of people as well as on the economic development of a nation. The result showed that households are willing to pay a minimum of an average of about ₦1,112 per month. With a nation of the 140 million people this can translate to about billions of naira per annum, with its associated impact on economic growth.

Using Classification Rule Analysis (CRA), McCarthy (2000), examined the determinants of cross–country differences in malaria morbidity and examined the linkage between malaria and economic growth, it was confirmed that there is a dominant role of climate in accounting for cross-country difference in malaria morbidity. Controlling for climate, suggests that access to rural health care and income equality influence malaria morbidity, in addition the study further showed that there is a significant negative association between higher malaria morbidity and the growth rate of GDP per capita. The study estimated that absolute growth impact of malaria differs sharply across countries; it exceeds a quarter percent per annum in a quarter of the sample countries. Most of these are located in sub-Saharan African with an estimated annual growth reduction of 0.55%.

Although a vicious cycle between malaria and poverty is acknowledged, there is no detailed evidence on how malaria and poverty relate at the household level. Studies focus on estimating direct costs of treatment and prevention (including transport to treatment source and special foods), and the indirect costs of time lost by the sick individual and the caretaker and premature mortality. Direct costs of malaria range from $0.41 in Malawi to $7.38 in Ghana. A few studies have estimated the cost of treatment as a proportion of household income to range between 2.0 % and 2.9 %. These figures are well below the 10% or more of total income often taken to be

indicative of costs for households. Only two of the studies reviewed compare how cost burdens vary by socio-economic status. These studies suggest that costs of malaria are highly regressive; i.e. the poor spend a significantly higher proportion of their income on malaria than their least poor counterparts'. In Malawi for example, total cost burdens averaged 7.2% of monthly household income but the poor incurred an average cost burden of 32% on malaria.

Onwujekwe *et. al.,* (2000) compared the financial and economic costs of malaria attack to that of a combination of other illness episodes on households in five malaria holo-endemic rural communities. The findings showed that the cost of treating malaria illness accounted for 49.87% of curative health care costs incurred by the households. Average malaria expenditure was $1.84 per household per month, while it was $2.60 per month for the combination of other illness episodes. The average person-days lost due to malaria and the combination of other illnesses were almost equal. If the financial costs of treating malaria and other illnesses are combined, this cost will deplete 7.03% of the monthly average household income, with treatment of malaria illness alone depleting 2.91%. Thus, malaria is a big contributor to the economic burden of disease, in malaria holo-endemic communities.

A more holistic approach to the study of the effects of malarial was presented by World Health Organization (WHO/TDR) (2003), through the work of Goodman *et.al.,* 2003; Janet, 2003. The two papers identified four main categories of variable for accessing the impact of malarial, namely; Resources cost of malaria; Characteristic of demand for prevention and treatment of malaria; Economic evaluation of malaria; Evaluation of the whole system level. With the above it became easy to identify socioeconomic determinate of malaria transmission, characteristics of the demand for malaria prevention and treatment of malaria" and the associated economic implications.

2.4 Epidemiology of Malaria in Nigeria

According to World Health Organization, Epidemiology may be defined as the study of the distribution and determinants of health related states or events (including disease) in human populations (WHO, 2013). Incidence of malaria varies by weather, which affects the ability of the main carrier of malaria parasites, anopheline mosquitoes, to survive or otherwise. Tropical areas including Nigeria have the best combination of adequate rainfall, temperature and humidity allowing for breeding and survival of anopheline mosquitoes. The burden of malaria varies across different regions of the world and even within a country. This is driven by the variation in parasite– vector–human transmission dynamics that favour or limit the transmission of malaria infection and the associated risk of disease and death. Of the four species of *Plasmodium* that infect humans—*P. falciparum, P. vivax, P. malariae* and *P. oval*. *Plasmodium falciparum* causes most of the severity and deaths attributable to the disease, which is most prevalent in Africa south of the Sahara, where Nigeria has the largest population.

Country-specific evidence shows that Nigeria has the largest population at risk of malaria in Africa and therefore most vulnerable to the risk of missing MDGs target. The disease, malaria, is a major health problem in the country, with stable transmission throughout the country. It accounts for about 50 percent of out-patient consultation, 15 per cent of hospital admission, and also prime among the top three causes of death in the country (National Malaria Control Plan of Action 1996 to 2001). More importantly, it is a social and economic problem, which consume about US$3.5 million in government funding and US$2.3 million from other stakeholders in various control attempts in 2003 (World Health Organisation (WHO, 2005).

Approximately 50% of the Nigerian population experience at least one episode per year. However, official estimate suggests as much as four bouts per person per year on the average (WHO, 1995 and 2002). The trend is rapidly increasing due to the current malaria resistance to first line anti-malarial drugs (WHO, 2000). The magnitude of incidence and death due to it is a

multiple of all other tropical diseases put together. It is responsible for over 90% of reported cases of tropical disease in Nigeria (Alaba and Alaba, 2003). The above suggests that malaria could be the largest contributor to total disease burden and productivity losses resulting from major tropical diseases in the country.

Evidence on Nigeria given by the malaria report 2005 shows that malaria incidence throughout the country had been on the increase over the years ranging between 1.12 million at the beginning of 1990 and 2.25 million by the turn of the millennium 2000 and 2.61 million in 2003. The disease carries with it two categories of costs; morbidity and mortality costs. Malaria morbidity affects households' welfare (through families' allocation to treatment and prevention of the disease), and decline in productivity, through lost time.

In the case of mortality, losses to households include lost of future income and cumulative investment on the dead due to malaria. According to the United States Embassy in Nigeria, 2011 on Nigeria Malaria Fact Sheet, Malaria affects 3.3 billion people, or half of the territories. WHO estimates 216 million cases of malaria occurred in 2010, 81% in the African region. WHO estimates there were 655,000 malaria deaths in 2010, 91% in the African Region, and 86% were children under 5 years of age. Malaria is the 3rd leading cause of death for children under five years worldwide, after pneumonia and diarrheal disease. Thirty countries in Sub-Saharan Africa account for 90% of global malaria deaths. Nigeria, Democratic Republic of Congo (DRC), Ethiopia, and Uganda account for nearly 50% of the global malaria deaths. Malaria is the 2nd leading cause of death from infectious diseases in Africa, after HIV/AIDS. Almost 1 out of 5 deaths of children under 5 in Africa is due to malaria.

Malaria causes anemia which may require blood transfusions, a procedure that increases the risk for HIV infection where universal blood screening is yet to be achieved. People living with HIV/AIDS (PLWHA) are at an increased risk of clinical malaria, severe illness, hospitalization,

and death. Malaria contributes to a temporary increase in viral load among HIV-infected people which may worsen the clinical disease, increase mother-to child transmission, and augment transmission in adults (US Embassy, 2011).

Malaria is a major public health problem in Nigeria where it accounts for more cases and deaths than any other country in the world. The remaining 3% of the population live in the malaria free highlands. There are an estimated 100 million malaria cases with over 300,000 deaths per year in Nigeria. This compares with 215,000 deaths per year in Nigeria from HIV/AIDS. Malaria contributes to an estimated 11% of maternal mortality. Malaria accounts for 60% of outpatient visits and 30% of hospitalizations among children under five years of age in Nigeria. Malaria has the greatest prevalence, close to 50%, in children age 6-59 months in the South West, North Central, and North West regions. Malaria has the least prevalence, 27.6 percent, in children age 6 to 59 months in the South East region.

Four scientifically proven key interventions to prevent and treat malaria:

1) the promotion of insecticide-treated mosquito nets (ITNs);

2) indoor residual spraying (IRS);

3) intermittent preventive treatment for pregnant women (IPT);

4) diagnosis and treatment.

Prevention programs focus on the distribution and use of bed nets, called Long Lasting Insecticidal Nets (LLINS), including evidence-based health communication programs on the mode of malaria transmission and the importance of sleeping under ITNs. Indoor Residual Spraying (IRS) involves the coordinated, timely spraying of the interior walls of homes with insecticides that kill mosquitoes. Intermittent preventive treatment for pregnant women (IPTp) is an effective means of reducing the effects of malaria in both the pregnant woman and her unborn child by giving at least two doses of the drug sulfadoxine-pyrimethamine (SP). Prompt

parasitological confirmation by microscopy or Rapid Diagnostic Test (RDT) is recommended for all patients with suspected malaria before treatment begins. Artemisinin-based combination therapy (ACT) has become the standard treatment of uncomplicated malaria.

However, Poverty is a major factor in malaria prevention and treatment. Vector control is highly dependent on a single class of insecticides, the pyrethroids. Resistance to pyrethroids has been reported in 27 countries in sub-Saharan Africa. Despite the National policy of ACT as the first-line treatment of uncomplicated malaria, MIS 2010 indicates that over 70% of children treated for malaria in Nigeria received chloroquine or SP (Sulfadoxine-pyrimethamine) . The World Bank provided $180 million for the Malaria Booster Program that supports seven states and some national-level activities. The World Bank provided an additional $100 million for this program in 2009. The UK Department For International Development (DFID) initiated SuNMaP (Support to Nigeria Malaria Programme), a $100 million, five-year program to control malaria in 2008. The Global Fund provided a $500 million Round 8 Malaria grant that began in 2009 and lasted to 2014.

The U.S. PMI (Prevention of Malaria Intervention) was launched in June 2005 as a five-year, $1.2 billion initiative to scale up malaria prevention and treatment interventions, and has been extended through 2015. PMI is led by the U.S. Agency for International Development and implemented together with the U.S. Centers for Disease Control and Prevention. The goal of PMI, working closely with host governments, is to reduce malaria-related mortality by 70% in the original 15 countries by the end of 2015. Nigeria became the 17th PMI country in 2010. Pre-PMI malaria funding in Nigeria was $18 million. PMI funding for Nigeria is $43.6 million in FY11 and projected to be $43.2 million in FY12. Malaria Action Programme for States (MAPS) is a PMI-funded integrated malaria project. The MAPS project, which spans from 2010 to 2015, is implemented in Benue, Cross River, Ebonyi, Nasarawa, Oyo, and, Zamfara states.

2.5 Social implication of malaria and their relationship with poverty

In poor countries, tragically, people die unnecessarily. This is a concept known and recognized throughout the world that the inhabitants of more developed and rich countries have a better life expectancy compared to the poorest countries. The reasons are not only linked to health care costs that often reflects health systems most technologically advanced and rich resources (WHO, 2008). Over the past two to three decades, our understanding of poverty has broadened from a narrow focus on income and consumptions to a multidimensional notion of education, health, Social and political participation and rights, personal security and freedom, and environmental quality (WHO, 2006; 2008). Thus poverty encompasses not just low income, but lack of access services, resources and skills, vulnerability, insecurity, voiceless and powerlessness.

According to Epidemiological data of the disease of WHO 2009 Malaria Report, malaria is not exclusively a disease of the poor, the deprivation associated with poverty can increase the risk of malaria (WHO, 2009). The relationship between malaria and poverty plays out along a number of distinct, yet interrelated, pathways. Poorer and marginalized communities might be more likely to suffer from malaria than non-less poor communities, because their geography and environment are more hospitable to mosquitoes than areas inhabited by non-poor communities (WHO, 2008). Poverty also might reduce the likelihood that households will adopt appropriate preventive measures (such as sleeping under an insecticide treated net [ITN]) and curative measures (seeking timely health care for fevers). This can result in greater malarial morbidity and mortality among the poorer than the non-poor. Conversely, malaria might further impoverish poorer households through the costs of preventive and curative measures, as well as for the inability to work while ill. Importantly, because gender and poverty interact to produce unique disadvantages among poorer women, gender is considered an independent risk factor.

2.5.1 Connectivity of malaria incidence and poverty index

- ***Inequalities in Incidence:*** An estimated 58% of malaria deaths occur among the poorest 20% of the world's population (Gwatkin and Guillot, 2010). The inequality of this distribution is higher than that for any other disease of public health importance. Ranft and May, 2010) conducted a study in Ghana, showed that 1496 children presenting to the hospital were examined for malaria parasites and interviewed with a standardized questionnaire. The information of eleven indicators of the family's housing situation was reduced by a Principal Component Analysis (PCA)to a socioeconomic score, which was then classified into three socioeconomic statuses: poor, average and rich. Their influence on the malaria occurrence was analyzed together with malaria risk co-factors, such as sex, parents' educational and ethnic background, number of children living in a household, applied malaria protection measures, place of residence and age of the child and the mother. The multivariate analysis demonstrated that the proportion of children with malaria decreased with increasing socioeconomic status as classified by PCA ($p < 0.05$). Other independent factors for malaria risk were the use of malaria protection measures ($p < 0.05$), the place of residence ($p < 0.05$), and the age of the child ($p < 0.05$). The socioeconomic situation is significantly associated with malaria even in endemic rural areas where economic differences are not much pronounced (Yvas and Kumaranayake, 2006).

- ***Low Household Income:*** Low income and consumption are important aspects of poverty (WHO, 2006). Poor households and individuals are prevented from consuming goods and services that otherwise would protect them against the risks of malaria. A literature review was undertaken in 2003 to critically assess evidence on malaria incidence or vulnerability to the effects of malaria (Worrall et. al, 2002) Citing studies from countries worldwide, the review concluded that the poorest countries suffer the greatest burden of malaria. However, evidence from household - and community - level case studies that stratified data along socioeconomic lines, present conflicting pictures of the distribution of malaria incidence among poor and less

poor households. In sub-Saharan Africa, a link between low income and the incidence of fever has been observed at the district level (Filmer, 2001).

- ***Social Exclusion:*** An important aspect of poverty is that it often overlaps with, and reinforces, other types of social exclusion (such as those based on race, ethnicity, geographic location urban/rural and gender) that perpetuate inequalities. The social exclusion of ethnic groups is often reflected in the relatively lower levels of development and higher rates of poverty in the areas where they live (WHO, 2006).

- ***Housing:*** For the poor, living conditions are often characterized by inadequate housing and overcrowding, which can increase the risk of malaria. Dwellings that are hastily constructed, or made of readily available materials, might allow mosquitoes to enter more easily than well-constructed housing with screened windows, thus increasing vector contact (Lindsay, 2003). Some evidence suggests that overcrowding might increase the risk of malaria, because mosquitoes are attracted by the higher concentration of carbon dioxide and other chemicals in crowded houses (Alton and Rattanavong, 2004). Family living space also might not be adequately separated from domestic animals, and the animals' body temperature might attract mosquitoes.(Lindsay, 2003). In a recent survey in Nigeria on children health, about 16% of children reported having fever in the two weeks preceding the survey. The prevalence of fever was highest among children from the poorest households (17%), compared to 15.8% among the middle households and lowest among the wealthiest (13%) ($p<0.0001$). Of the 3,110 respondents who had bed nets in their households, 506(16.3%) children had fever, while 2,604(83.7%) did not. ($p=0.082$). In a multilevel model adjusting for demographic variables, fever was associated with rural place of residence (OR=1.27, $p<0.0001$, 95% CI: (1.16, 1.41), sex of child: female (OR=0.92 $p=0.022$, 95% CI: 0.859, 0.988) and all age categories (> 6 months), whereas the effect of wealth no longer reached statistical significance (Yusuf et. al., 2010).

- ***Occupation and Migration:*** Poor households often earn their livelihoods from multiple sources. For example, farmers in Lao People's Democratic Republic and the Philippines tend to increase their income with non-timber products collected in nearby forests (Erhart, 2004) Studies have demonstrated a significant link between regular work in the forest and increased risk of malaria also in Africa (Filmer, 2001; Erhart, 2004) Among households in the village with bed nets, sleeping in the forest regularly (without a bed net) was associated with an eightfold higher risk of malaria. Notably, the risk of malaria among households in the village that did not use bed nets was similar whether or not an individual slept in the forest or not (Erhart, 2004). In countries with forest malaria, migrants into forested areas are particularly at risk, because they lack immunity to malaria. Migrants might be drawn to the forests for a variety of reasons, and might or might not be predominantly from poor households.

- ***Migration and the Spread of P. falciparum:*** While migrants into forested areas tend to be particularly vulnerable to malaria due to their lack of immunity, they also might transport malaria back into malaria-free zones when they return to their homes or search for work in other areas. During the 1990s, for example, many male workers travelled from communities in Thailand to the gem-mining areas of Borai Province in Cambodia. When they returned to their homes in Thailand, malaria tests revealed that some workers had been infected with resistant strains of P. falciparum (Espino, 1997).

- ***Malnutrition and Concurrent Infections:*** Individuals dwelling in poor households are often malnourished. Malnutrition encompasses not just protein-energy malnutrition, but also deficiencies in micronutrients such as iron, vitamin A, iodine and zinc, in particular. Underweight has been identified as a contributing factor in 60% of all child deaths in developing countries (Espino, 1997; WHO, 2001) Underweight is believed to increase the susceptibility of children contracting malaria for various reasons, including reduced immunity. Evidence strongly suggests that micronutrient deficiencies and general under nutrition increase the burden of

malaria morbidity and mortality (Caulfield, 2004) Individuals in poor households are more likely than those in better-off households to suffer from concurrent infectious and parasitic diseases in addition to malaria.

- ***Inequalities in Access to Prevention for Malaria:*** Prevention is a key aspect of malaria control, and prompt treatment is considered the most important method of preventing deaths from malaria (McCombie, 2002) Yet, in the Lao People's Democratic Republic, for example, only 24% of the population was sleeping under a bed net in 2000, while an estimated 51% of the population of Solomon Islands was sleeping under bed nets in 1999.As discussed below, some evidence suggests that bed net use is higher among non-poor than poor households insecticide–treated net(ITN) ownership as measured by national surveys.2007 – 2008 in the high burden WHO African region countries). The same in Tanzania where it was shown that poor households living in rural areas spend significantly less on all forms of malaria prevention compared to their richer counterparts, including bed nets, and insecticides. Thus, preventive measures might be missing in poor individuals and households that face greater exposure to malaria than in those that are better off. Inequalities in access to malaria prevention and control might arise from financial and non financial barriers. Separately and together, these barriers can delay or prevent the poor from accessing health care services. For example, based on the findings of a literature review (Worrall *et. al.*, 2002) poor households are more vulnerable to the effects of malaria than less poor households, possibly because poor households have less access to treatment for malaria than non-poor households. Furthermore, household expenditure on prevention for malaria is more strongly related to income and socioeconomic status than to household expenditure on treatment. However, the cost of seeking treatment for malaria infection is likely to be heavier for poor than for non-poor households (Worrall *et. al.*, 2002).

- ***Economic Barriers:*** When health services are available, the costs associated with preventive and curative treatment of malaria might deter or prevent the poorer from seeking care.

Furthermore, the cost of malaria related preventive measures has been found to be higher in rural than in urban areas (Chima *et. al.*, 2003) Spending on malaria prevention, such as bed nets, appears to be related on household income or socioeconomic status, with better-off households allocating a larger share of their income to malaria prevention than poorer households(Ettling, 1994) The costs of seeking care can be divided into direct costs (such as fees for services), indirect costs (such as the cost of transportation) and opportunity-loss costs (such as lost wages from time away from work). Although the absolute cost of seeking care as a share of non-food expenditure might be lower for the poor than that for the non-poor, the relative cost of seeking health care is higher.

- ***Low Education and Knowledge:*** A general lack of health information and awareness among poor and marginalized groups can greatly reduce the demand for healthcare services. In addition, ethnic minorities might hold beliefs and perceptions about health and illness that influence health seeking. Knowledge of malaria might be lower among poor than non-poor households for several reasons. Information, education and communication (IEC) material for malaria might not reach poor people. Illiterate people and those with low levels of education might be unable to understand written health education materials, such as posters and flyers. Poor households might not have access to radios or television, thereby missing health messages broadcast through these media. Women and ethnic minorities might have even less access to mass media: women tend to be less educated and literate than men, while ethnic minorities can have limited command of the official language of the area or country. Thus, although health information on the cause, transmission and appropriate treatment for malaria might be available in health centers and within villages, such information might not be of any benefit to poor and marginalized groups. Health education delivered through outreach workers likewise might not reach poor households in remote rural villages. In this way, low levels of education can lead to low knowledge of malaria. In turn, such knowledge and perception of malaria is an important

factor in determining acceptance and use of malaria prevention and control measures (WHO, 2006; 2008).

2.5.2 Inequalities in the Quality of Malaria Treatment:

- ***Public sector***: many studies from all the poor countries, in Africa and in Asia, have shown that health staffs are reluctant to work in rural and remote health centers (Asian Development Bank, 2001).Furthermore, health posts in remote areas tend to suffer from shortages in essential medicines and equipment, which often result in low-quality care and limited confidence in the health care services. Villages near urban centers or along accessible coastal areas enjoy better quality health care than do villages in the remote interior or on isolated stretches of coast (Asian Development Bank, 2002). Patients seeking care during these periods would be given a prescription for anti-malarial drugs that could be purchased from a local pharmacy. The irregular supply of free anti-malarial drugs, combined with delayed diagnoses, discouraged community members from seeking prompt care for malaria. Furthermore, death from malaria in the Philippines has been attributed to delayed consultation, irregular availability of anti-malarial drugs for severe cases in peripheral health centers, and improper treatment from hospital-based physicians. (MDGs- UN, 2005).

- ***Private practitioners:*** Malaria treatment might be offered free in public health centers in many regions. However, patients—including some poor patients— seek care from private practitioners for various reasons, including the perceived poor quality of public health care providers. In areas where antimalarial drugs are available commercially, they can be substandard, counterfeit or outdated. In a recent study in Kenya conducted by Chuma *et. al.*, 2010 demonstrated that multiple factors related to affordability, acceptability and availability interact to influence access to prompt and effective treatment. Regarding affordability, about 40% of individuals who self-treated using shop-bought drugs and 42% who visited a formal

health facility reported not having enough money to pay for treatment, and having to adopt coping strategies including borrowing money and getting treatment on credit in order to access care. Other factors influencing affordability were seasonality of illness and income sources, transport costs, and unofficial payments. Regarding acceptability, the major interrelated factors identified were provider patient relationship, patient expectations, beliefs on illness causation, perceived effectiveness of treatment, distrust in the quality of care and poor adherence to treatment regimes. Identified availability barriers were related to facility opening hours, organization of health care services, drug and staff shortages. Ensuring that all individuals suffering from malaria have prompt access to effective treatment, remains a challenge for resource constrained health systems. Policy actions to address the multiple barriers of access should be designed around access dimensions, and should include broad interventions to revitalize the public health care system.

- ***Malaria and Disability:*** A further condition that can complicate relationship between Malaria and poverty is disability. A very recent study performed in Malawi by (Benedicte et. al., 2012) on disability and poverty generated information on disabling effects of cerebral malaria as a consequence of poverty. Malawi is among the countries in the world where malaria causes serious health problems. The whole population is at risk. In 2004, about 33% of all children in a district were estimated to have had malaria. Malawi's population is among the poorest in Africa. Over half the 15 million population is food insecure and dependent on rain-fed smallholder agriculture. Those who live along the lake shore supplement their diet and income by fishing from small boats. While Malawi's National Statistical Office indicates that 39% are living below the poverty line. Palmer, (2006) claims that as much as 65% of the population is unable to meet their daily consumption needs. The informants in this study are known to the health services as malaria survivors. However, they do not receive health services for the disabling after-effects because poverty in most cases has prevented them from seeking such help.

2.5.3 Malaria and its impact on economic growth

Several kinds of evidence suggesting that malaria has large economic effects have been established. What are the channels through which malaria could be a major drag on the economy? The traditional medical view of malaria at its most severe, in holo-endemic areas, is that malaria contributes significantly to child mortality and can cause acute disease in pregnant women, but it does not have large effects on the fitness of other mature adults due to their partial immunity acquired through constant re-infection. McGregor, (1988) states this clearly: "in adult life...a host-parasite balance resembling commensalisms is achieved. Despite sustained infectious challenge, adults constitute an economically viable work-force capable of coping with the strenuous physical activities that are required to maintain essential food supplies in subsistence agricultural communities." Though this view may be shared by many in the medical field, it has rarely been the subject of careful research. One wonders if the medical focus on mortality and acute disease obscures a general debilitation that could be caused by malaria. At least one article reports that long-term asymptomatic malaria may be the cause of chronic pains and lassitude among Europeans in East Africa (Wilks *et. al.*, 1965). Formidable methodological and measurement problems confront any assessment of the impact of malaria on individuals and households in areas of stable malaria. There is not even a clear method for diagnosing which individuals suffer from malaria. Virtually the whole population carries malaria parasites, and the density of parasites is not a reliable measure of disease due to a variable immune response, which is still poorly understood. Fever symptoms are not specific to malaria. If everyone is infected with malaria, there is no comparison group for measuring the impact of malaria on diseased individuals relative to the healthy population. If a clear measure of disease were available, one still faces the problem of assessing the cost of illness in extended rural households, accounting for the compensating behavior of other household members. It is hard to evaluate the cost of lost opportunities of household members who help out a person with malaria. Most

attempts to directly measure the lost work due to malaria (which ignore these problems) find small or no impacts (Chima and Mills, 1998).

Malaria has life-long effects on cognitive development and education levels through the impact of chronic malaria-induced anemia and time lost or wasted in the classroom due to illness. The importance of these effects is speculative, though, since their impact is virtually unstudied. Iron deficiency anemia *per se* has been shown to affect the cognitive skills of children as well as their cognitive abilities in later life (Pollit *et al.,* 1989; Lozoff *et al*., 1991).

In short, the impact of malaria on the productivity of individuals in areas of stable malaria cannot be assessed with the current state of research. Whether or not individuals are significantly debilitated by malaria, there are several other channels through which malaria could have large impacts on the economy. The first is the impact of malaria on foreign direct investment and tourism. Malaria, unlike diseases resulting from poverty, does not discriminate between rich and poor victims. As long as malaria protection is imperfect and cumbersome, well-to-do foreign investors and tourists may stay away from malarial countries.

A second channel through which malaria may affect the economy is limitation on internal movement. The better educated and the ambitious who move to the largely malaria-free cities lose their natural protection due to lack of exposure. They may be reluctant to maintain contact with the countryside for fear of infection. Communities in unstable malaria areas may try to keep out people from stable malaria areas for fear of epidemics. In general, the transmission of ideas, techniques, and development of transportation systems may all be stunted by malaria. Finally, the strong correlation of malaria with income levels and income growth may due to a range of tropical vector-borne diseases besides malaria. General health status should be picked up by life expectancy in the income growth regressions, but many tropical diseases, like yellow fever, trypanosomiasis, onchocerciasis, and leishmaniasis, have similar geographical ranges to malaria.

Malaria is likely the most important of these diseases, but the measures of malaria used in this paper may be an indicator for a combination of tropical diseases. There may be important synergies between the diseases, so that areas affected by multiple tropical diseases are worse off than the sum of the impacts of the individual diseases.

2.6 Willingness To Pay for Malaria Prevention and Control Measures.

One of the approaches to measuring the burden of a disease is the Willingness To Pay (WTP) approach. The WTP approach is one of the two subsets of the method of Contingent Valuation (CV). The WTP and its twin concept, the Willingness To Accept (WTA), are the two approaches that are often used to implement the method of contingent valuation of health-care programmes (Morrison and Gyldmark, 1992; Donaldson, 1990). The method of CV is founded in welfare economics and in value theory in particular. It has been suggested that CV is a method of choice when valuing health programmes for the purposes of decision making and priority setting in the health-care sector (Johannesson, 1993; Johannesson and Jonsson, 1991). It has been used widely to value public safety, disease prevention and control programmes (or services in general), and to value health outcomes or states (Berwick and Weinstein, 1985; Johannesson *et. al.*, 1991; Thompson, 1986).

The CV method in general and the WTP in particular, is particularly suitable for evaluating the burden (or cost) of malaria and especially for valuing malaria control programme. However, because WTP involves asking individuals to state the maximum amount that they would be willing to pay to acquire a service (or to prevent an undesirable health outcome), it is important that relevant questions be asked in a correct manner and after making available to the respondents all information relevant to making a sound decision; the sample must also be representative. One advantage that can be derived from using the WTP to value the disease burden of malaria is that it is capable of measuring the intangible costs that neither the

production function nor cost of illness approach is equipped to measure (WHO, 2001). This is because after a respondent knows what it would cost him to treat an episode of malaria and the indirect cost (in terms of lost outputs during the sick days), whatever he states in excess of the sum would reflect his valuation of the pains/trauma, etc. (the intangible costs) that are not contained in the direct and indirect costs. Thus, it is a powerful tool for analysts in providing evidence-based policy prescriptions. There is heavy presence of mountains with captivating bare rocks formations scattered across the grasslands (Plateau State Ministry of Environment, 2000). The study area is therefore located in

CHAPTER THREE

MATERIALS AND METHODS

3.1 Materials

The following materials were used for the study namely; sets of well- structured questionnaires administered to household heads during personal visits to the selected households, private clinics and primary health facilities. Voice recorder and photo camera were also used during focus group discussion with the household members to elicit general information about households.

3.2 Methods

3.2.1 Area of study

The study was undertaken in Bokkos L.G.A of Plateau State, Nigeria. Bokkos Local Government Area is one of the 17 L.G.As that made up Plateau State, with its headquarters located in the Bokkos town. It is located between 80^{o} 24'N and 80^{o} 32' latitude and 100^{o} 38'E and 100^{o} 40'E longitude. It has land area of 1,682km^2 and a population of 178,454 persons (NPC, 2006). The mean annual rainfall varies from 131.75cm and 146cm. The altitude ranges from around 1,200 and 1,829 meters above the sea level. Though, situated in the tropical zone, however, a higher altitude made it a temperate climate zone with an average temperature of between 18^{o}C and 22^{o}C. Harmattan winds cause the coldest weather around December and February. The warmest temperatures usually occur in the dry season months of March and April.

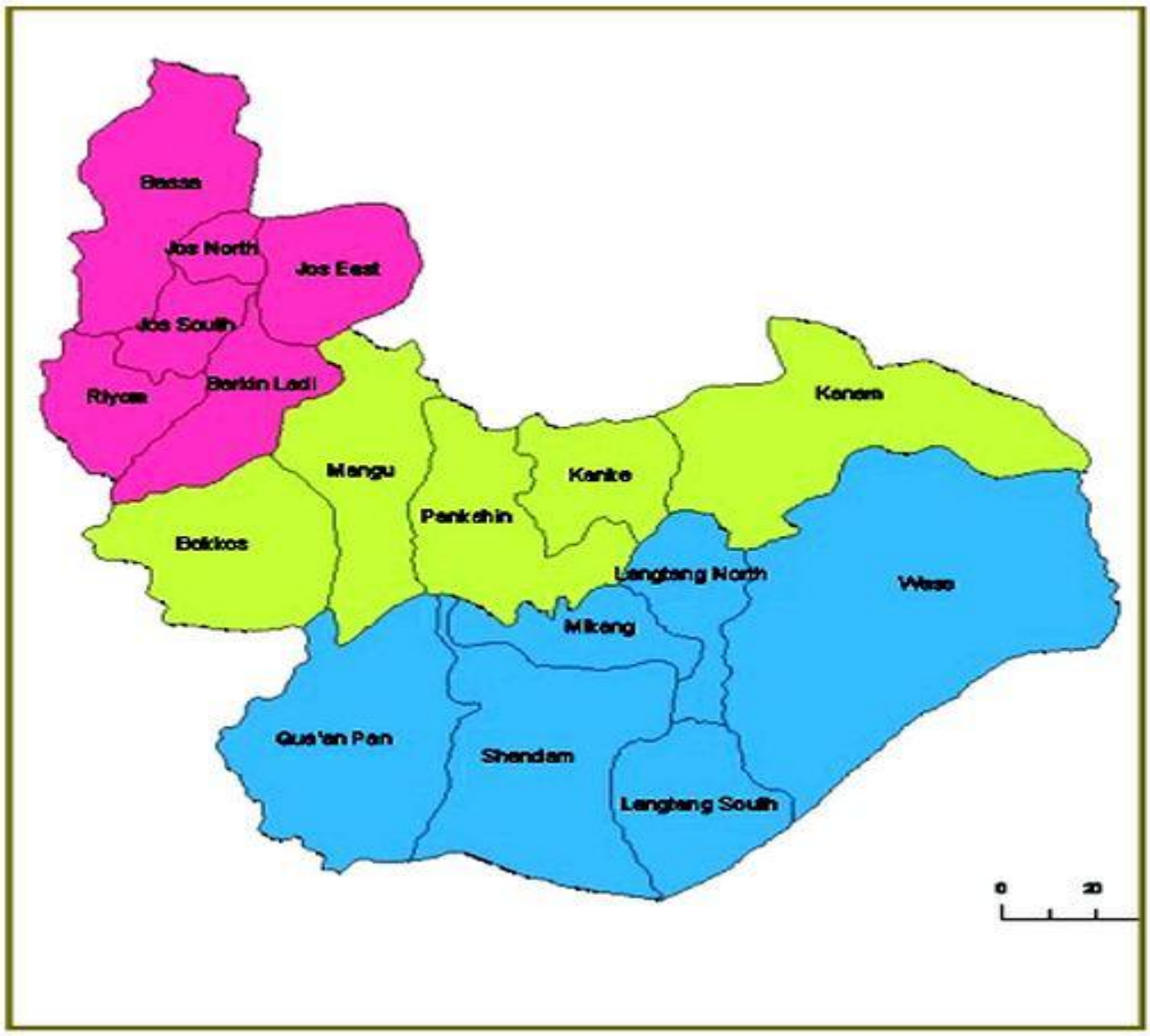

Figure 1: Map of Plateau State showing the Local Government Areas in the State.

Note that Bokkos Local Government Area is marked in green.

the savannah epidemiological malaria zone of the country with majority of the people engaged in subsistence farming, trading and minority in white- collar jobs such as civil servants and private sectors employees. They mostly live in rural, peri-urban and usually congested and polluted urban areas making malaria incidences in the area to be on a high side.

3.2.2. Research Design

The research design employed the use of questionnaire, personal interviews and visits to selected health facilities namely; a government hospital, a private clinic and a primary health center to obtain records of the prevalence of malaria incidence and its socio-economic burden among family households in Bokkos Local Government areas (L.G.A) of Plateau State, Nigeria.

3.2.3 Study Population

The study population was the total numbers of persons that were treated or infected with malaria in the last one year (2013 – 2014). These are the records of patients diagnosed of malaria in the primary health care centers, private clinic and general hospital in the study area.

3.2.4 Sample selection procedure

This study employed purposive and simple random sampling procedures. The first stage involved purposive selection of three (3) Health Centers viz one Primary Health Center (i.e. Primary Health Center Richa) one General hospital (i.e. General Hospital Bokkos) and one private clinic (i.e. Church of Christ in Nations (COCIN) Dispensary, Daffo). The list of all the patients diagnosed and treated of malaria was obtained from each of the selected hospitals. From these lists, forty (40) respondents were randomly selected from each of the 3 selected hospitals enrolled in the study and visited to obtain 120 respondents interviewed for the study.

Calculation of Sample Size:

First Stage: 3 Hospitals viz one Primary Health Care Centre, General Hospital and Private Clinic each = 3 Hospital selected. Second Stage: 40 respondents (out-patients) were randomly selected from each 3 selected Hospitals making a total sample size of 120 respondents.

3.2.5 Instrument for the Data collection

The instrument for the data collection was well-structured questionnaire to elicit information from the individual while open ended discussion was used to obtain information from the whole households. Personal interview was used to obtain in depth information from the hospitals and those interviewed were the medical staff namely; doctors, nurses and community health workers. A confirmation of a malaria case was determined through the respondent's description of the major symptoms experienced by the patient and through the verification of available documents, e.g. prescription forms, laboratory reports, payment receipts.

3.2.6 Validation of the instrument

Validity is often defined as the extent to which an instrument measures what it purports to measure and requires that an instrument is reliable. The well–structured questionnaire was used for the study and pre–tested using Cronbach alpha test for reliability and hence shows validity for the desired expectations. This was done by administering few numbers of the questionnaires to the potential respondents and the information received was evaluated to check consistency with the objectives of the study. The respondents' response rates were also checked.

3.2.7 Methods of Data collection

In line with the overall objective of this study, two types of data were employed. Secondary data on cost, public expenditure and population of reported case of malarial treatment morbidity and mortality were obtained from the health records of Primary Health Care, Richa, General Hospital

Bokkos and COCIN Clinic, Daffo in Bokkos L.G.A. The selected households were interviewed with the aid of well-structured questionnaire on their demographic characteristics such as sex, age, whether or not the household possessed a bed net, whether the family members slept under bed net at night before survey, the type of bed net (treated or untreated) used, the type of place of residence (rural/urban) and their economic/wealth index; how much they spent in protecting themselves against malaria attacks; how much they spent in treating a single malaria episode; and their choice of health-care provider; among others. The responses of the respondents were collected via a structured pre-tested questionnaire during an interview session with each household.

3.2.8 Data Analyses

To achieve the objectives of the study were achieved through the use of both descriptive and inferential statistical tools. Mean, percentages, frequency distribution, cross tabulations, willingness to pay (WTP) approach and multiple linear regressions. In epidemiology, Incidence and Prevalence are two commonly used terms used interchangeably to describe the pattern and distribution of disease transmission among a population group. Shields and Twycross (2003) and this methodology was adopted throughout this study.

Objective 1 was achieved using cross tabulations analysis to describe the malaria epidemiology (incidence and prevalence) among the socio –economic status (SES). This was to achieve incidence of malaria across the age, household size, wealth index, educational level.

Objective 2 was achieved through the multiple linear regression analysis (MLR) to estimate the effects of SES on malaria epidemiology (incidence and prevalence). Following Ajadi *et. al.*, (2012), this is implicitly expressed as:

MI = *f* (AGE, HHS, EDS, GEN, REG, MS, HE, OCC) …….. (1)

Where MI = Malaria Index i.e Number of family members that had malaria last year (2014)

HHS = House hold size of the family,

EDS = Education status of the household head,

GEN = Gender of the household head,

REG = Religion belief,

AGE = Age of the household head,

MS = Marital Status of the household head,

HE = Household expenditure, a proxy of wealth index.

OCC = Occupation of the household head

Objective 3 was achieved by posing questions on cost of illness studies that use cost-of-illness approach (Jimoh *et. al.,* 2007). The elicitation format for WTP questions was binary-with-follow-up (BWFU) questions (i.e. a bidding process with yes-or-no options). Respondents were first informed of the malaria epidemiology (incidence and prevalence rate) in the Nigerian society and those that are at the greatest risk as well as the short-term and long-term effects on them. They were further informed of the cost of treating a malaria attack, and going by their own accounts in their responses to earlier questions, they were reminded of their own current expenditures on treatment and prevention, lost work time, as well as of the usual pains and sufferings that are associated with malaria attacks. Thereafter, they were asked to state the amount they are willing to pay per month for an effective treatment whenever any member of the household had a malaria episode, and what their households are willing to pay for the control of malaria, among other questions. The responses of the respondents were then analyzed using central measures of tendency (specifically, the mean) to determine the value the households attached to different malaria prevention methods, malaria treatments and total malaria control. The excess of the amount people were willing to pay to malaria eradication and control over what it currently costs to treat and prevent it, was taken as the household valuation of the intangible costs of malaria illness.

Objective 3 was achieved through regression analysis; it is desirable to investigate what determines the amount that households are willing to pay (economic burden) for the eradication of malaria; this is implicitly specified following Jimoh *et. al.*, (2007) as:

WTPMC = *f* (HE, EDS, MPROTEC, MALCOST, INDIRECTCOST, HHS, MS, LSTAY, PUBMED

Where WTPMC = amount the household is willing to pay for malaria control

HE = Household expenditure, a proxy of wealth index

EDUC = Educational Status,

MPROTEC = current cost of malaria protection methods i.e cost spent on insectides, window/door nets, mosquito repellant coils

MALCOST= current cost of treating malaria cases measure by amount spent in control of last malaria incidence in the family.

INDIRECTCOST = the indirect costs of malaria attacks measured either by cost of transport to medical facility and other indirect cost of lost work days or number of sick days

HHS = House hold size of the family.

MS = Marital status, LENGHTSTAY = Length of years spent in the community,

PUBMED = public medical facility Dummy variable public facility = 1, otherwise = 0

CHAPTER FOUR

RESULTs

4.1 Results

4.1.1 Socio-Economic Characteristics of the Respondents

The social and economic characteristic of the respondent is presented in Table 1. The results show that 22.4% of the respondents are aged between 16 – 25 years, 36.2% of them are aged between 26 – 36 years, 17.2% of them were aged between 46 – 55years; 8.6% of them are aged above 56years. The mean age was 37.2 years; the females accounted for 65.5% of the total respondents, while males makeup 42.4%. About 56% of the respondents are married while 44% of them are singles. About 11.2% of the respondents had the household size of between 2 – 5 persons, up to 62.1% of them had between 6 – 9 persons in their household, 22.4% of them had 10 – 13 persons in the household, and 4.3% of them had 14 – 17 persons in their household. The result also shows that 14.7% of the respondents have no formal education, 12.9% of the respondents attempted and dropped out of primary education, 31% of them completed primary education, 11.2% of them dropped out of attempted and dropped out of secondary school, 19.8% of them completed secondary school education, 7.8% of them attempted but dropped out of the tertiary education and only 1.7% of them completed the tertiary education. It could be inferred that majority of the respondents are educated; respondents with no education or otherwise only accounted for 13.0%.

About 42.2% of respondents had stayed in their residence between 1 – 10 years, 31% of them had stayed in the residence between 11 – 20 years, 13.8% of them had stayed in their residence between 21 – 30 years and 12.9% of them had spent over 30 years in their residence.

Average year of residence was 10 years. Only 38.8% of respondents possessed mosquito nets while 61.2% of the respondents do not possess mosquito nets, Out of the respondents that possess mosquito nets, 60% of them that possessed treated mosquito nets while 40% of them

possessed untreated nets, 33.6% of the respondents sleep under treated nets and 66.7% of the respondents do not sleep treated nets.

Table 1: Socio – Economic Status (SES) of the Respondents

Variables	Frequency	Percentages	Mean	Std.dev.
Age				
16 – 25	26	22.4	37.2years	13.0years
26 – 35	42	36.2		
36 – 45	18	15.5		
46 – 55	20	17.2		
≥ 56	10	8.6		
Gender				
Male	42	36.5		
Female	74	65.5		
Marital Status*				
Single	65	56.0		
Married	51	44.0		
Household size				
2 – 5	13	11.2	7persons	3persons
6 – 9	72	62.1		
10 – 13	26	22.4		
14 - 17	5	4.3		
Educational attainment				
No formal education	17	14.7		
Primary educ. dropped	15	12.9		
Primary educ. completed	37	31.9		
Sec. educ. dropped	13	11.2		
Sec. educ. completed	23	19.8		
Tertiary dropped	9	7.8		
Tertiary completed	2	1.7		
Length of Stay in the residence				
1 – 10	49	42.2	10years	6years
11 – 20	36	31.0		
21 – 30	16	13.8		
≥ 30	15	12.9		
Possession of Mosquito Nets*				
Yes	45	38.8		
No	71	61.2		
Type of Mosquito Nets*				
Treated	28	60.0		
Non-treated	18	40.0		
Family sleep under Treated Nets*				
Yes	39	33.6		
No	77	66.4		
Household monthly expenditure				
< 7,000	89	76.7	₦5,612.07	₦3,226.74
7,000 – 17,000	12	10.3		
18,000 – 28,000	8	6.9		
29,000 – 39,000	5	4.3		
40,000 – 50,000	2	1.7		
Religion*				
Christianity	63	54.3		
Islam	53	45.7		

Source: Field Survey Data, 2015

*** Mean and Standard deviation not needed for categorical variables**

It is a common trend that respondents always felt reluctant in disclosing their actual income however, household expenditure become a reliable proxy of their income. It was also shown that 76.7% of the respondents spent less than N7,000 per month on household expenditure, 10.3% of them spent between N7,000 – N17,000 per month, 6.9% of them spent between N18,000 – N29,000 per month, 4.3% of them spent between N29,000 - N39,000 per month and 1.7% of them spent above N40,000 per month as household expenditure. The mean monthly expenditure was N5,612.07. About 54.3% of the respondents were Christians while 45.7% of them were Muslims.

4.1.2: Prevalence of Malaria among the Socio-Economic Status of the Respondents

The Cross tabulations of the Malaria prevalence among the Socio-Economic Status was presented in Table 2. The malaria prevalence was categorized into three groups based on frequency of prevalence which include 1 – 3 prevalence, 4 – 6 prevalence and above 6 prevalence and cross-tabulated with the SES. The result shows that 16.38% of children between 6 -10 years had 1-3 malaria incidence, 24.14% of children between 1- 5 years had 4 – 6 incidences, 5.89% of children between 1 – 5 years had above 6 malaria incidences. The children below 5 years had highest malaria incidence of 40.37% followed by children between 6 – 10 years with 23.27% and malaria incidence was lowest among adult above. Malaria prevalence was highest among those with 1 – 6 years (primary education) with 53.05% and about 23.28% of this category had 4 – 6 malaria incidences. This is followed by those without formal education with malaria incidence of 53.05% and 12.87% of them had above 6 prevalence, Malaria

Table 2: Cross tabulations of the Malaria prevalence among the Socio-Economic Status.

	Malaria prevalence*			
Demographic variables	1-3	4-6	above 6	Total
Age (years)				
0 – 5	10.34	24.14	5.89	40.37
6 – 10	16.38	6.03	0.86	23.27
11 – 15	6.03	6.90	0.86	13.79
16 – 20	8.62	5.17	0.86	14.66
21 – 25	5.17	5.17	0.86	11.21
> 26	4.90	2.75	1.98	9.63
Education (years)				
None	20.31	14.68	12.87	47.86
Primary education	20.69	23.28	9.08	53.05
Secondary education	15.90	17.24	2.59	35.73
Tertiary education	9.98	7.76	3.76	21.50
Gender				
Male	25.86	24.14	6.89	56.89
Female	21.55	24.14	4.31	50.00
Marital status				
Single	25.86	28.45	1.72	56.03
Married	21.55	19.83	2.59	43.97
Occupation				
Trading	5.17	2.59	0.86	8.62
Unemployed	14.66	15.52	0.86	31.03
Artisan/Farmers	19.83	16.38	0.86	37.07
Civil servant	7.76	13.79	1.72	23.28
Household size (persons)				
2 – 5	5.17	6.90	0.86	12.93
6 – 9	18.97	16.38	0.86	36.21
10 – 13	18.97	20.69	1.72	41.38
14 – 17	26.89	12.09	4.90	43.88
Housing type				
Cemented with modern sheets	9.48	6.90	0.86	17.24
Clayed with thatched grass	12.93	18.10	1.72	32.76
Clayed with aluminum sheets	11.21	13.79	5.17	30.17
Bricks with aluminum sheets	11.21	7.76	0.86	19.83

***Malaria incidence is measured as the number of times of malaria occurrence in 2014.**
Source: Field Survey Data, 2015

prevalence was lowest among those with 13 – 18 years of education (Degree holders) with 21.50% and it was 9.98% of them had 1 – 3 malaria prevalence.

Male individuals had highest malaria incidence with 58.89% while female had 50% malaria incidence, 25% and 21.55% of male and female had 1 – 3 malaria incidences respectively. 24.14% of both gender had 4 – 6 malaria incidence respectively and 6.8% and 4.31% of male and female respectively had above 6 incidences. Single individuals had highest malaria incidence

of 56.03% while married had 43.97% with about 28.45% of single individuals had 4 – 6 incidences and 2.5% of married individuals had above 6 incidences. Artisan/Farmers had highest malaria incidence of 37.07% followed by unemployed individuals with 31.03% and civil servant with 23.28% malaria incidence, traders had lowest malaria incidence with only 8.62%, 19.83% of Artisan/Farmers had 1 – 3 incidence and 1.72% of civil servant had above 6 incidences.

Household with size between 14 – 17 persons had malaria incidence of 43.88% followed by household of 10 – 13 persons with 41.38% and 36.21% of household size with 6 – 9 persons had malaria incidence. About 26.89% of household size with 14 – 17 persons had 1 – 3 incidences, 20.69% of household with 10 – 13 had 4 – 6 malaria incidence, 4.90% of household size with 14 – 17 had above 6 incidences, 32.76% of household that lived in clayed wall and thatched roof, 30.17% of those that lived in clayed walled and aluminum sheet roof had malaria incidences, 19.83% of household with bricked wall with aluminum sheet had malaria incidences, while 17.24% of those that lived in cemented wall with modern roof sheet, 12.93% of those that lived in clayed walled thatched roofs had 4-6 incidences, 18.10% of those with houses built with clayed walled with thatched roofs had 5.17% of those that lived in clayed walled houses with aluminum sheet had above 6 malaria incidences.

4.1.3: Effects of Socio-Economic Status (SES) on Malaria Prevalence and Incidence

A multiple linear regression analysis test was conducted as a statistical method to verify the effects of socio-economic status (SES) on the malaria prevalence and incidence in the area and presented in Table 3. It was hypothesized that age, household size, educational attainment, gender, religion, marital status, household expenditure and occupation type were factors influencing the malaria incidence and prevalence in the area. The correlation coefficient (R) of 0.97 which shows positive correlation between dependent variable (the number of members of the family that had malaria in 2014) and independent variables (Age, Gender, Marital status,

household monthly expenditure, Occupation, Educational status, Religion and Household size of the respondents). R^2 which is coefficient of determination is 0.94 when multiply by 100 it is

Table 3: Multiple regression results of the effects of Socio-Economic Status (SES) on Malaria Prevalence and Incidence

Parameters	Coefficients	Standard Error	t-stat	P-value
Intercept	-3.15	0.93	-3.40	0.00
Age	-0.23	0.07	-3.29**	0.00
Household size	3.65	0.10	38.06**	0.00
Educational attainment	-0.35	0.10	-3.50**	0.00
Gender	0.10	0.07	1.49	0.14
Religion	-0.17	1.07	-0.16	0.35
Marital Status	0.03	0.07	0.46	0.65
Household Expenditure	-1.20	0.09	-13.33**	0.00
Occupation	0.02	0.04	0.53	0.60

Source: Field Survey Data, 2015

Multiple R = 0.97 **R^2 = 0.94** **Adjusted R^2 = 0.90**

Standard Error = 0.36F-value = 210.73** **Observations = 116**

**** = significant at 1%**

equal to 94% (0.94x100%), which implies that about 94% of the incidence of malaria in aggregate life of members in the households (*the number of members of the family that had malaria in 2014)* is explained by the socio-economic factors such as age of the respondents, gender, marital status, household monthly expenditure, occupation, educational status, religion and the household size.

Other factors which are not considered in this study account for the remaining 6%. Such factors may include culture and custom, health habit, environmental sanitation, belief system etc. The result in Table 3 also shows that the calculated F-value is 210.73 and this is related to the P-value or the significance value that is 0.001, which indicates the overall significant of the model as indicated by R^2 in explaining the effects of SES on malaria prevalence and incidence.

Based on the significant factors, the coefficient of Age was -0.23, significant at 1% but has negative effects on the malaria prevalence and incidence, household size has positive coefficient value of 3.65 significant at 1%, coefficient of educational level is -0.35 which is negative and significant at 1% and the coefficient of household expenditure is -1.20 which is negative and significant at 1%.

4.1.4: Amount Willing To Pay for Improved Malaria Prevention and Control Measures and its Determinants

4.1.4.1: Amount Willingness To Pay for Improved Malaria Prevention and Control Measures

The amount that households are willing to pay for malaria prevention and control measures was indicated in Table 4. It highlighted the amount the households are willing to pay for treating a malaria episode, its prevention, household expenditure, actual amount spent in household

Table 4: Amount Willing To Pay for Improved Malaria Prevention and Control Measures

Parameters	Min	Max	Mean	St.dev
WTP_treatment (N)	390.00	9750.00	1811.31	831.44
WTP_prevention (N)	364.00	3120.00	811.83	403.84
Total WTP (N)	754.00	12870.00	2623.14	2152.68
household expenditure (N)	7000.00	60000.00	15612.07	7766.24
amt spent in household protection (N)	1000.00	7000.00	2193.53	1044.98
amt spent in treating malaria (N)	200.00	5000.00	928.88	939.20
indirect cost (N)	1400.00	12000.00	3122.41	1553.25

Source: Field Survey Data, 2015.

protection, treating malaria and other indirect cost such as time loss in treating malaria and transportation cost incurred. The amount households are willing to pay on average was ₦1811.31 (±₦1831.44) per malaria episode for the treatment. It also shows that they are willing to pay an average of ₦811.83 (±₦403.84) per month for preventive measures such as bed nets, room and area spraying. Similarly, it shows that the average sum that households are willing to pay for total eradication of malaria is an average of ₦2,623.14 (±₦2152.68). The average household expenditure was ₦15612.07 (±₦7766.24), actual amount spent in household protection was N2193.53 (±N1044.98), actual amount spent on treatment was ₦928.88 (±₦939.20) and indirect cost which include cost of transport to medical facility, cost of lost work days or number of sick days.

In comparism, as shown in Table 5, the amount households are willing to pay on the average for the eradication of malaria represents the household valuation of the intangible costs include the actual expense used to treat adult which was ₦766.34 while the amount willing to pay was ₦1090.52 and the excess on actual expense was ₦324.17 (42.30%), actual treatment of child was ₦1414.69 while the willingness to pay was ₦1635.78, the excess was ₦221.09 (15.63%). The actual amount spent on bed nets was ₦1,096.77 while the willingness to pay was ₦1,316.12 and the excess over actual expense was ₦219.35(20%), the actual expense and amount willing to pay for door net were ₦1749.83 and ₦1933.60 which gives an excess over actual payment of ₦183.78 (10.50%), the excesses over actual payments for area spray fumigation and room spray insecticides were estimated as ₦244.70 (25%) and ₦301.11 (61.53%). The actual payments for eradication was ₦2499.75 while amount willing to pay was ₦3124.69, therefore gives an excess over actual payment of ₦624.94 (25%).

Table 5: Estimates of Amount Willing To Pay and Corresponding Actual Expenditure

Parameters	Actual expenses (₦)	Amount _WTP (₦)	Excess on actual (₦)	% excess
Treatment_Adult	766.34	1090.52	324.17	42.30
Treatment_Child	1414.69	1635.78	221.09	15.63
Bed nets	1096.77	1316.12	219.35	20.00
Door nets	1749.83	1933.60	183.78	10.50
Area spray fumigation	978.79	1223.48	244.70	25.00
Room spray insecticides	489.39	790.50	301.11	61.53
Total eradication	2499.75	3124.69	624.94	25.00

Source: Field Survey Data, 2015.

4.1.4.2: Determinants of the Amount that Household are willing to pay for the Malaria Eradication

The model for the determinants of the amount that household is willing to pay for malaria eradication was presented in Table 6. The regression result model the factors such as Household expenditure, Educational attainment, Cost of protection, Cost of treatment, Indirect cost, Household size, Length of stay in residence, Marital status and Choice of health care provider as determinants of amount they are willing to pay for malaria eradication. From Table 6, it was shown that the model has good statistical properties with estimated parameters all having correct a priori signs, it has good R^2 (0.68), low Durbin Watson (1.653) and F is 23.12 and valid inferences could be made from it. These results indicate that the significant determinants of households willingness to pay for malaria eradication and control are household expenditure, level of education, costs of protection and treatment, indirect cost (value of hours lost at work, transport cost to clinic) and household size. The coefficient of household expenditure (proxy of wealth status) was 0.976 and significant at 1%, it indicates that one percentage increase in the

household expenditure will bring about a 0.98 percent increase in the amount they are willing to pay for the control of malaria.

The coefficient of educational status was 0.015 and significant at 1% which suggests that one percentage increase in the educational status of the household head will bring about a 0.015 percent increase in the amount they are willing to pay for the control of malaria. Also, the coefficients of costs of protection and treatments were -0.308 and -0.511, this implies that one percentage increase in the cost of protection (area spray, spraying room, bed and door nets) and cost of obtaining treatment in the clinic/hospital would lead to decreases of 0.308 and 0.511 percent respectively in the amount they are willing to pay for malaria control.

Furthermore, the results shows the coefficient of household size was -0.012 which imply that one percentage increase in the household size, lead to decrease of 0.012 percent in the amount they are willing to pay for malaria control.

Table 6: Regression Results of Determinants of the Amount that Households are Willing To Pay for the Malaria Eradication

Variables	Coefficients	Std. Error	t Stat	P-value
Intercept	0.405	0.032	12.483	0.000
Household expenditure	0.976	0.345	2.829**	0.004
Educational attainment	0.015	0.004	3.750**	0.000
Cost of protection	-0.308	0.016	-18.864**	0.000
Cost of treatment	-0.511	0.008	-66.813**	0.000
Indirect cost	-0.791	0.022	-36.046**	0.000
Household size	-0.012	0.004	-3.000**	0.002
Length of stay in residence	-0.001	0.002	-0.740	0.461
Marital status	0.001	0.003	0.270	0.788
Choice of health care provider	-0.003	0.003	-0.895	0.373

Source: Field Survey Data, 2015

R^2 = 0.68 **Adjusted R^2 = 0.60** **Standard Error = 0.02** **F-value = 23.12**

Observations = 116 **Durbin Watson (D.W) = 1.653** **** = significant at 1%**

4.2 Discussion

It was evidence from the study that the population area is made up of people in their prime age and there is large percentage of married individuals mostly female which indicates a growing population, hence the need for proper management of health infrastructural facilities to meet up the anticipated population growth. The same observations were reported by Ajadi *et. al,* (2012) and WHO, (2013) that Nigeria has a growing population with large number of female.

Household size refers to the total number of persons living together as a family unit sharing basic facilities such as shelter, clothing and food (Ohwofasa, 2010). The mean household size indicated a large household population as it is above the nationally recommended household size of 6 persons (World Bank, 2002). The years spent in school was low which means that malaria prevention campaigns like "Roll Back Malaria" would be unsuccessful if the few educated in the local government are made to be involved. These findings are similar with the observation of Ifatimehin, *et. al.* (2009) that most there is low literacy level coupled with predominantly large household size in most parts of the Northern region of the Country resulting in high malaria prevalence.

The inability of most households to afford good shelter, feeding, healthcare, and clothing, which are basic needs, had resultant negative effect on the environment and human quality. This implies poor health and sanitation in the unplanned environment due to their low purchasing power which could have negative implication on level of expenditure on malaria preventive measures by the individual respondents. Ifatimehin *et. al.* (2009) reported that the environmental risk profiles, housing quality reflect the exposure of the population to mosquito bite and high vulnerability to mosquito bite is enhanced in most houses within the fringes of forest, water bodies, and farming areas, as well as within the flight distance of the mosquitoes from their respective breeding habitats.

According to World Health Organization, (2013), Epidemiology reflects the distribution and determinants of disease and conditions among populations which implies disease distribution is considered in terms of Persons, time and place (Who, when and where). It studies the the distribution of disease prevalence in terms of age, sex, race, occupation, income status across the SES in a given area. It was evidence that children below 5 years had highest malaria incidence followed by children between 6 – 10 years. This observation is consistent with Alaba, (2005), Yusuf, *et. al.,* (2010), Nigeria Malaria Fact Sheet, (2011), Ajadi, *et.al.,* (2012) and FMH, (2001) that childhood deaths, resulting mainly from cerebral malaria and anemia, constitute somewhere between 20% and 30% of child mortality in Nigeria. According to WHO, (2000) and Teklehaimanot and Mejia, (2008), most children under age 5 years had over 90.0% malaria cases and between 20% and 25% of child mortality in Africa.

Highest malaria prevalence was observed amongst the lowest educated respondents, this correlates with malaria prevalence. Most uneducated individuals were grossly unaware of the malaria epidemiology as it relates to host, environment and disease vectors. Low awareness about the control and prevention measures of malaria prevalence such as clearing swampy areas, bushes, proper disposal of waste to break the chain between host and environment for malaria disease; taking prophylactic anti-malaria drugs to break the chain between host and agent in malaria disease and spraying the breeding sites for mosquitoes to break the chain between the environment and the agent and for the vector and host chain one can sleep under mosquito net.

The poor quality of household was also linked to high malaria prevalence; there is highest malaria prevalence among those living in clayed walled house with thatched grass. This people lived in dwellings prone to mosquito proliferation. The poor housing characteristics such as the quality of roofing, quality of the walls, effectiveness of the housing ceiling and screens make them exposed to mosquito bite as their respective houses are not protected from mosquito incursion and subsequent breeding. It has been shown that the characteristics of wall construction

are associated with malaria prevalence (Teklehaimanot and Mejia, 2008) and this is consistent with Lindsay, (2003), Ifetimehin *et. al.* (2009) and Jimoh, *et. al.* (2007) that indicated that the poor living conditions are often characterized by inadequate housing and overcrowding, which can increase the risk of malaria, dwellings that are hastily constructed, or made of readily available materials, might allow mosquitoes to enter more easily than well-constructed housing with screened windows, thus increasing vector contact and overcrowding might increase the risk of malaria, because mosquitoes are attracted by the higher concentration of carbon dioxide and other chemicals in crowded houses (Alton and Rattanavong, 2004).

The observations from the regression model of the effects of SES on malaria prevalence showed that household size has positive significant effect on the malaria prevalence in the area. The implication of this is that as the household size increases, likewise the cases or malaria prevalence increases. Therefore, intensifying family planning campaign and awareness is a much needed task towards efforts at reducing malaria incidence. This is because the lesser the family size, the greater the capability to cater for the family. This shows that household size is one important factor that cannot be downplay with when dealing with health of people. This result is in line with Ajadi *et. al.* (2012) and Ifatimehi *et. al.* (2009) that identify over-crowding, poor sanitation in most large households are a predominant factor in high malaria incidence areas.

It is also indicated that Age, educational attainment and Household expenditure had negative influence on the malaria prevalence. In their research, Ajadi *et. al.* (2012) supported the claim that younger individuals, particularly children below the age of 5 years were the most prevalence of malaria incidences. Higher educational status of the individual implies a lower malaria prevalence and incidence in the area; it is evident in Onwujekwe, et. al. (2009) that there is high malaria prevalence among the households whose head has little or no formal education, this implies that education plays significant role in the transmission, prevention and control of

malaria incidence and prevalence in the area as educated individuals are better informed in this regard.

A negative relationship of household expenditure with the malaria prevalence and incidence is supported with several literatures that relate wealth status (which is proxy in this study as household expenditure) with the poverty status of an household (Jimoh *et. al.*, 2007; Uzochukwu and Onwujekwe, 2004; Ajadi *et. al.*, 2012 and Yusuf *et. al*, 2010). The expenditure pattern of the household particularly on disease prevention and control is subject to the wealth status or income earnings of the household head. It is observed that rich household head spend significantly on malaria prevention measures such as insecticides spraying, mosquito bed and door treated nets, this category seek medical attention in the Government hospitals and approved private clinics, the incidence of fever and its treatment were related to poverty in Sub Saharan Africa (SSA), with incidence typically lower at the very top of the wealth distribution (Filmer, 2005). It is similar to the earlier studies where higher prevalence of malaria was found among the poorest population groups (Akazili, 2002; Bennett and Gilson, 2001).

On average, they are willing to pay an excess of 15.63% to treat a child, and 25% for malaria eradication. This high level of willingness to pay for malaria prevention and control indicate that if there were insurance policy for malaria treatments, households would be prepared to pay a good premium of for malaria treatment and preventive measures such as bed nets, room and area spraying. This is also reflected in the study of Jimoh, *et. al.* (2007) that reported that high premiums for malaria treatment and prevention in Nigeria.

Household expenditure and educational attainment had positive effect while cost of protection, treatments, indirect cost while household size had negative effects on the amount they are willing to pay for malaria eradication. According to Filmer (2005), wealthier household will seek better treatment options than the poor households who are willing to go for traditional treatment which are regarded as cheap. Also, educated individuals are well informed about the malaria

epidemiology and willing to break down the environmental, host and mosquito (malaria vector) relationship by committing extra amount to improved prevention and control strategies.

However, high costs of protection, treatment, indirect costs could hindered most households in committing extra amount as they believed the present cost patterns posed significant economic burden to them. Similarly, a household with large people is less likely to committing to improved malaria treatment and prevention as large household size is synonymous with large expenditure pattern which is already a serious economic burden to most poor income earners. These results are in line with the studies of Jimoh *et. al.,* 2007; Ajadi *et. al.,* 2012; Ifatimehin *et. al.,* 2009; Onwujekwe *et. al.* (2009).

CHAPTER FIVE

5.0 SUMMARY CONCLUSION AND RECOMMENDATION

5.1 SUMMARY

Malaria epidemics had frequently been linked with poverty and reducing the burden of malaria is increasingly becoming a global priority as economic burden of malaria illness on households accounts for almost 50% of total economic burden of illnesses in malaria holo-endemic communities, this necessitated the study to examine epidemiology and economic burden of malaria among family households in Bokkos L. G.A, Plateau state, Nigeria with specific objectives to describe malaria epidemiology among the Socio-Economic Status (SES) in the study area, isolate the impact of socio-economic status on malaria epidemiology in the study area and estimate the economic burden and hence isolate the factor influencing their willing to pay for malaria prevention and control. This study employed purposive and simple random sampling to select 120 respondents from 3 purposely selected hospitals (one primary health center, General Hospital and private clinic). However, 116 respondents returned completed questionnaire and this form the sample size for the study.

Secondary data include Empirical and theoretical literatures from related journals and publication from Federal and State of Ministry of Health and World Health Organization (WHO). Primary data were elicited with the aid of well- structured questionnaire on their demographic characteristics such as sex, age, whether or not household possess a bed net, whether the family members slept under bed net night before survey, type of bed net (treated or untreated), type of place of residence (rural/urban) and wealth index; how much they spend in protecting themselves against malaria attacks; how much they spend in treating a single malaria episode; and their choice of health-care provider; among others. The Objectives of the study were achieved through the use of both descriptive and inferential statistical tools. Mean, percentages, frequency distribution, cross tabulations, willingness to pay (WTP) - binary-with-

follow-up (BWFU) questions (i.e. a bidding process with yes-or-no options) approach and multiple linear regressions.

The results indicated that the mean age was 37.2 years; this implies that the population of the study area is made up of people in their prime age. The females accounted for 65.5% of the total respondents, while males makeup 42.4%. About 56% of the respondents are married, 11.2% of the respondents had the household size of between 2 – 5 persons and 4.3% of them had 14 – 17 persons in their household, 14.7% of the respondents have no formal education and only 1.7% of them completed the tertiary education, the mean years spent in school was 8.8years; about 42.2% of respondents had stayed in their residence between 1 – 10 years and 12.9% of them had spent over 30 years in their residence and average year of residence was 10 years. Only 38.8% of respondents possessed mosquito nets while 61.2% of the respondents do not possess mosquito nets, Out of the respondents that possess mosquito nets, 60% of them that possessed treated mosquito nets while 40% of them possessed untreated nets, 33.6% of the respondents sleep under treated nets and 66.7% of the respondents do not sleep treated nets, 76.7% of the respondents spent less than ₦7,000 per month on household expenditure and 1.7% of them spent above ₦40,000 per month as household expenditure. The mean monthly expenditure was ₦5,612.07 and about 54.3% of the respondents were Christians while 45.7% of them were Muslims.

The result shows that 24.14% of children between 1- 5 years had 4 – 6 prevalence and children below 5 years had highest malaria prevalence of 40.37% followed by children between 6 – 10 years with 23.27% and malaria prevalence was lowest among adult above. Malaria prevalence was highest among those with 1 – 6 years (primary education) with 53.05% and about 23.28% of this category had 4 – 6 malaria prevalence. Male individuals had highest malaria prevalence with 58.89% while female had 50% malaria prevalence, 25% and 21.55% of male and female had 1 – 3 malaria prevalence respectively. Single individuals had highest malaria prevalence of 56.03% while married had 43.97% with about 28.45% of single individuals had 4 – 6 prevalence

and 2.5% of married individuals had above 6 prevalence. Artisan/Farmers had highest malaria prevalence of 37.07% followed by unemployed individuals with 31.03%. Household with size between 14 – 17 persons had malaria prevalence of 43.88% followed by household of 10 – 13 persons with 41.38% and 36.21% of household size with 6 – 9 persons had malaria prevalence. 32.76% of household that lived in clayed wall and thatched roof, 30.17% of those that lived in clayed walled and aluminum sheet roof had malaria prevalence, 19.83% of household with bricked wall with aluminum sheet had malaria prevalence while 17.24% of those that lived in cemented wall with modern roof sheet,

Multiple linear regression analysis used to verify the effects of socio-economic status (SES) on the malaria prevalence and prevalence in the area shows that household size had positive relationship with the malaria prevalence and prevalence while age, educational level and household expenditure were positive had negative effects with malaria prevalence. Households are willing to pay an average ₦1,811.31(±1831.44) per head per malaria episode for the treatment, average ₦811.83 (±₦403.84) per month for preventive measures such as bed nets, room and area spraying, it shows that the average sum that households are willing to pay for total eradication of malaria is ₦2,623.14(±₦2152.68). The average household expenditure was ₦1,5612.07(±₦7766.24), actual amount spent in household protection was ₦2,193.53(±₦1,044.98), actual amount spent on treatment was ₦928.88 (±₦939.20) and indirect cost was ₦3,122.41 which include cost of transport to medical facility, cost of lost work days or number of sick days. They are willing to pay an excess on actual expense of ₦324.17 (42.30%), actual treatment of child was ₦1,414.69 while the willingness to pay was ₦1,635.78, the excess was ₦221.09 (15.63%), the actual amount spent on bed nets was ₦1,096.77 while the willingness to pay was ₦1,316.12 and the excess over actual expense was ₦219.35(20%), the actual expense and amount willing to pay for door net were ₦1,749.83 and ₦1,933.60 which gives an excess over actual payment of ₦183.78 (10.50%), the excesses over actual payments for

area spray fumigation and room spray insecticides were estimated as ₦244.70 (25%) and ₦301.11 (61.53%). The actual payments for eradication was ₦2,499.75 while amount willing to pay was ₦3,124.69, therefore gives an excess over actual payment of ₦624.94 (25%).

The results of the determinants of the amount the households are willing to pay (WTP) for the malaria eradication showed that the significant determinants are household expenditure, level of education, costs of protection and treatment, indirect cost (value of hours lost at work, transport cost to clinic) and household size.

5.2 CONCLUSION

It is noted that majority are semi-illiterates based on the low educational level, minority possessed treated and very few among them sleep under it, low monthly expenditure indicated a low wealth status of most people in the area. Malaria prevalence was severe among children, in large family and poorly constructed housing type such as clayed house roofed with thatched grass. Household size had positive relationship with the malaria prevalence and prevalence while age, educational level and household expenditure were had negative effects with malaria prevalence. Also household expenditure, level of education, costs of protection and treatment, indirect cost (value of hours lost at work, transport cost to clinic) and household size are significant determinants of the amount the households are willing to pay (WTP) for the malaria eradication. The economic burden of malaria is very enormous especially for the poor households who predominated the study area as indirect cost was ₦3,122.41 (cost of transport to medical facility, cost of lost work days or number of sick days), the average willing to pay is in excess of ₦221.09 over the actual amount of treatment of a child was ₦1,414.69 per child per malaria episode, in excess of ₦324.17 over ₦766.34 of the actual expense to treat an adult per malaria episode and willingness to pay for prevention in excess of ₦219.35 over actual payment

of ₦1,749.83 per household. Hence, the malaria burden in Nigeria is enormous, intolerable and has a devastating impact on economic growth considering the large population of the country.

5.3 RECOMMENDATIONS

Based on the conclusion of the study, it is recommended that

i. Government policies and programmes towards achievement of goals and objectives of poverty reduction should take account of the interest of the rural dwellers.

ii. Planning is needed for adequate provision of facilities and public utilities in urban and rural settlements to meet human needs and aspirations, and to ensure orderly arrangement of land uses so as to provide habitable and decent forum for the efficient performance of human activities.

iii. Soap opera and staged play in local languages disseminating essential information about malaria to the people should be produced. Drama should be staged in strategic locations in rural areas teaching family planning and family health education. This would break the barrier surrounding ignorance of unhealthy living such as poor sanitation and large family size.

iv. Government, Non-Governmental Organization at both Local and International level should subsidized the effective malaria treatment particularly the new more expensive artemisinin based combination therapy.

v. Free distribution of treated mosquito nets to the households particularly to the poor income earners should become a major priority of the Government and donor organizations in order to prevent the mosquito bites and curtail transmission of malaria

vi. It is important to recognize that health and poverty are closely linked thus reducing the burden of malaria in Nigeria will help to contribute to the economic well-being of communities; and poverty-reduction will be an essential input into improving health.

National malaria control programme in Nigeria and their partners need to recognize these links, and identify mechanisms for ensuring that the poorest have access to essential health interventions.

APPENDICES

Appendix 1:

Graphical illustrations of Malaria prevalence among socio-economic status of respondents

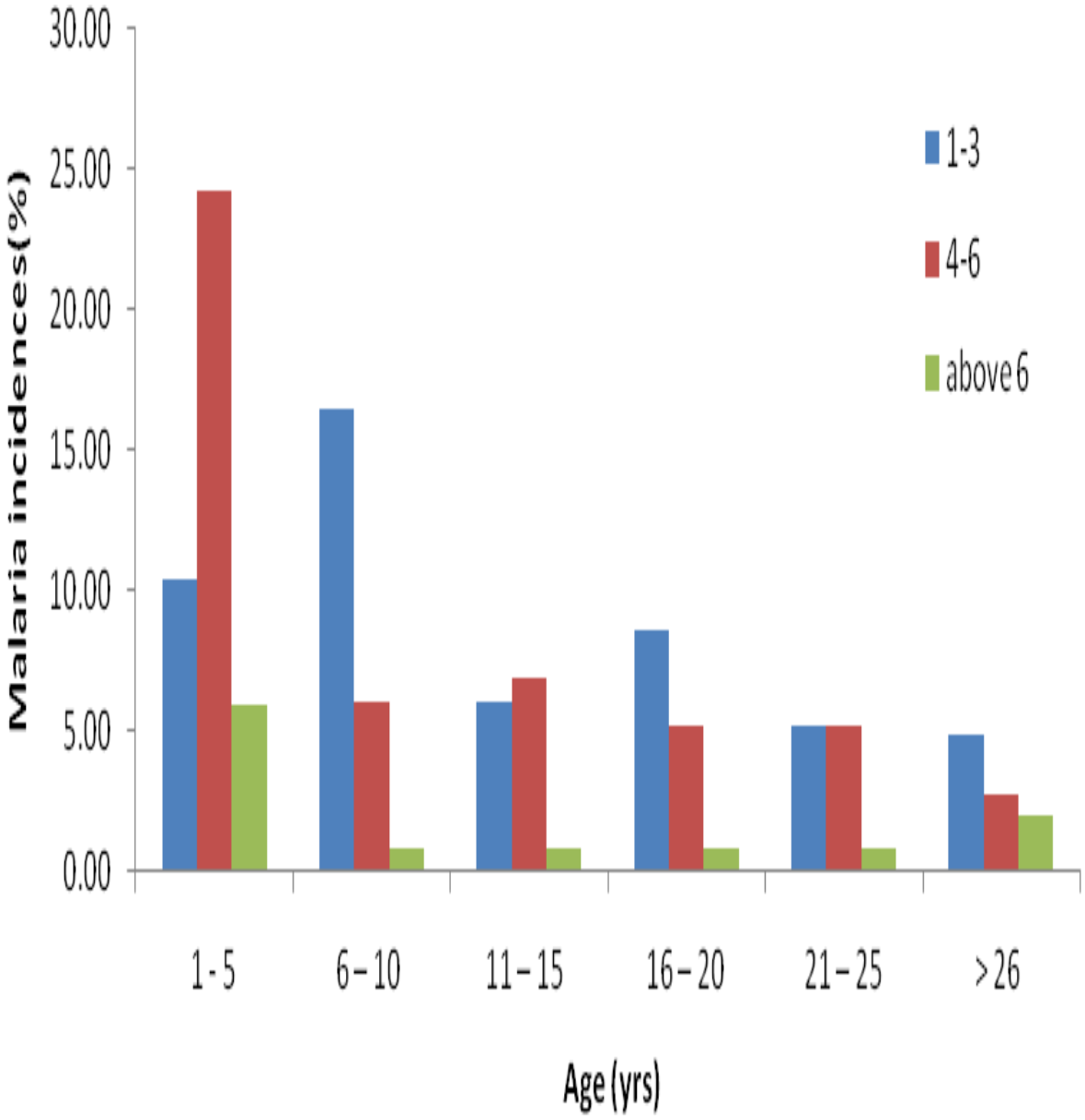

Figure 2: Malaria Incidence across Age

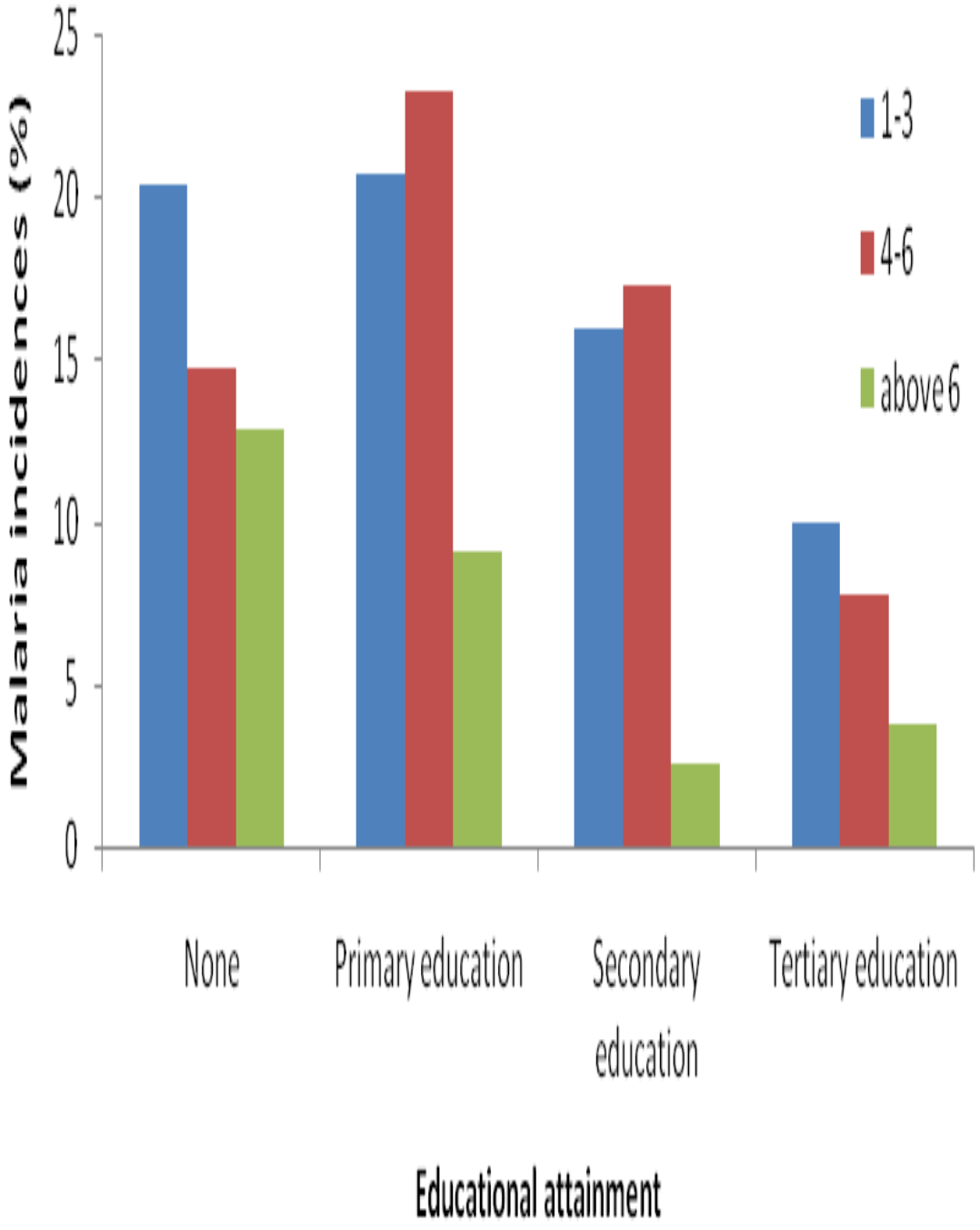

Figure 3: Malaria Incidence across Educational attainment

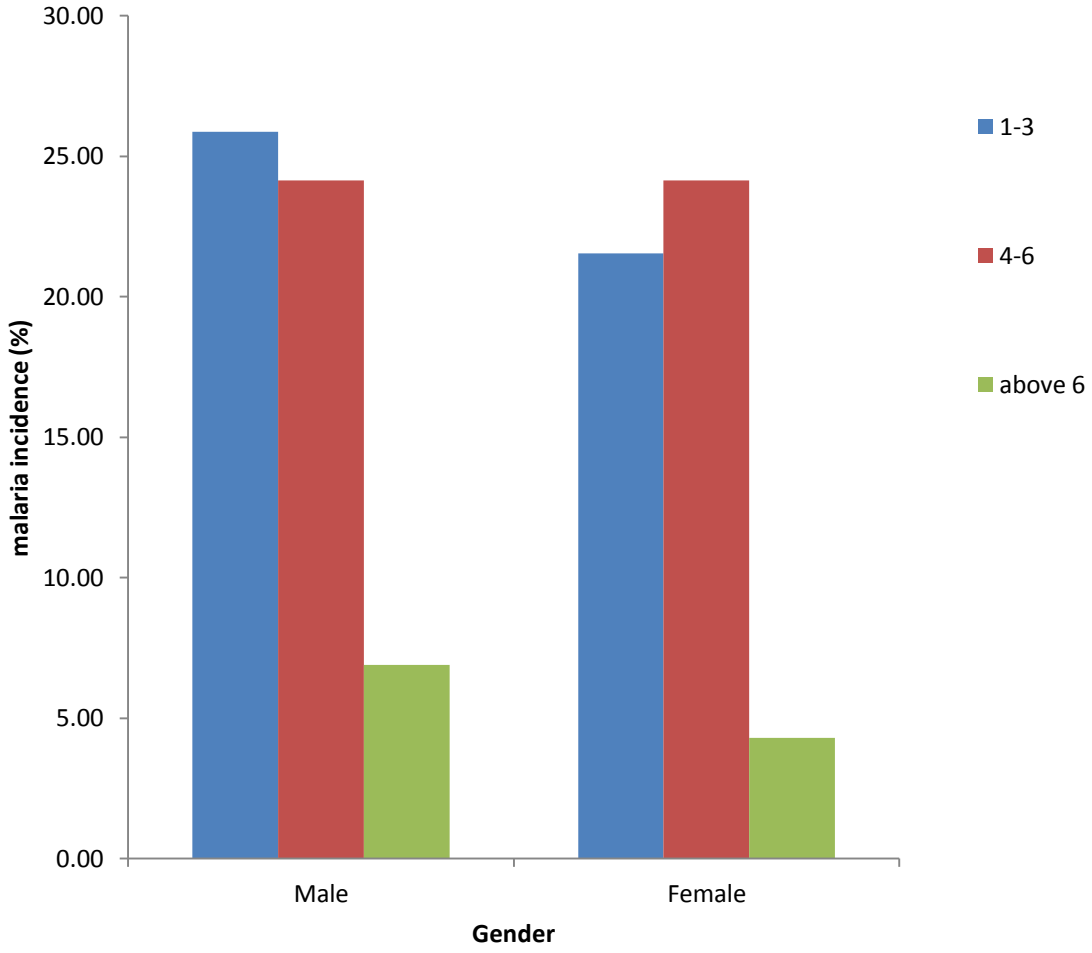

Figure 4: Malaria Incidence across Gender

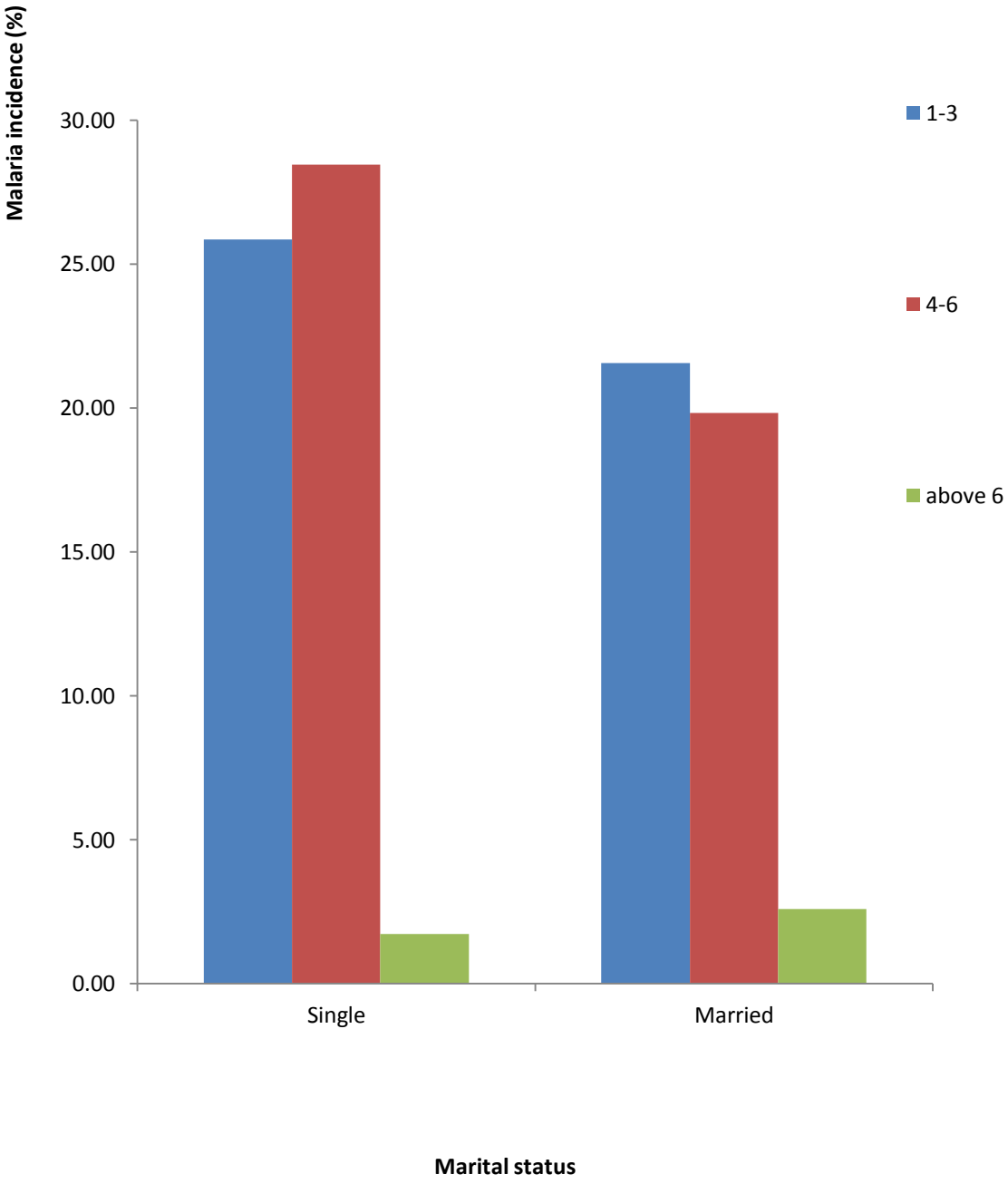
Malaria incidence (%)
30.00
25.00
20.00
15.00
10.00
5.00
0.00
1-3
4-6
above 6
Single
Married
Marital status

Figure 5: Malaria Incidence across Marital status

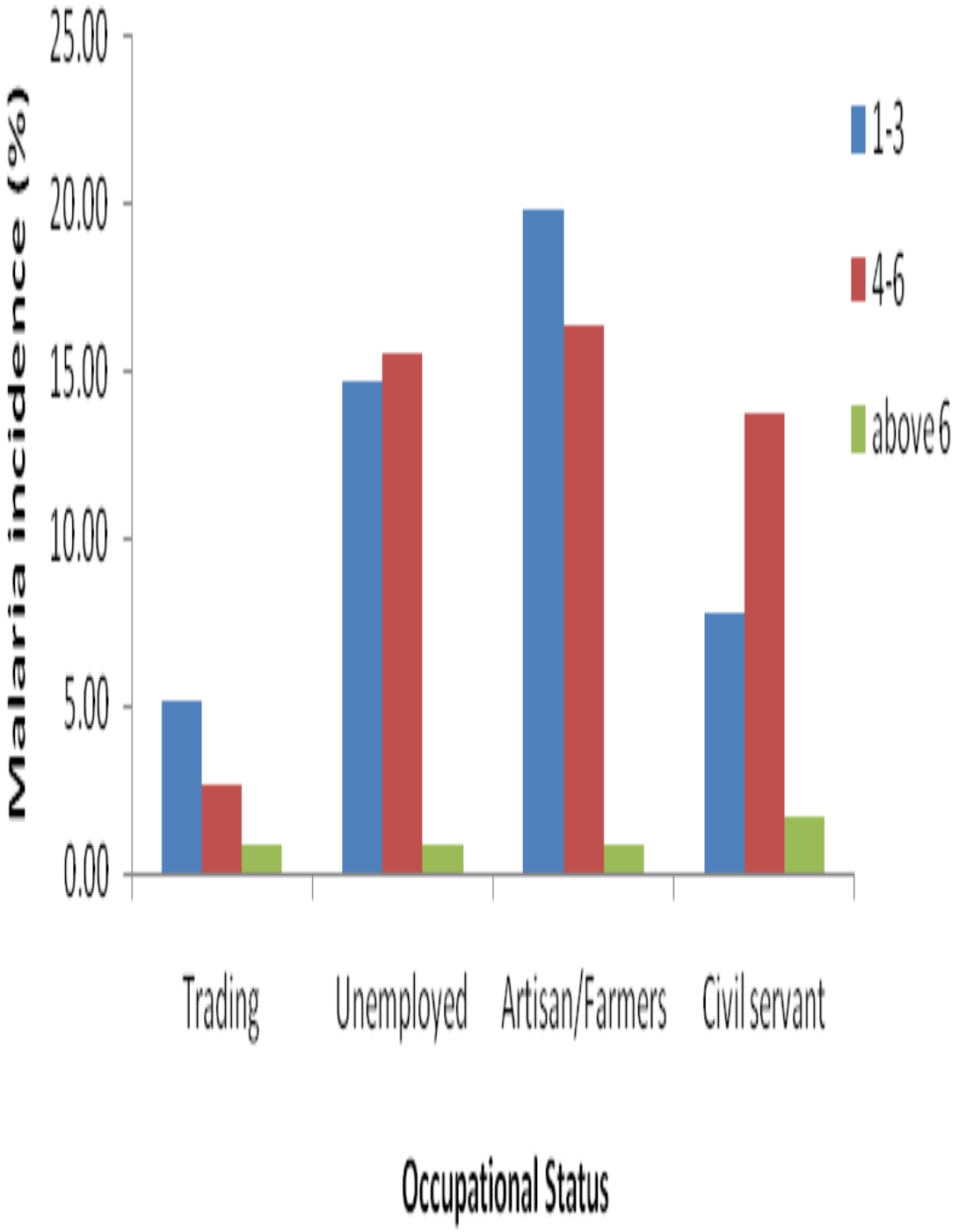

Figure 6: Malaria Incidence across Occupational Status

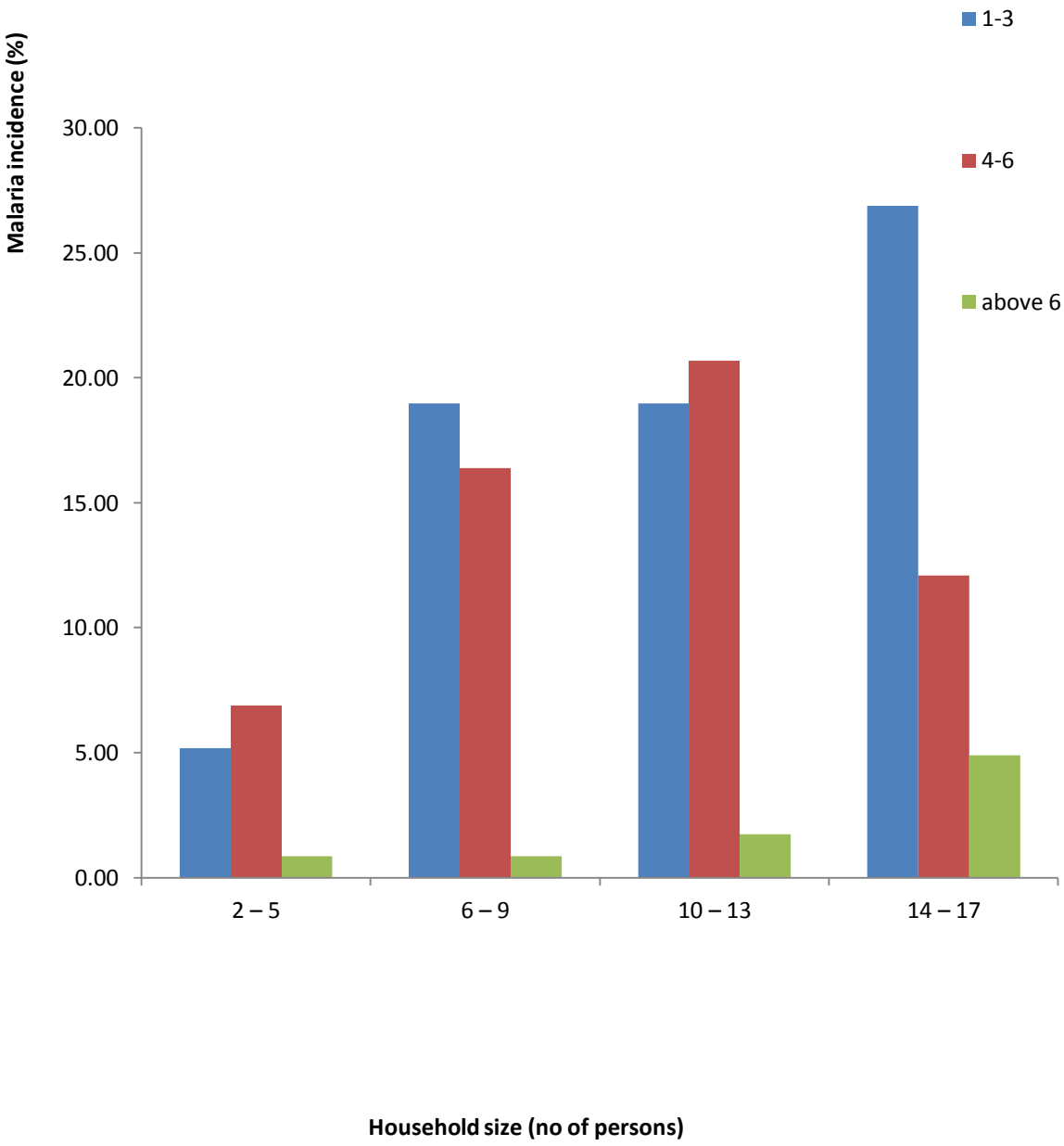

Figure 7: Malaria Incidences across Household size

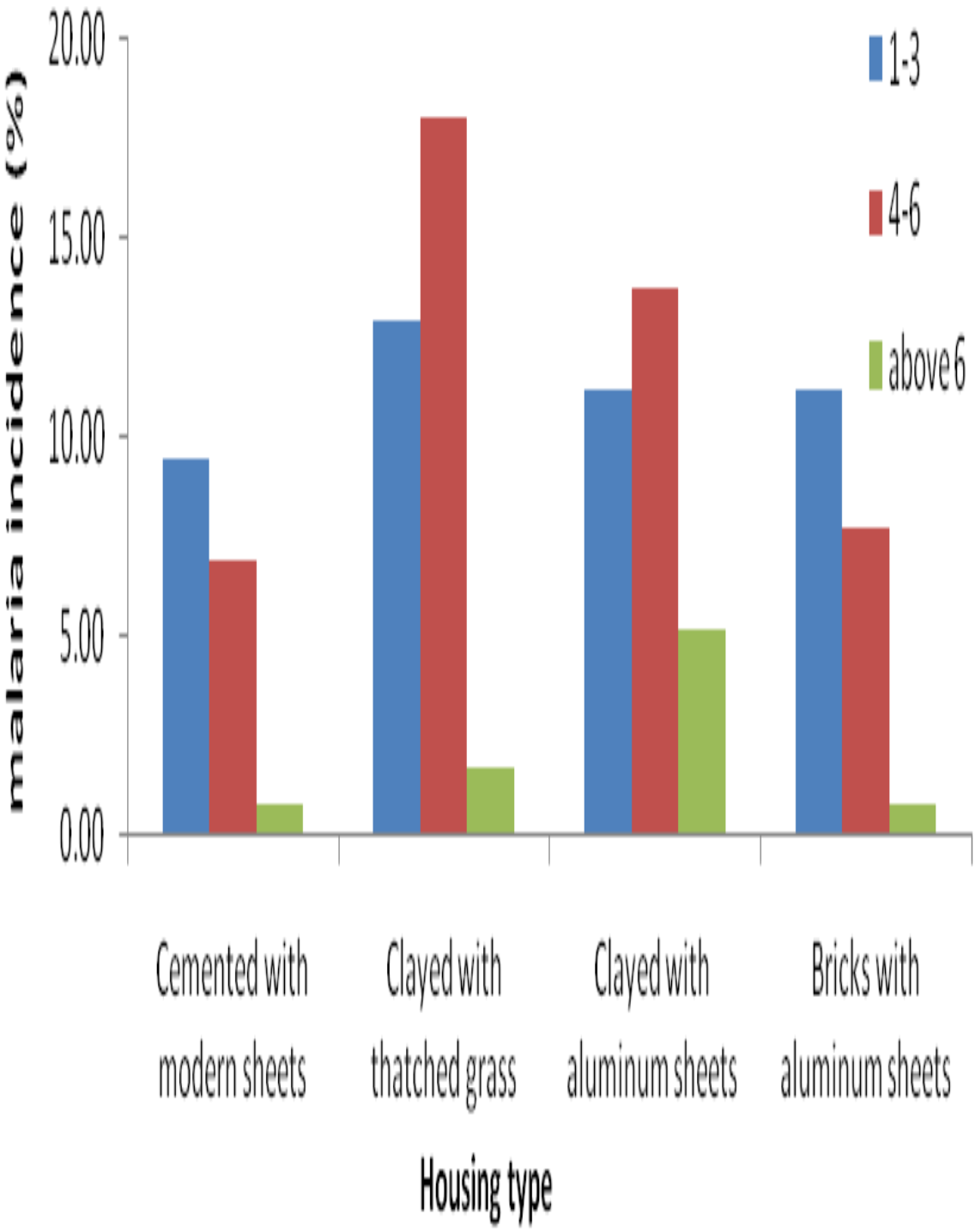

Figure 8: Malaria Incidence across Housing type

Appendix 2:

Results of the Regression Analysis of effects of SES on malaria prevalence and incidence

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.97
R Square	0.94
Adjusted R Square	0.90
Standard Error	0.36
Observations	116.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	8.00	221.86	27.73	210.73	0.00
Residual	107.00	14.08	0.13		
Total	115.00	235.94			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-3.15	0.93	-3.40	0.00	-4.99	-1.31
Lnage	-0.23	0.07	-3.29	0.00	-0.16	0.11
Lnhhs	3.65	0.10	38.06	0.00	3.46	3.84
Lnedu	-3.50	0.10	-3.50	0.00	-5.55	1.98
Gender	0.10	0.07	1.49	0.14	-0.03	0.24
Religion	-0.17	1.07	-0.16	035	-0.31	-0.03
Ms	0.03	0.07	0.46	0.65	-0.11	0.17
Lnhexp	-1.02	0.09	-13.33	0.00	-0.16	1.19
Occ	0.02	0.04	0.53	0.60	-0.06	0.10

Appendix 3: Regression result of determinants of the amount household is willing to pay for malaria eradication

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.72
R Square	0.68
Adjusted R Square	0.60
Standard Error	0.02
Observations	116.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	9.00	30.97	3.44	23.123	0.00
Residual	107.00	0.02	0.00		
Total	116.00	31.00			

Variables	Coefficients	Std. Error	t Stat	P-value	*Lower 95%*	*Upper 95%*
Intercept	0.405	0.032	12.483	0.000	0.34	0.47
Household expenditure	0.976	0.345	2.829	0.004	0.723	1.892
Educational attainment	0.015	0.004	3.750	0.000	-0.01	0.002
Cost of protection	-0.308	0.016	-18.864	0.000	-0.34	-0.28
Cost of treatment	0.511	0.008	66.813	0.000	0.50	0.53
Indirect cost	0.791	0.022	36.046	0.000	0.75	0.83
Household size	-0.012	0.004	-3.082	0.002	-0.01	0.01
Length of stay in residence	-0.001	0.002	-0.740	0.461	-0.0008	0.002
marital status	0.001	0.003	0.270	0.788	0.00	0.01
choice of health care provider	-0.003	0.003	-0.895	0.373	-0.01	0.0003

Appendix 4:

Questionnaire on Prevalence and Economic Burden of Malaria among Family Households in Bokkos L. G.A, Plateau State, Nigeria, Department of Public Health Technology, Federal University of Technology, Owerri, Imo State

Dear sir/Ma

I am a Masters Student of the above named department and Institution carrying out a research on the above topic. Kindly provide answers to the questions below, the information you provided are strictly for research purpose only and shall be treated confidential.

Yours faithfully,

Achwai Isaac.

Section A: Socio – Economic Status of the Respondent

1. Gender: Male [ ] Female [ ]
2. Age: ……
3. Marital Status: Married [ ] Single [ ]
4. Household size: 2 – 5 [ ] 6 – 9 [ ] 10 – 13 [ ] 14 – 17 [ ]
5. Educational attainment: No formal education [ ] Primary education dropped [ ] Primary education completed [ ] Secondary education dropped [ ] Secondary education completed [ ] Tertiary education dropped [ ] Tertiary education completed [ ]
6. Household monthly income: < 7,000 [ ] 7,000 – 17,000 [ ] 18,000 – 28,000 [ ] 29,000 – 39,000 [ ] 40,000 – 50,000 [ ]
7. What is your monthly household expenditure: ……..
8. Religion: Christianity [ ] Islam [ ]
9. Occupation: Trading [ ] Artisan [ ] Civil servant [ ] Unemployed [ ]
10. Housing type: Cemented house with modern sheets [ ] Clayed house with thatched roof [ ] Clayed house with aluminum sheet [ ] Bricks house with aluminum sheets [ ]
11. Length of stay in the residence: 1 – 10 years [ ] 11 – 20 years [ ] 21 – 30 years [ ] ≥ 30 years [ ]
12. Do you possess mosquito nets: Yea [ ] No [ ]
13. Type of mosquito nets: treated [ ] Non-treated [ ]
14. Do your family sleep under mosquito nets: mosquito nets: Yes [ ] No [ ]

Section B: Malaria Prevalence among Socio-Economic Status. How many times your household members had malaria episodes last year (Please fill in the information as appropriate as outlined in the Socio-Economic Status).

1. Age category

Age	1 – 3	4-6	Above 6
1-5 years			
6 – 10			
11 – 15			
21 – 25			
Above 25			

2. Educational attainment

Educational attainment	1 – 3	4-6	Above 6
None			
Primary education			
Secondary education			
Tertiary			

3. Gender

Gender	1 – 3	4-6	Above 6
Female			
Male			

4. Marital Status

Marital status	1 – 3	4-6	Above 6
Married			
Single			

5. Occupation

Occupation	1 – 3	4-6	Above 6
trading			
Unemployed			
Artisan			
Civil servant			

6. How many times is your household infected by malaria last year: ……

Section C: Amount willing to pay for improved prevention and control

1. How much did your household spent to prevent malaria infection: ……
2. How much did your household spent on malaria control: ……..
3. How much are you willing to pay more for improve malaria control: ……

4. How much are you willing to pay for improve malaria prevention: …….
5. How much did your household spent to purchase treated mosquito nets: ……
6. How much did your household spent to purchase treated door and window nets: ……..
7. How much are you willing to pay more to obtain improve treated mosquito nets: ……..
8. How much are you willing to pay more to obtain improve treated door and window nets: ……
9. How much did you spent on treating an adult malaria episode: ……..
10. How much more are you willing to pay more to treat an adult malaria episode: ……
11. How much did you spent on treating a child malaria episode: ……..
12. How much more are you willing to pay more to treat a child malaria episode: ……
13. How much did spent on area spray fumigation: ……..
14. How much more are you willing to pay for area spray fumigation: …….
15. How much did spent on room spray insecticides: ……..
16. How much more are you willing to pay for room spray insecticides: …….
17. Which kind of health provider do you prefer to treat your malaria episode: Govt. hospital [ ] Private clinic [ ] Traditional medicine [ ]

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