

**Master of Public Health
University of Cape Town**

Dissertation

**Factors that Influence the Use of Insecticide Treated Bed Nets
in a Rural Community in Mangochi District, Malawi**

Student's Name : George Chithope-Mwale

Student Number : CHTGEO001

**Supervisor : Dr. David Coetzee
School of Public Health
and Family Medicine**

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Declaration

I, *George Chithope-Mwale (Dr)*, hereby declare that the work on which this dissertation is based is my own original work (except where acknowledgements indicate otherwise) and that neither the whole nor any part of it has been submitted for another degree in this or any other University. I empower the University of Cape Town to reproduce either the whole or any portion of this work for the purposes of research.

Signature...

Signed by candidate

Date.....

26/09/05

Dedication

To my late father for his words of wisdom and for being a source of inspiration

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Abbreviations

AIC... .. Aikaike's Information Criterion

CHWs... ..Community Health Workers

ITN... ..Insecticide Treated bed Net

LRT... .. Likelihood Ratio Test

MoHP... ..Ministry of Health and Population

NMCPNational Malaria Control Programme

RBM... .. Roll Back Malaria

TA... ..Traditional Authority

USAID... .. United States Agency for International Development

WHO... .. World Health Organisation

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Abstract

Background: Malaria remains an important cause of mortality and morbidity in Africa.

In areas of endemic malaria transmission such as Malawi, a country south of the Sahara, young children and pregnant women are the population groups at highest risk.

Because of the limited effectiveness of other malaria control measures such as chemoprophylaxis in endemic areas, bed nets impregnated with an appropriate insecticide have emerged as the single most effective tool in the prevention of malaria morbidity and mortality. Indeed the Roll Back Malaria (RBM) initiative has endorsed and placed Insecticide Treated bed Nets (ITNs) at its heart in the fight against malaria.

Despite availability of compelling evidence about the effectiveness of ITNs, widespread use of this malaria prevention tool is limited in many African countries including Malawi where only 8% of the 11 million people were reported as using ITNs.

Poverty in Africa, of which Malawi is no exception, has commonly been cited as the major barrier to net ownership and hence use. On the contrary, it has been found that in some African communities, those who reported that they could not afford bed nets had sufficient money to spend on jewellery and ceremonial goods which has led to the conclusion that households did not consider procurement of bed nets a priority.

Hence there is need to try and gain an understanding of the community specific factors that influence the use of bed nets in order to be able to design proper strategies aimed at increasing coverage as well as promoting effective use of ITNs.

Aim: The aim of the current study was to investigate factors that influence the use of insecticide treated bed nets in a rural community in Mangochi district in Malawi.

Methods: A community based cross-sectional study design was used. Data were collected over a three week period from a random sample of 196 heads of households with and without bed nets using a pre-tested questionnaire which was administered by trained interviewers. The data were entered into an Excel spread sheet by two independent data entry personnel before being exported to **STATA** software (version 8) for statistical analysis.

Results: The response rate was 100%. Factors influencing bed net use, identified in this study, are placed under three headings namely, personal, socio-economic and environmental factors. The most important personal factor affecting bed net use was gender of the head of the household. Female headed households were almost four times more likely to use bed nets than male headed households (OR= 3.8). Presence of children under 5 years of age or pregnant women in the household was not significantly correlated with bed net use, p -value = 0.08 and 0.88 respectively. Similarly age of the head of household, marital status and religion were not significantly associated with bed net use with p -values of 0.20, 0.24 and 0.35 respectively. With regard to socio-economic factors, having a source of income was significantly related to bed net use (p -value = 0.02). Level of education and employment status were not significantly associated with bed net use, with corresponding p -values of 0.79 and 0.40.

The most important environmental factors affecting bed net use were mosquito density and weather. Low mosquito density and hot weather were the main reasons mentioned by the respondents for not using bed nets all year round, 93% and 5.4% respectively.

For those who did not possess any bed net, lack of money was the main reason for non possession, 78% of the respondents.

Conclusion: Complex combinations of factors inherent in a community affect bed net use. An understanding of such factors is crucial if malaria control programmes are to effectively promote ITNs as an important tool in prevention of malaria and thus contribute to the overall objective of reducing malaria morbidity and mortality both at individual and community level.

CHAPTER 1

INTRODUCTION

1.1 Problem Statement

Malawi is a developing country in sub Saharan Africa where malaria is an important cause of mortality and morbidity (Holtz *et al.* 2002; WHO 2003). It is the leading cause of paediatric hospitalisation and paediatric hospital death (Wirima cited in Holtz *et al.* 2002).

For many decades, malaria control strategies in sub Saharan Africa have included chemoprophylaxis (Nuwaha 2001), larviciding (Tsuyouka *et al.* 2001) and indoor residual wall spraying (Evans *et al.* 1997; Tsuyouka 2001) using chemicals such as DDT (dichlorodiphenyltrichloroethane) (Evans *et al.* 1997; Kapp 2004). However, these measures have been shown to have limited effectiveness in preventing mortality and morbidity from malaria because of the rapid emergence of drug resistant parasites (Evans *et al.* 1997; Nuwaha 2001) as well as concerns about toxicity in environmental spraying and associated harmful effects in human beings (van Wendel de Joode *et al.* 2001).

Bed nets impregnated with a pyrethroid insecticide have been known to offer much greater protection against malaria since the mid 1980s; however, use of this preventive tool remains low in many countries (Rashed *et al.* 1999; WHO 2003). Hence an understanding of the factors that influence the use of bed nets is important in order to successfully promote the use of insecticide treated bed nets.

1.2 Literature Review

1.2.1 Burden of Malaria

World wide, about 90% of all malaria deaths occur in Africa south of the Sahara (WHO 2003). According to WHO (2003) this is a result of two main factors: first, the majority of infections in Africa are caused by *plasmodium falciparum*, the most dangerous human malaria parasite and second, because the most efficient malaria vector, the mosquito *Anopheles gambiae*, is the most widespread in Africa and at the same time the most difficult to control. Each year, an estimated one million people in Africa die from malaria and most of these are children under 5 years of age (WHO 2003).

In areas of stable malaria transmission such as Malawi, young children and pregnant women are the population groups at highest risk of morbidity and mortality from malaria (Muller & Jahn 2003; Rashed *et al.* 1999). Most children experience their first malaria infection during the first year or two of life when they have not yet acquired adequate clinical immunity, which makes these early years particularly dangerous. On the other hand, adult women in areas of stable transmission have a high level of immunity, but this is impaired, especially in the first pregnancy, with the result that risk of infection increases (WHO 2003).

There are three principal ways in which malaria can contribute to mortality in young children (WHO 2003). First, an overwhelming acute infection affecting the brain, which frequently presents as seizures or coma (cerebral malaria), may kill a child directly and quickly. Second, repeated malaria infections contribute to the development of severe

anaemia which increases the risk of death. Third, low birth weight, frequently the consequence of malaria infection in pregnant women, is the major risk factor for death in the first month of life. In addition, repeated malaria infections make young children more susceptible to other childhood illnesses such as diarrhoea and respiratory infections as well as conditions such as malnutrition and thus contribute indirectly to mortality.

Children who survive malaria may suffer long term consequences of the infection. Repeated episodes of fever and illness reduce appetite, restrict play and decrease social interactions and educational opportunities thereby contributing to poor development (WHO 2003). According to Murphy & Breman (cited in WHO 2003) an estimated 2% of children who recover from cerebral malaria suffer from learning impairments and disabilities due to brain damage including epilepsy and spasticity.

Malaria results in substantial direct costs of treatment and care and indirect costs due to productive time lost (Goodman *et al.* 2000). Malaria keeps adults from work, either due to illness in the adult or child, which results in lost income or reduced harvest from the fields. In addition to lost income, the cost of drugs to treat malaria can easily overwhelm households' resources, especially for the poorer households. In Malawi poor households spend more than 25% of their yearly income to treat malaria (Ettling *et al.* 1994). A study in northern Ghana found that while the cost of malaria care was only 1% of the income of the rich, it was 34% of the income of the poor households (Akazili cited in WHO 2003).

1.2.2 MALAWI and Insecticide Treated Bed Nets

In response to this malaria burden Malawi, as well as many other African countries, has adopted the promotion and use of insecticide treated bed nets (ITNs) as an important and priority aspect of malaria control strategies (Nuwaha 2001; Rashed *et al.* 1999; WHO 2003). Indeed the Roll Back Malaria (RBM) initiative, a global movement in the fight against malaria, has endorsed and placed ITNs at its heart, as the single most effective tool in the prevention of malaria morbidity and mortality, especially in malaria endemic countries (Nahlen *et al.* 2003; WHO 2004)

Bed nets, a very old method of reducing contact between man and vector, may have been used by people in the Middle East as early as the 6th century BC (Binka & Adongo 1997) mainly to protect themselves against biting insects and for cultural reasons (WHO 2003). It was only in the 1980s that it was discovered that a net treated with a pyrethroid insecticide offers much greater protection against malaria; not only does such a net act as a physical barrier to prevent mosquitoes biting, but also the insecticide repels, inhibits or kills any mosquitoes attracted to feed (Curtis 1998; Muller & Jahn 2003). This effect has been documented from randomised controlled trials and observational studies carried out in African settings of varying malaria transmission intensities (D'Allessandro 2001; Lengeler 2004, Muller & Jahn 2003). In these studies, it has been demonstrated that ITNs can reduce all cause under 5 mortality by around 20%, saving about 6 lives for every 1000 children aged 1-59 months protected each year. The incidence of clinical episodes of *plasmodium falciparum* infection is reduced, on average, by 50%. When used by pregnant women, ITNs are also effective in reducing maternal anaemia, placental infection and low birth weight (WHO 2003).

Despite such compelling evidence widespread use of ITNs is limited in Malawi like in many other African countries (WHO 2003). The Demographic & Health Survey conducted in 2000 in Malawi indicated that only 8% of the 11 million people reported ITN use.

It has been documented that compliance with prevention and control measures for diseases such as malaria is a function of an individual's propensity to (a) see themselves at particular risk of becoming infected, (b) consider infection as a serious event, and (c) see the risk as something that can be prevented and controlled (Ager cited in Rashed *et al.* 1999). These perceptions are founded on an understanding of illness. However, in some cases the link between the mosquito, the parasite and the infected person is not always well understood. For example, malaria has often been attributed to intense exposure to the sun, to drinking unboiled water and to divine will among other perceptions. Such perceptions form an obstacle to the promotion and use of ITNs (Rashed *et al.* 1999).

Studies on factors that affect bed net use have reported different results in different countries. For example, in a study in Ghana, knowledge of the relationship between mosquitoes and malaria was not a significant predictor of bed net use (Agyepong & Manderson cited in Heggenhougen *et al.* 2003). Another study in Thailand showed that the use of insecticide treated nets was significantly related to factors such as knowledge of malaria prevention, perception of benefits of the use, and the receipt of information about the bed nets from malaria workers (Stewart & Marchand 2005). In rural Kenya, Alaii *et al.* (2003) found that cooler weather was an important predictor of bed net use; on the other hand, mosquito density, relative wealth and educational level of the head of the household

did not affect bed net use. These study findings have direct implications on how local malaria control programmes conduct ITN promotional activities.

Poverty in African countries, of which Malawi is not an exception, has commonly been cited as the major barrier to net ownership (Holtz *et al.* 2002; WHO 2003) and hence use. On the contrary, it has been found that in some African communities, those who report that they could not afford bed nets had sufficient money to spend on jewellery and ceremonial goods, which has led to the conclusion that households did not consider procurement of bed nets a priority (Aikins *et al.* cited in Yohannes *et al.* 2000; Rashed *et al.* 1999).

Therefore in order to design proper strategies aimed at increasing coverage as well as promoting effective use of insecticide treated bed nets, it is important to gain an understanding of the community specific factors that influence the use of bed nets.

It was against this back-ground that this study was conducted in a rural community of Mangochi district in Malawi.

1.2.3 Mangochi District

Mangochi is one of the thirteen districts in the southern region of Malawi. It is a malaria endemic lake shore district with an estimated total population of 711 179 of which 52% are females and 48% are males. Children under 5 years of age constitute 17% of the population. Almost 50% of women aged 15-49 and 20% of men aged 15-54 have had no education (Demographic & Health Survey 2000; Mangochi District Health Office 2002).

The population is predominantly rural and poor. The villagers earn a living mainly by farming and fishing. *Yao* is the major ethnic group and the majority of the inhabitants are conversant in *Chewa* language. Administratively, the district has some 735 villages distributed among nine Traditional Authorities (T.A.), (Malawi Government, Mangochi District Profile 2002).

Malaria accounts for 40% of all outpatient clinic visits in the district (Mangochi District Health Office 2002). Previous studies in the district have indicated that *plasmodium falciparum* is the dominant malaria parasite (> 90%) with *Anopheles gambiae* being the major mosquito vector (Rubardt *et al.* 1999; Steketec *et al.* 1996). This mosquito vector bites predominantly indoors and it has a preference for nocturnal feeding (Webster 2002). The biting cycle peaks late into the night (Curtis 1998), the time when most people are likely to be asleep. The biting behaviour of this vector makes sleeping under an ITN highly effective in preventing malaria. The resting behaviour is mainly indoors (Webster 2002).

Currently the subsidised cost of a bed net is MK50 (about US\$ 0.45) for pregnant women and children under 5 years of age, when the net is procured from public antenatal clinics. Other members of the community can access the nets at the subsidised price of MK100 (about US\$ 0.90) from other outlets within the communities.

Mangochi is the district where the author has been working as District Health Officer for over four years.

1.3 Aim of the research

The aim of the study was to investigate the factors that influence the use of insecticide treated bed nets (ITNs) in a rural community in Mangochi district.

1.3.1 Specific objectives

The specific objectives were to determine which of the following factors influenced the use of ITNs:

- (i) Demographic (Personal) factors: gender, age, marital status, knowledge and beliefs about malaria, religion.
- (ii) Socio-economic: level of education, occupation, income.
- (iii) Environmental: weather, season of the year, mosquito density.

1.4 Definition of Terms:

Insecticide Treated Net: a bed net treated with an anti-mosquito insecticide. In the study community bed nets are treated with insecticide free of charge every six months (communal dipping).

Household: all persons who shared earned income and ate from the same cooking pot

Bed net use (User): having at least one bed net in the house

Non User: a household without any bed nets

Employed: being in a formal employment i.e. working for an organisation (public or private) or somebody. This excludes self employment.

Petty trader: a person whose major source of income is from petty trading i.e. small business(es) involving the sell of various commodities (e.g. firewood, second hand clothes,

reed mats e.t.c) as distinguished from a person whose major source of income is from farming or fishing

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CHAPTER 2

METHODS and SUBJECTS

2.1 Study Site

The study was conducted in the Traditional Authority (T.A) of Chimwala, a rural area, where ITNs were launched in 2001 as a pilot project before rolling out to all areas of the district in 2003 during a nation-wide ITN roll out programme by the National Malaria Control Programme (NMCP) of the Ministry of Health and Population (MoHP). In this area, the ITNs were introduced in 41 selected villages with a total population of about 25 000. This was the first and largest population to be introduced to ITNs in the district. On average, a village consists of 100 households, with about 7 people per household.

2.2 Study Design

A community based cross-sectional study design was used. This was the most appropriate design for obtaining information on malaria and bed nets and for describing the factors that affect the use of ITNs in this community at one particular point in time.

2.3 Study Population

The study population was all adult heads of households in the initial rural ITN project area of T.A. Chimwala in Mangochi district.

2.4 Sample Size

Using **EpiInfo** (2003), the required sample size (N) was estimated to be 196. This was based on the expected prevalence (guesstimate) of ITN use of 15% in the study

population with a precision of 5% around a 95% confidence interval.

2.5 Sampling

A two stage sampling strategy was used. All households in the study area, which consists of the 41 villages, were eligible for inclusion in the study. A village was taken as a cluster and this constituted the sampling unit in the first stage of the sampling process. The clusters (villages) were then randomly selected from a list.

In the second stage of sampling, in which a household constituted a sampling unit, a simple random sample of households was selected from within each of the chosen clusters (villages). For this process, each of the households within the randomly selected clusters (villages) was given a number; random numbers were then selected and these constituted the sample of randomly selected households.

For N = 196, ten (10) clusters (villages) were selected for logistic reasons. Within the first nine (9) clusters twenty (20) households were chosen, with the remainder, sixteen (16), coming from the tenth cluster. The head of the household was the target for a questionnaire interview.

2.6 Measurement Tool

In this study all data were collected using an interviewer administered questionnaire.

The questionnaire was in three parts: Section 1 elicited the background characteristics of the respondent (head of household). Section 2 consisted of questions on respondent's

knowledge and beliefs about malaria. The final part, Section 3, had questions on bed nets. In total there were 32 questions (variables). The questionnaire was translated to *Chewa*, the language spoken and understood by the majority of the inhabitants.

2.7 Pilot study

The questionnaire was pre-tested on a convenience sample of fourteen (14) people outside the study area before conducting the main study. Apart from helping to assess whether the questionnaire was of good quality and appropriate, the pilot study also assisted in assessing the adequacy of field training that had been given to the interviewers by the author as well as logistics such as time required to complete the interview. Based on the pilot study, some minor changes were made to the original questionnaire in order to improve clarity of some of the questions.

2.8 Data Management and Analysis

All data for the study were collected over a three week period in December 2004 / January 2005 under the supervision of the author.

2.8.1 Data Collection Team

The interviewers were community health workers (CHWs) selected from within the district. CHWs are people who work and stay with the communities and are conversant with the local culture.

2.8.2 Training on Data Collection

To minimise interviewer variability and hence ensure that data was uniformly collected a three-day training on how to administer a questionnaire was conducted by the author.

The training involved instructions on how to conduct the interview and fill out the study questionnaire as well as field practice in an area outside the study site.

2.8.3 Data Collection

A pre-tested questionnaire was administered to the study subjects by the trained interviewers. Data were collected by visiting the individual subjects in their households.

To increase the probability of finding the selected heads of households, repeat visits (up to three) were arranged by the interviewer to households where the head was not available during the first visit.

2.8.4 Data Cleaning and Entry

Data from the field were checked manually by the author on a weekly basis by going through the questionnaires and looking for mistakes or omissions such as incomplete questionnaires. Where mistakes were identified the interviewer was asked to go back to the subject to obtain the missing information.

All data were then entered into an **Excel** spreadsheet by two independent data entry personnel.

2.8.5 Data Analysis

The data were exported from the **Excel** spreadsheet to **STATA** version 8.0 (2003) for statistical analysis.

Data exploration was followed by bivariate analysis (on categorical variables) using Chi-square (χ^2) test of significance for differences in proportions, and then multivariate analysis using logistic regression where appropriate. The *Shapiro Wilk* test was used to test for normality of numerical data.

2.8.5.1 Numerical (Continuous) Variables

Medians and quartiles (Inter quartile range- IQR) were used as summary statistics for the continuous variables with a skewed distribution. The *Mann-Whitney* test was used to determine whether there was a statistically significant difference in median values between the two groups of bed net users and non users.

2.8.5.2 Categorical Variables

Many variables were categorical and these were analysed and presented as proportions per category. The Two-Sample test for categorical data was used to determine whether proportions per category were significantly different between the bed net users and non users.

2.8.5.3 Logistic Regression

Logistic regression was used to identify significant predictors of bed net use. Variables

included in the analysis were age of the head of household, gender, marital status, educational status, employment status, whether head of household had children or not, whether s/he had heard about malaria or not, and whether there had been any death in the household due to malaria or not. These variables were chosen to enable further assessment and comparison between bed net users and non users.

Variables were added one at a time to assess their significance, and the subsequent regression models were compared. The model with best fit was identified using the Likelihood Ratio Test and the Aikake's Information Criterion (AIC). The goodness-of-fit of this (identified) model was checked using the *Pearson* Chi-square goodness-of-fit statistic.

The Chi-square values and logistic regression values were corrected (adjusted), in the analysis, taking into account the design effect i.e. cluster sampling.

In all the analyses in this study, probability values of $p < 0.05$ were regarded as statistically significant.

2.9 Quality Control: Validity and Reliability

The measures listed below were undertaken in order to improve validity and reliability of the data:

- ✦ Selection of interviewers along similar criteria with reference to age, sex and educational level

- ✚ Training and supervision of all interviewers by the author
- ✚ Use of a standardised and pre-tested questionnaire
- ✚ In addition, all data from the field were entered into the computer by two independent data entry personnel

2.10 Ethical Considerations and Approval

In this observational study, ethical approval was obtained from the Human Research Ethics Committee of the University of Cape Town prior to the onset of the study. In Malawi, in the district of Mangochi, the district health officials and village chiefs in the study area were formally informed by the author about the research and its purpose.

With respect to the study participants, individual informed written consent was obtained after explaining the purpose of the study in a local language, *Chewa*. All interviews were conducted in private at the respondent's home. Each participant was assured of confidentiality of information obtained during the interview and it was clearly mentioned that study findings used in the report will not be traced to any individual who participated.

The subjects were further informed that they had the right to refuse to participate or withdraw from the study at any time and that such action will not affect the quality of health care that they or members of their households may seek from health facilities.

2.11 Dissemination of Findings

The study findings are to be disseminated to all stakeholders including representatives

from the study area, district health officials in Mangochi and the NMCP of the Ministry of Health and Population (MoHP) in Malawi. This will be in a form of meetings as well as circulating copies of the study findings.

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CHAPTER 3

RESULTS

3.1 Characteristics of the Respondents (Heads of Households)

All 196 heads of households who were selected were identified and participated in the study, thus giving a response rate of 100%. 80% (n=156) of the respondents were bed net users while 20% (n=40) were non users. A summary of socio-demographic characteristics of the respondents is shown in Table 1. The median age of bed net users was 38 years (IQR: 27.5 – 47.5) while for non users the median age was 40 years (IQR: 31.5 – 57). This difference in median age between the two groups was not statistically significant ($p = 0.14$, Mann-Whitney test). Among male subjects, a significantly larger proportion (72.5%, $p = 0.03$) was bed net non users, while among females a significantly larger proportion (47%, $p = 0.03$) was bed net users. With respect to education, 49% of bed net users and 60% of non users had never been to school. This difference in proportions between the two groups was not statistically significant ($p = 0.21$). In terms of employment status, 94% of bed net users were unemployed while almost 98% of the non users were unemployed, again not a statistically significant difference in proportions between the two groups ($p = 0.38$).

For the male heads of households who were married (n = 84 for bed net users, and n = 27 for bed net non users), their female partners did not have paid jobs except one female partner in the bed net user group. Where the head of household was female, the study questionnaire was not designed to probe whether she had a male partner (husband) and his occupation.

Table 1: Characteristics of Respondents

Characteristic	Users (n=156)	Non Users (n=40)	p value
Age (median)	38 (IQR: 27.5- 47.5)	40 (IQR: 31.5- 57)	0.14
Gender (%)			
Male	53% (n=82)	72.5% (n=29)	0.03
Female	47% (n=74)	27.5% (n=11)	0.03
Education (%)			
None	49% (n=76)	60% (n=24)	0.21
Primary	41% (n=64)	35% (n=14)	0.49
Secondary	7% (n=11)	2.5% (n=1)	0.29
Tertiary	1% (n=1)	0 (n=0)	0.53
Other (e.g. adult literacy classes)	2% (n=4)	2.5% (n=1)	0.84
Marital Status (%)			
Married	81% (n=126)	72.5% (n=29)	0.24
Single	19% (n=30)	27.5% (n=11)	0.24
Employment Status (%)			
Employed	6% (n=9)	2.5% (n=1)	0.38
Unemployed	94% (n=147)	97.5% (n=39)	0.38
Religion (%)			
Muslim	83.3% (n=130)	85% (n=34)	0.80
Catholic	1.9% (n=3)	5% (n=2)	0.27
Anglican	5.8% (n=9)	0 (n=0)	0.12
Presbyterian	3.2% (n=5)	0 (n=0)	0.25
Other (e.g. Pentecostal church, Seventh Day Adventist)	5.8% (n=9)	10% (n=4)	0.34
Occupation Of female partner	Users (n=84)	Non Users (n=27)	p value
Housewife	98.8% (n=83)	100% (n=27)	0.57
Other (e.g. working)	1.2% (1)	0	0.57

The sources of income mentioned by the group that was unemployed included income from fishing, farming and petty trading, Table 2. Petty trading was the main source of income for the bed net users although the difference in proportions between users and non users was not statistically significant, 37% and 28.2% respectively ($p = 0.31$). For bed net

non users, the category other, which included doing manual work for pay, was the main source of income. Among subjects whose main source of income was fishing, a significant proportion (23%, $p = 0.01$) was bed net users.

Table 2: Sources of Income mentioned by the Unemployed heads of households

Source of Income	Users (n=147)	Non Users (n=39)	<i>p</i> value
Petty trading	37% (n=54)	28.2% (n=11)	0.31
Farming	24% (n=35)	28.2% (n=11)	0.59
Fishing	23% (n=34)	5.1% (n=2)	0.01
Other (e.g. Doing manual work for pay depending on availability, Being supported financially by children and relatives)	16% (n=24)	38.5% (n=15)	< 0.01

3.2 Presence of vulnerable persons in Household and whether Household had previously been affected by malaria death

Table 3 gives a summary of household characteristics in terms of the number of under 5 children in the household, whether the household had a pregnant woman or whether a member of the household died of malaria. With respect to the presence of under 5 children, a larger proportion (42%) of households using bed nets had one under 5 child and this proportion was significantly higher than that for non user households (15%) with one under 5 child ($p < 0.01$). On the other hand, 60% of non user households had no child under the age of five as compared to 33% of the user households. With regard to the presence of a pregnant woman, 8% of households using bed nets had a pregnant woman while 10% of non user households had a pregnant woman. And in terms of malaria deaths, 21% of households using bed nets had lost a family member due to malaria.

Table 3: Household Characteristics

Characteristic	Users (n=156)	Non Users (n=40)	<i>p</i> value
Number of Under 5 Children			
0	33.3% (n=52)	60% (n=24)	< 0.01
1	41.7% (n=65)	15% (n=6)	< 0.01
2	20.5% (n=32)	22.5% (n=9)	0.78
3	4.5% (n=7)	2.5% (n=1)	0.57
*Household with Pregnant Woman	8.3% (n=13)	10% (n=4)	0.73
Member of household died of Malaria	21.2% (n=33)	17.5% (n=7)	0.60

*Purely based on the knowledge of the head of household

3.3 Malaria knowledge and Beliefs

Almost 99% of the bed net users and 95% of the non users had heard about malaria. This difference in proportions was not statistically significant ($p = 0.14$) (Table 4a). Of the respondents who had heard about malaria, 82% of the bed net users and 66% of the non users were able to state that malaria is caused by a parasite carried by mosquitoes. This difference in proportions was statistically significant ($p = 0.03$). 68% and 60% of bed net users and non users respectively mentioned that malaria was transmitted through mosquito bites ($p = 0.33$). With regard to severity of malaria, 97% of the bed net users and 84% of the non users indicated that malaria was a serious illness. This difference was statistically significant ($p < 0.01$).

Table 4a: Malaria Knowledge and Beliefs

Variable	Users (n=156)	Non Users (n=40)	<i>p</i> value
Heard about Malaria			
Yes	98.7% (n=154)	95% (n=38)	0.14
No	1.3% (n=2)	5% (n=2)	0.14
	Users who had heard about Malaria (n=154)	Non Users who had heard about Malaria (n=38)	
Cause of Malaria			
Parasite carried by			
Mosquitoes	82% (n=126)	66% (n=25)	0.03
Don't know	16% (n=24)	26% (n=10)	0.15
Other (e.g. Getting wet in the rain Poor hygiene, Overworking)	2% (n=4)	8% (n=3)	0.06
Transmission of Malaria			
Mosquito bite	68.8% (n=106)	60.5% (n=23)	0.32
Drinking dirty water	0.7% (n=1)	2.5% (n=1)	0.33
Intense exposure to the sun	0.7% (n=1)	0 (n=0)	0.61
Don't know	22.7% (n=35)	29% (n=11)	0.42
Other (e.g. Drinking from the same cup, Sharing a bed with a person suffering from malaria, When person with malaria breathes into another person's face)	7.1% (n=11)	8% (n=3)	0.85
Perception on Malaria Illness			
Malaria is a serious illness	96.8% (n=149)	84.2% (n=32)	< 0.01
Malaria is Not a serious illness	1.3% (n=2)	2.6% (n=1)	0.56
Don't know	1.9% (n=3)	13.2% (n=5)	< 0.01

Of the respondents who indicated that malaria is a serious illness, 97% in each group of bed net users and non users mentioned that they considered themselves and / or members of their households to be at risk of malaria (Table 4b).

Table 4b: Respondent's Perceived Risk of Malaria

Perceived Risk	Users (n=149)	Non Users (n=32)	<i>p</i> value
At Risk of Malaria	96.6% (n=144)	96.9% (n=31)	0.93
Not at Risk of Malaria	2.7% (n=4)	0 (n=0)	0.35
Don't know	0.7% (n=1)	3.1% (n=1)	0.24

In the study area, the sources of information on malaria included radio, health personnel and friends, with health personnel being the most important source of information among both bed net users and non users. There were no statistically significant differences in proportions per category (Table 5).

Table 5: Sources of Information on Malaria

Source of Information	Users (n=154)	Non Users (n=38)	<i>p</i> value
Health Personnel	58% (n=89)	42% (n=16)	0.08
Radio	26% (n=40)	39% (n=15)	0.11
Friend	12% (n=19)	16% (n=6)	0.51
Other (e.g. Newspaper, People talking about Malaria)	4% (n=6)	3% (n=1)	0.77

3.4 Characteristics of Households using Bed Nets

Table 6 gives a summary of the characteristics of households using bed nets (n=156) in terms of number of bed nets owned, whether the nets were treated with insecticide and the family member who sleeps under the bed net. The median number of bed nets owned by a household was 1.5 (IQR: 1- 2). 37% of households had one bed net only. 75% of

households indicated that their bed nets had been treated with insecticide within the last 6 months. With regard to family member who slept under the bed net, 77% stated that all family members slept under a bed net. This was regardless of whether the net was shared or not.

Table 6: Characteristics of Households using Bed Nets (n=156)

Characteristic	Percentage (n)
Number of Bed Nets Owned	
1	37.2% (58)
2	35.3% (55)
3	14.1% (22)
4	10.3% (16)
5	1.9% (3)
6	0.6% (1)
7	0.6% (1)
Bed Net Treated with Insecticide	
Yes ≤ 6 months ago	75% (116)
Yes > 7 months ago	14% (22)
Not at all	11% (18)
Family Member Sleeping Under the net(s)	
All family members	77.5% (121)
Wife only	10.3% (16)
Under 5 Child(ren) only	7.7% (12)
Father only	4.5% (7)

3.4.1 Reasons for Using Nets

With regard to the reasons for using bed nets, 56% of heads of households stated that the main reason was to prevent malaria while 44% mentioned that they used the nets to reduce mosquito nuisance (Table 7).

Table 7: Reasons Mentioned for using Bed Nets (n=156)

Reason	Percentage (n)
Prevent Malaria	56% (88)
Reduce Mosquito Nuisance	44% (68)

3.4.2 Period of the Year when Net is likely to be Used

With respect to period of the year when the bed net was most likely to be used, 53% of the heads of households indicated that they used their nets all year round, while 46% stated that they used the nets only during the rainy season (Table 8).

Table 8: Period of the Year when Bed net Most likely to be Used (n=156)

Period of the Year	Percentage (n)
All Year Round	53% (82)
*Rainy Season only	46% (72)
Dry Season only	1% (2)

*Actual proportion using in the Rainy season is $(46+53=) 99\%$

3.4.3 Reasons for Not Using a Bed Net All Year Round

Of the households which did not use bed nets all year round (n=74), 93% stated that the reason for this was low mosquito density during the other seasons of the year, while 5% mentioned hot weather (Table 9).

Table 9: Reasons Mentioned for Not using Bed nets All Year Round (n=74)

Reason	Percentage (n)
Low mosquito density	93.2% (69)
Hot Weather	5.4% (4)
Other (e.g. Just feeling lazy to use it at other times)	1.4% (1)

3.4.4 Reasons for Not Treating a Bed Net with Insecticide

Of the respondents who did not have their bed nets treated with insecticide (n=18), the reasons mentioned for this included non availability of insecticide (22%) and cost (22%), (Table 10). The category, other, constituted a large proportion because there was a free communal dipping in the community some 3 months before the study and some respondents had missed this event which meant they had to wait for another event or buy the insecticide themselves, which is usually available from local shops.

Table 10: Reasons Mentioned for Not Treating Bed nets with Insecticide (n=18)

Reason	Percentage (n)
Insecticide Not Available	22% (4)
Could Not Afford to Buy Insecticide	22% (4)
Other (e.g. Missed free communal dipping : Was away, Didn't know the date, Busy with other activities)	56% (10)

3.4.5 Knowledge of ITNs and Sources of Information

In the study sample, 7% of non-users had never heard about ITNs (Table 11). Of the respondents who had heard about ITNs, the sources of information included health

personnel, radio and friends. Again, health personnel were the main source of information on ITNs, with no statistically significant difference in proportions between bed net users and non users ($p = 0.11$).

Table 11: Knowledge of ITNs and Sources of Information

Variable	Users (n=156)	Non Users (n=40)	<i>p</i> value
Heard about ITNs			
Yes	100% (n=156)	92.5% (n=37)	< 0.01
No	0 (n=0)	7.5% (n=3)	< 0.01
	Users who had heard about ITNs (n=156)	Non Users who had heard about ITNs (n=37)	
Source of Information on ITNs			
Health Personnel	68% (n=106)	54.1% (n=20)	0.11
Radio	28.8% (n=45)	32.4% (n=12)	0.67
Friend	2.6% (n=4)	2.7% (n=1)	0.97
Other (e.g. People talking about ITNs)	0.6% (n=1)	10.8% (n=4)	< 0.01

3.5 Reasons for Not Possessing (Using) ITNs

Of the non-users who had heard about ITNs but did not possess (use) any (n=37), the main reason mentioned was that they could not afford to buy a bed net (78%) (Table 12).

Table 12: Reasons Mentioned for Not possessing a Bed Net (n=37)

Reason	Percentage (n)
Can not Afford	78% (29)
Bed nets Not Available	3% (1)
Other (e.g. torn and no money to buy another)	19% (7)

3.6 Relationship between Bed Net Use and other Variables in the Study

3.6.1 Chi Square tests of Association

Chi-square (χ^2) tests indicated a significant association between bed net use and the variables gender ($\chi^2 = 6.57, p = 0.03$) and source of income ($\chi^2 = 4.48, p = 0.02$)

(Table 13). Factors (variables) not significantly associated with bed net use included age of head of household, educational level, whether household had pregnant woman or not, whether household had children and whether household had lost a family member due to malaria or not.

Table 13: Relationship between Bed Net Use and the Different Variables in the study

Variable 1	Variable 2	¹ Chi-Square	p value
Gender	² Bednet Users	6.57	0.03
Male	82/111		
Female	74/85		
³ Age	Bednet Users	1.87	0.20
>30 years	111/144		
≤30 years	45/52		
Marital status	Bednet Users	1.57	0.24
Married	126/155		
Not married	30/41		
Education Status	Bednet Users	1.28	0.29
⁴ Been to School	80/96		
Not been to School	76/100		
Education Level	Bednet Users	0.33	0.79
Primary	64/78		
Secondary	11/12		
Tertiary	1/1		
Other	4/5		
Source of Income	Bednet Users	4.48	0.02
Petty Trading	54/65		
Fishing	34/36		
Farming	35/46		
Working	9/10		
Other	24/39		

Table 13 Continued: Relationship between Bed net use and the different variables in the study

Variable 1	Variable 2	¹ Chi Square	<i>p</i> value
Employment status	Bednet Users	0.78	0.40
Employed	9/10		
Unemployed	147/186		
Children in Household	Bednet Users	3.95	0.08
Yes	151/187		
No	5/9		
Religion	Bednet Users	1.12	0.35
Muslim	130/164		
Catholic	3/5		
Anglican	9/9		
Presbyterian	5/5		
Other	9/13		
Pregnant Woman in Household	Bednet Users	0.02	0.88
Yes	13/17		
No	77/99		
Malaria death in Household	Bednet Users	0.16	0.70
Yes	33/40		
No	123/156		
⁵ Malaria Serious Illness	Bednet Users	1.14	0.31
Yes	149/181		
No	2/3		

¹ Value adjusted for cluster sampling

² Number who use bed nets out of the total in category

³ An arbitrary cut off point: Age categorised into young (≤ 30) and older (>30) age groups

⁴ Regardless of whether formal or informal (i.e. adult literacy education)

⁵ Only those who had heard about malaria

3.6.2 Logistic Regression

Based on *Likelihood Ratio Test (LRT) and **Aikaike's Information Criterion (AIC), out of the eight (8) variables, three (3) variables namely gender, marital status, and education status came up in the model with the best fit (LRT : $\chi^2 = 2.16$, p -value = 0.14;

AIC = 193.91). Values for this model are shown in Table 14. The *Pearson* Chi-square (χ^2) goodness-of-fit statistic for this model was 3.58, $p = 0.47$, confirming that this indeed was the model with best fit.

Table 14: Values for the Logistic Regression Model with the best fit

Variable	β	Odds Ratio	<i>p</i> -value	95% CI for Odds Ratio
Constant	-1.53	-	-	-
Gender	1.36	3.88	< 0.01	1.72 - 8.72
Marital Status	1.03	2.81	0.03	1.12 - 7.06
Education Status	0.55	1.73	0.13	0.82 - 3.66

*LRT: model with the highest Chi-square value; **AIC: model with the lowest AIC value

Although this was the model with a better fit based on LRT and AIC values, the variable education status was not statistically significant hence it is not an important predictor of bed net use. This is consistent with Chi-square tests of association where there was no significant association between this variable and bed net use. The variable marital status came up as statistically significant in this three variable model, but in Chi-square tests there was no significant association between this variable and bed net use, as such, in this study, this variable can not be considered as an important predictor of bed net use. Consequently, this leaves us with the variable gender as an important predictor of bed net use.

Table 15 shows the values for the model containing all the eight (8) variables used in logistic regression. Apart from gender of the head of household, the rest of the variables which includes whether head of household had heard about malaria or not and employment status were not significant predictors of bed net use, $p = 0.38$ and 0.52 respectively.

Table 15: Values for the Model containing All the Variables used in Logistic Regression

Variable	β	Odds Ratio	<i>p</i> value	95% CI for Odds Ratio
Constant	-3.22	-	-	-
Gender	1.27	3.55	< 0.01	1.85 – 6.83
Marital Status	0.90	2.46	0.06	0.95 – 6.38
Education Status	0.56	1.75	0.18	0.74 – 4.13
Whether Head of household had Children or Not	1.25	3.51	0.11	0.73 – 16.94
Whether Head of household lost a Family member to Malaria or Not	0.61	1.85	0.33	0.48 – 7.17
Whether Head of household heard about malaria or Not	1.18	3.24	0.38	0.18 – 58.79
Age of Head of household	-0.01	0.98	0.12	0.96 – 1.00
Employment status	0.66	1.92	0.52	0.21 – 17.62

CHAPTER 4

DISCUSSION

4.1 Study Limitations

In this cross sectional study, bed net possession was used as a proxy for bed net use since the study was not designed to actually visit the respondents at night or very early in the morning to observe bed net use. Consequently, respondents may have indicated that they used bed nets simply to please the research assistants who were community health workers thus leading to information bias and hence an overestimation of actual bed net use.

Secondly, the study had a relatively small number of bed net non users resulting in estimates which may be considered unstable owing to these small numbers, that is, fragile data.

Despite these limitations, which may affect the internal validity of the results, the study still provides very useful information for malaria control programmes.

4.2 Key Findings

A large proportion of the respondents had heard about malaria, 99% of bed net users and 95% of non users. However there were still some misconceptions about the cause and transmission of malaria.

Bed net use in this study area was higher (80% of respondents) than the expected prevalence of bed net use. Apart from the possibility of overestimation, other possible reasons for this include the fact that the study was conducted during the rainy season, the

period of high mosquito density when people are more likely to possess or use bed nets. It could also be due to the fact that the study was conducted in an initial project area where, as a result of the regular health education messages, people were beginning to understand the importance of protecting themselves from malaria. This can be supported by the large proportion of respondents who indicated that they considered malaria a serious illness (97% of bed net users) and that they considered themselves or members of their households as being at risk of malaria.

The main factors identified affecting bed net use are grouped under three headings namely personal factors, environmental and socioeconomic factors.

4.2.1 Personal factors

Female headed households were four times more likely to use bed nets than male headed households (OR=3.8). Age, marital status and religion of the respondents did not influence bed net use. Similarly having children including under 5 children or a pregnant woman in the household was not significantly associated with bed net use.

4.2.2 Environmental factors

A considerable proportion of the respondents (47%) did not use their bed nets whenever it was perceived that mosquito density was low, that is, during the dry season. Bed net use was high during the rainy season, the period of high mosquito density. Thus mosquito density influenced bed net use. Weather was another environmental factor that affected bed

net use. Some respondents indicated that they could not use their bed nets whenever it was too hot.

4.2.3 Socio-economic factors

There was a significant association between bed net possession and having a source of income ($\chi^2 = 4.48, p = 0.02$). Level of education and employment status of the head of household did not influence bed net use.

4.3 Relationship of Findings to available Literature

4.3.1 Malaria Knowledge, Beliefs and Sources of Information

In this study population, although a large proportion of respondents had heard about malaria as well as ITNs, there were still some misconceptions about the cause and transmission of malaria. These included drinking dirty water, getting wet in the rain and intense exposure to the sun. Several other studies have documented similar misconceptions about malaria cause and transmission. These erroneous beliefs have included cold weather, poor hygiene (Rubardt *et al.* 1999) and witchcraft (Nuwaha 2001; Tsuyouka *et al.* 2001). This demonstrates the need for continued education of the communities because these misconceptions may constitute important barriers to bed net use.

On the other hand, while it is important to raise people's knowledge about malaria cause and transmission, it needs to be borne in mind that knowledge of the relationship between mosquitoes and malaria transmission may not be sufficient to encourage bed net use (Heggenhougen *et al.* 2003). In Ghana, Agyepong & Manderson (cited in Heggenhougen

et al. 2003) found that knowledge and practice do not necessarily have a linear relationship. In their study, the researchers found that knowledge of an association between mosquitoes and malaria did not predict bed net use. Similarly this study found that the respondent's knowledge about malaria was not a significant factor affecting bed net use. Clearly this has implications for health education/promotion programmes which aim to increase awareness and hence knowledge about malaria, ignoring the role of other important factors influencing bed net use.

Regarding sources of information, the finding that health personnel were the main source of information on both malaria and ITNs, followed by radio, is consistent with other studies (Rubardt *et al.* 1999; Tsuyouka *et al.* 2001).

4.3.2 Household member Using Net and Reasons for using Bed Net

Unlike in other studies, in the current study a large proportion of households with bed nets (77%) reported that all family members including children under 5 were sleeping under bed nets. This was regardless of whether the net was shared with others or not. This information is important as it helps to assess whether the ITNs are reaching the groups at highest risk of malaria viz pregnant women and children under the age of five. Other studies have reported that adult members of the family were more likely to have used the bed nets (Alaii *et al.* 2003; Rashed *et al.* 1999) and in particular the men (Rashed *et al.* 1999). This difference may be due to the fact that this study was done in an area where the pilot project for ITNs was conducted and where there had been health education campaigns on malaria and its dangers. Therefore, it is possible that as a result of this, many heads of

households had become more sensitised to malaria and hence were keen on protecting themselves and members of their households.

In this study it was found that 44% of households used their bed nets as protection against mosquito nuisance as opposed to preventing malaria. This is lower than the finding in a study by Yohannes *et al.* (2000) in rural communities of central Malaita, Solomon Islands and in another study by Binka & Adongo (1997) in rural Ghana, where 59% and 70% of the respondents respectively reported that protection against mosquito nuisance was the main reason for using bed nets. Although on the face of this finding one can argue that preventing mosquito nuisance/bites achieves the same overall objective of preventing malaria, that is, if one is not bitten by mosquitoes carrying the malaria parasite then they won't suffer from malaria, the implication of the finding is that people who use their bed nets for the sole purpose of preventing mosquito nuisance are less likely to continue using them when mosquito densities are perceived to be low, thus putting themselves or members of their family at risk of malaria in an area where transmission occurs throughout the year. Binka & Adongo (1997) have reported such an observation in rural Ghana where bed net use decreased by 20% after the rainy season, the period of high mosquito density. Thomson *et al.* (cited in Yohannes *et al.* 2000) highlights that lower density of nuisance mosquitoes may not mean the malaria vectors are few and therefore inefficient. The malaria vector is efficient in infecting humans even at low densities. Based on this, consistent use of ITNs throughout the year needs to be emphasised as an effective tool for preventing malaria.

4.3.3 Environmental Factors and Bed net Use

A very large proportion (99%) of the households with bed nets indicated that they used their nets during the rainy season – which is the period of high mosquito density. However, only 53% of the households used their bed nets all year round. Yohannes *et al.* (2000) and Binka & Adongo (1997) have reported similar findings in their studies in Solomon Islands and Ghana respectively. In both studies large proportions (> 95%) of community members used bed nets in the rainy season but less than 55% used bed nets through-out the year.

The major reason mentioned, in the current study, for not using bed nets all year round was low mosquito density which is typically in the dry season. Another reason was hot weather. In their study in rural Kenya, Alaii *et al.* (2003) found that mosquito density had no effect on the probability of bed net use while excessive heat was the main reason for not using bed nets. On the other hand in a study by Yohannes *et al.* (2000) in central Malaita, Solomon Islands, mosquito density was found to be a major determinant of bed net use. These observations serve to confirm and emphasize the need to understand community specific factors affecting bed net use if we are to effectively promote ITNs as a malaria preventive tool.

4.3.4 Personal Factors and Bed Net Use

In the current study, female headed households were more likely to use bed nets than male headed households. This, in part, may be due to the fact that women, whenever they have income, are said to prioritise the purchase of food or other goods associated with health such as bed nets while men are inclined to use their financial resources to meet other

household needs (Rashed *et al.* 1999), and thus gender roles are believed to play a part over the acquisition and use of bed nets. The current observation could also be due to the fact that since 2003 bed nets in this community (and indeed now the whole district) were available to women, in particular pregnant women and those with under 5 children, at a heavily subsidized price (of \$0.45 per net) from public antenatal clinics.

This shows that in male headed households, women, especially pregnant women, and children under 5 years of age, are less likely to be protected from malaria. Men are the ones who generally control household income. Rashed *et al.* (1999) points out that when men's consumption choices do not correspond with those of women, women have to use their own production to generate the income which they need. This can be difficult for women in communities living in poverty where there are little or no opportunities for women to generate income.

In this study, having children under 5 years in a household was not associated with bed net use. Similarly having a pregnant woman in the household was also not associated with bed net use. Nuwaha (2001) has reported similar findings in a study done in an urban sample of Uganda where there had been no previous project on ITNs. Unlike in a rural setting in an urban setting, where many residents are likely to have more disposable income, households might prefer to use other equally effective but expensive methods such as repellents to protect themselves from malaria, thereby making bed nets not as great an issue in terms of malaria prevention. In contrast, in a rural setting if households can not afford to buy a bed net they might resort to traditional anti-mosquito methods such as burning leaves and cow

dung, methods that are less effective in preventing malaria (Binka & Adongo 1997; Heggenhougen *et al.* 2003).

Age of the head of household and marital status were also not found to be significant factors determining bed net use. In his study Nuwaha (2001) found that young age (< 30 years) was a significant predictor of bed net use and a possible explanation put forward for this was that young people were more likely to heed health education messages and hence likely to buy and use bed nets.

4.3.5 Socio-economic Factors and Bed net Use

Level of education of the head of household was not correlated with bed net use. This finding is not surprising because in this study population there were only a few (8%) heads of households who had gone beyond primary education. Alaii *et al.* (2003) has reported a similar observation in a study done in rural Kenya. With regard to employment status, it was also not surprising that there was no significant association with bed net use because a large proportion (95%) of the respondents was unemployed.

This study found a significant relationship between having a source of income and bed net use (possession). Rashed *et al.* (1999) reported a similar association in a study in Benin. It should be mentioned, however, that having a source of income is more of a factor affecting bed net ownership than use as community members were able to own a bed net but not all used their bed nets all year round.

4.3.6 Bed net Non Users and Reasons for Non Use

For the respondents who did not have bed nets, the main reason stated was that they could not afford to buy the nets (78%). With over 90% of the heads of households unemployed and relying on irregular sources of income from farming, fishing and petty trading, it can be difficult to choose between spending the little money one gets on food and spending it on items such as bed nets. In a study by Hertz *et al.* (2002) in Malawi, 82% of the respondents reported that they did not own a bed net because of poverty. Indeed according to WHO (2003), a major barrier to bed net ownership in many low income countries is poverty as the price of a net represents a large proportion of the income of a poor household.

On the other hand, it can be difficult to tell whether it is out of sheer poverty or lack of prioritizing or, according to a study by Yohannes *et al.* (2000), the expectation that health care products should be given free of charge, that some households do not possess bed nets. This can be a big challenge for malaria control programmes when considering subsidies or even free nets for the poor of the poorest, with the aim of protecting the groups at highest risk of malaria.

4.3.7 Conclusion

In this study in a rural community in Mangochi district of Malawi, a combination of factors was found to affect bed net use. These factors include personal, socioeconomic and environmental factors. An understanding of such factors is crucial if malaria control

programmes are to effectively promote the use of ITNs at individual and community level in order to achieve the overall objective of preventing malaria morbidity and mortality.

4.3.8 Recommendations

Based on the findings from this study, the following recommendations are made:

1. Because the major reason for non possession of a bed net was lack of money, free nets need to be made available to the poor, particularly pregnant women and children under 5 years of age, provided that mechanisms are in place to ensure that the system is not abused or exploited. This will require strong coordinated action between the communities and the District health office supported by the National Malaria Control Programme.
2. Because there are still misconceptions and myths about the causes of malaria and its transmission, there is a need for further educational messages since such misconceptions, on their own, can be potential barriers to bed net use. Realising the shortage of the major health promoters (environmental health staff), primary school teachers can be used to disseminate information on malaria and ITNs.
3. ITN promotional / educational messages need to emphasize the importance of consistent use of ITNs all year round. The messages should consider the relevant factors affecting bed net use. They should be simple, clear and correct, and they should not portray ITNs as a luxury, e.g. for prevention of nuisance bites, but rather as a necessity just like vaccines in the prevention of childhood illnesses. There is

evidence that promotional programmes can change behaviour and are more likely to be effective if they are built on local research and use locally appropriate channels of communication repeatedly and for an extended time (at least 3 years) (Curtis *et al.* 2001).

4. Because hot weather was one of the reasons mentioned for not using bed nets all year round, insecticide treated curtains can be used as an alternative. The effectiveness of such an intervention has already been demonstrated (Rubardt *et al.* 1999). As suggested by Majori *et al.* (cited in Yohannes *et al.* 2000), in small houses impregnated curtains may be more appropriate than bed nets.
5. Because male headed households were less likely to use bed nets, special focus needs to be placed on men to motivate them to prioritise the purchase and use of bed nets for themselves and members of their households. This is particularly important because men, in general, control household income whenever this is available.
6. For a bed net to maintain its effectiveness against malaria vectors it needs to be treated with an appropriate insecticide regularly. Because in this community there is already communal dipping of bed nets in insecticide such an approach needs to be sustained; however, there is need to explore the perceptions of the community members to communal dipping.

7. Because ITNs are the single most effective malaria preventive measure, and can easily be deployed on a large scale in a community, every effort must be made to try and understand the complex social, personal and environmental factors that influence their use in different communities e.g. urban/rural.

8. Because health workers are currently the main source of information on malaria and ITNs, they need to be regularly equipped with appropriate and up to date information on malaria and ITNs. This can be in the form of, for example, refresher trainings and/or newsletters.

A consensus building meeting will be organised with key stakeholders including representatives from the National Malaria Control Program, College of Medicine, Non Governmental Organisations and the community to map out ways in which these recommendations can be taken forward. This meeting is very important as some of the recommendations have policy implications.

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Statistical Soft ware

EpiInfo, 2003, Centres for Disease Control and Prevention, Atlanta, USA

STATA Version 8.0, 2003, Stata Corporation, Texas, USA

Form number

Appendix 1: Consent form

Consent Form

*This form is available in **English** and **Chewa** languages. Please make sure the participant expresses preference for one language. If the participant can not read, the consent form can be read out to him or her by a relative or the interviewer in the language of his/her choice. After the participant has indicated that he or she understands the consent form, he or she should be asked to sign or thumb stamp the form.*

Statement

The study for which your participation is required aims to investigate the factors that make people use or not use insecticide treated bed nets. The information will help us in planning for malaria control activities.

This study and your participation is for research purposes only and it will not affect your use of or access to health care facilities. You are one of the 196 heads of households who have been selected at random from among the many people in this community. No individual benefit is to be expected from participation in this study. The study will run for three weeks, but we will interview you only once, however we may later return to you if we need more information.

For the purposes of this study we will ask you to answer a list of questions. We request you to be free to give us your honest answers. Your answers to the questions and other information you provide will only be used for the purpose of this research and your name and personal information will not be used or shared.

You are free to ask any questions and you have the right to refuse to participate or withdraw from the study at any point in time. This will not affect you or members of your household in any way.

I have read the foregoing information, or it has been read to me. I have had the chance to ask questions about the study and those questions have been answered fully. I consent voluntarily to participate as a subject in this study and understand that I have the right to withdraw from the study at any time without any consequences for me or members of my household.

Name of Participant:

Name of Interviewer:

Signature: _____

Signature: _____

Date: _____

Date: _____

Appendix 2: Questionnaire

Questionnaire number

**QUESTIONNAIRE ON FACTORS THAT INFLUENCE THE USE OF
INSECTICIDE TREATED BED NETS IN A RURAL COMMUNITY IN
MANGOCHI DISTRICT, MALAWI**

Name of village _____

Interviewer visit:

	Visit 1	Visit 2	Visit 3
Date			
Interviewer name			
Name of respondent			
Results*			

*Results codes

- Completed..... 1
- No one at home..... 2
- Refused..... 3
- Respondent away for duration of survey..... 4
- Postponed..... 5
- Other (specify)..... 10

NOTE TO INTERVIEWER:

Please explain to the respondent that this questionnaire is available in *English* and *Chewa*. He or she may choose the preferred language

SECTION 1: Background Characteristics of Respondent

I would like to ask you some questions about your background

No.	Questions and Filters	Coding Categories	Skip to
Q.1	Gender	Male... 1 Female... 2	
Q.2	How old are you? (age in completed years)	<input type="text"/> <input type="text"/>	
Q.3	Have you ever attended school?	Yes... 1 No... 0	If No go to Q.5
Q.4	If yes, what is the highest level of school you have attended?	Primary... 1 Secondary... 2 Tertiary... 3 Other(specify)... 10	
Q.5	Are you married?	Yes... 1 No... 0	If No go to Q.8
Q.6	If yes, do you have children?	Yes... 1 No... 0	If No go to Q.8
Q.7	How many are children under 5?	<input type="text"/> <input type="text"/>	
Q.8	Are you currently employed?	Yes... 1 No... 0	If No go to Q.10
Q.9	If yes, can you describe the nature of your employment?	Unskilled worker(laborer)... 1 Skilled worker(e.g teacher)... 2 Other(specify)... 10	
Q.10	If no, probe: what is the source of income for the household?	Fishing... 1 Farming... 2 Petty trading... 3 Other(specify)... 10	
Q.11	<i>This Question only to those who answered Yes to Q.5</i> What is your wife's occupation?	Housewife... 1 Other(specify)... 10	
Q.12	What is your religion?	Muslim... 1 Catholic... 2 Anglican... 3 Presbyterian... 4 Other(specify)... 10	

SECTION 2: Malaria knowledge and Beliefs

Now I would like to ask you questions about your knowledge on malaria

No	Questions and Filters	Coding Categories	Skip to
Q.13	Have you ever heard about malaria?	Yes ... 1 No ... 0	If No, go to Q.19
Q.14	What was the source of this information?	Radio ... 1 Health personnel ... 2 Friend ... 3 Television ... 4 Other(specify) ... 10	
Q.15	What is the cause of malaria?	Parasite carried by mosquito ... 1 Witchcraft ... 2 Don't know ... 9 Other(specify) ... 10	
Q.16	How is malaria transmitted?	Mosquito bite ... 1 Drinking dirty water ... 2 Intense exposure to the sun ... 3 Don't know ... 9 Other(specify) ... 10	
Q.17	Do you consider malaria as an illness that is serious?	Yes ... 1 No ... 0 Don't know ... 9	If No, go to Q.19
Q.18	If yes, do you perceive yourself or members of your household as being at risk of malaria?	Yes ... 1 No ... 0 Don't know ... 9	

SECTION 3: Malaria Prevention: Bed net use

Now I would like to ask you questions about malaria prevention

No	Questions and Filters	Coding Categories	Skip to
Q.19	Have you ever heard of insecticide treated bed nets?	Yes... 1 No...0	If No, go to Q.31
Q.20	What was the source of this information?	Radio ... 1 Health personnel ... 2 Friend ... 3 Television ... 4 Other(specify)... 10	
Q.21	Do you have bed nets in your house for malaria prevention?	Yes ... 1 No...0	If No, go to Q.23
Q.22	If yes, how many bed nets do you have?	<input type="text"/>	
Q.23	If no, what is the reason for not possessing a net?	Bed nets not available ... 1 Can not afford... 2 Other(specify)... 10	
Q.24	Are/Is the bed net(s) treated with insecticide?	Yes ... 1 No ... 0	If No, go to Q.26
Q.25	If yes, how long ago was bed net treated with insecticide? <i>For this question try to help respondent to provide an approximate period by relating the event to specific dates or seasons</i>	≤ 6 months ago... 1 > 7 months ago... 2	
Q.26	If no, what is the reason for not treating a bed net?	Insecticide not available.. 1 Can not afford... 2 Other(specify)... 10	
Q.27	In your household, who uses the bed net(s)?	Husband ... 1 Wife... 2 U 5 children... 3 Other(specify)... 10	
Q.28	What motivates you to use a bed net?	Privacy ... 1 Reduce mosquito nuisance ... 2 Prevent malaria... 3 Other(specify)... 10	
Q.29	During which part of the year do you use a bed net?	Dry season ... 1 All year round... 2 Rainy season... 3 Other(specify)... 10	If All year round, go to Q.31

Q.30	If not "all year round" what prevents you from using a bed net during the other parts of the year?	Hot weather ... 1 Low mosquito density ... 2 Other (specify) ... 10	
Q.31	<i>This Question only to those who answered Yes to Q.5</i> Is your wife currently pregnant?	Yes ... 1 No ... 0 Don't know ... 9	If No, go to Q.32
Q.32	Do you have someone from your household who died of malaria?	Yes ... 1 No ... 0	
<p>End of the interview. Thank the respondent for his or her time</p>			

University of Cape Town

Appendix 3: Copy of Ethics Approval Letter

UNIVERSITY OF CAPE TOWN



Research Ethics Committee
E53 Room 44.1, Old Main Building
Groote Schuur Hospital, Observatory,
7925
Queries : Xolile Fula
Tel : (021) 406-6492 Fax: 406-6411
E-mail : Xfula@curie.uct.ac.za

11 November 2004

REC REF: 388/2004

Dr GGF Chithope- Mwale
03 Kumshaw Flat
Station Road
Mowbray
7700

Dear Dr Chithope- Mwale

FACTORS THAT INFLUENCE THE USE OF INSECTICIDE TREATED BED NETS IN A
RURAL COMMUNITY IN MANGOCHI DISTRICT, MALAWI

*Thank you for submitting your study to the Research Ethics Committee for
review.*

*It is a pleasure to inform you that the Research Ethics Committee has formally
approved the above mentioned study.*

Please quote the REC. REF in all your correspondence

Yours sincerely

PROF. T. XABOW
CHAIRPERSON