SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA
LEGON

ASSESSING THE COVERAGE AND USE OF LONG LASTING INSECTICIDE TREATED NETS IN THE KPONE-ON-SEA TOWNSHIP OF THE GREATER ACCRA REGION OF GHANA

BY

SETSOAFIA TAWIAH DZATA
(10396345)

THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH DEGREE

JULY, 2013

DECLARATION

This work is the result of my field research done independently under the supervision of Prof. Isabella A. Quakyi. I declare that except for references to other people's work which have been duly acknowledged, it has not been submitted for the award of any other degree apart from this. I am responsible for the views expressed and the factual accuracy of its content.

SETSOAFIA TAWIAH DZATA

Student

PROFESSOR ISABELLA A. QUAKYI

Academic Supervisor

DEDICATION

This dissertation is dedicated to the memory of my father, Mr. Ben H. K. Dzata (deceased) and my brother Mr. Gift Kwasi Dzata (deceased), for the influence they had in my academic life.

ACKNOWLEDGEMENT

Next to God who continues to give me life, I am indebted to my academic supervisor Prof. Isabella A. Quakyi for her continuous guidance, support and commitment in ensuring the successful completion of this work.

I am also grateful to all lecturers in the School of Public Health and more especially lecturers and staff of BEOHS department whose mentorship, criticisms and tutelage helped shape this work for the better.

My sincere thanks go to my mum and siblings for their continuous love, support and prayers throughout this period.

My appreciation also goes to the chiefs and people of the Kpone-On-Sea community for giving me the opportunity to conduct this work in their community. I am also grateful to staff of the health center and the district health directorate for giving me all the information I needed. To my research assistants and Bernard Bortie all from this community, I am grateful for your support and assistance.

Finally, I wish to show my appreciation to all my MPH mates, Mr. Charles Azagba and Ms. Enyonam Fiadzorgbe for all their support during this period.

ABSTRACT

Malaria is a parasitic disease infecting millions of people on the globe annually, especially children less than five years of age and pregnant women. It is caused by any of the human malaria parasites including; *Plasmodium falciparum, malariae, vivax and ovale* of which *Plasmodium falciparum* is the most dangerous and dreaded malaria parasite. According to Ghana Health Service (GHS) health facility data, malaria is the number one cause of morbidity, accounting for about 38% of all outpatient illnesses, 36% of all admissions, and 33% of all deaths in children under five years old.

Insecticide treated mosquito nets are currently one of the most viable options to prevent malaria transmission in Africa. Looking for practical solutions, W.H.O. stimulated industry to produce long lasting insecticide-treated mosquito nets (LLINs), using new bioactive fabric technologies; Long-lasting nets are treated only once, at factory level.

This study assessed the National Malaria Control Programme's (NMCP) LLINs distribution and hanging campaign in Kpone–On–Sea Township. It sought to establish the coverage of LLINs in the community and its usage by children less than five years old and pregnant women.

The cross-sectional study involved 400 households with heads of the households or their representatives as respondents and data was collected through questionnaire interviews and observational checklists.

Results from the study indicated that out of 400 households 93.3% owned any type of net whiles 83.8% own LLIN and 74.9% used it. Households with children less than five years old accounted for 84.7% with regard to ownership whiles 69.3% for usage. LLIN

possession by pregnant women was 84.8% whiles usage was 72.3%. The study also indicated that 73.8% of respondents had good knowledge of malaria, 21.2% had very good knowledge and 5.0 % had low knowledge. Furthermore, 89.5 % of the respondents had knowledge of LLIN.

The findings further indicate that coverage of LLIN in the community is 83.9% and usage 74.9%, seven months after a free distribution and hanging campaign. This provides a useful assessment of the efficacy of NMCP's LLIN campaign in this community and suggests ways for improvement.

TABLE OF CONTENTS **PAGE**

DECLARATION i
DEDICATION ii
ACKNOWLEDGEMENT iii
ABSTRACT iv
TABLE OF CONTENTS vi
LIST OF TABLES ix
LIST OF FIGURES x
LIST OF ACRONYMS xi
DEFINITION OF TERMS xii
CHAPTER ONE 1
1.0 INTRODUCTION 1
1.1 Background 1
1.2 Statement of the problem 5
1.3 Justification of study 6
1.4 Study Objectives 7
1.4.1 General objective 7
1.4.2 Specific objectives 7
CHAPTER TWO 8
2.0 LITERATURE REVIEW 8
2.1 Malaria 8
2.2 LLIN Ownership and use 9
2.3 Accessibility and cost 12
2.4 Knowledge on Malaria and LLIN use 14
2.5 Socio-cultural beliefs 15
CHAPTER THREE 17
3.0 METHODS 17
3.1 Study site 17
3.2 Study design 19

3.3 Study population 19
3.4 Study population variables 19
3.5 Sample size determination 19
3.6 Sampling procedure 20
3.7 Data collection techniques 20
3.7.1 Data collection tools 21
3.8 Data Processing and Analysis 21
3.9 Quality Control 21
3.10 Ethical considerations 22
3.11 Pilot Study 23
CHAPTER FOUR 24
4.0 RESULTS 24
4.1 Socio-Demographic Information 24
4.2 Possession/ownership of LLIN 27
4.3 Possession and usage of LLIN in relation to some socio-demographic characteristics of respondents 27
4.4 Knowledge of malaria 31
4.5 Knowledge of LLIN 32
4.6 Accessibility and cost of LLIN 32
CHAPTER FIVE 36
5.0 DISCUSSION 36
5.1 Possession/ownership of LLIN 36
5.2 LLIN Usage 38
5.3 Knowledge of malaria 39
5.4 Knowledge of LLIN 40
5.5 Accessibility and cost of LLIN 40
5.6 Limitations 40
CHAPTER SIX 42
6.0 CONCLUSION AND RECOMMENDATIONS 42
6.1 Conclusion 42
6.2 Recommendations 43

REFERENCES 44
APPENDICES 48
Appendix I: Sample Informed Concerned Form 48
Appendix II: Sample Questionnaire 50
Appendix III: Sample Observational Checklist 55

LIST OF TABLES

Table1: Demographic characteristics of respondents 26

Table 2: Household LLIN possession and usage with socio-demographic characteristic.30

Table 3: Summary of proportion of household ownership and use of LLIN..... 31

Table 4: Association between some factors that influence ownership and use of any bed net..... 34

LIST OF FIGURES

Figure 1: GIS Map of Kpone-on-sea 18

LIST OF ACRONYMS

DHS	Demographic Health Survey
GDHS	Ghana Demographic Health Survey
GHS	Ghana Health Survey
GIS	Geographical Information System
ITNs	Insecticide Treated Nets
LLINs	Long Lasting Insecticide Treated Nets
MDG	Millennium Development Goal
MIS	Malaria Indicator Survey
NMCP	National Malaria Control Programme
PMI	President's Malaria Initiative
SSA	Sub-Saharan Africa
WHO	World Health Organisation
WHOPES	WHO Pesticide Evaluation Scheme

DEFINITION OF TERMS

Coverage: proportion of households possessing at least one LLIN.

Usage: the proportion of persons that were reported to have slept under an LLIN the previous night.

Household: all persons who eat out of the same food pot and recognize the same head of household.

Children under five years old: defined as children aged 0-59 months at the time of the study.

Long Lasting Insecticide Treated Nets: is a factory-treated mosquito net made with netting material that has insecticide incorporated within or bound around the fibres.

Universal coverage: one LLIN for every two people in every household.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Malaria is said to be the world's most important parasitic infection, ranking among the major health and developmental challenges for the poor countries of the world. Four parasite species of the genus *Plasmodium* infect human beings, but one, (*Plasmodium falciparum*) the most lethal of the four causes majority of malaria infections. Nearly all malaria deaths and a large proportion of morbidity are caused by *Plasmodium falciparum* (Guerin et al., 2002). There are 300 to 500 million clinical cases every year, and between one and three million deaths, mostly of children, are attributable to this disease (Breman, Egan, Keusch, & Breman, 2001).

Malaria affects severely, children younger than 5 years and pregnant women. Although adult women usually, might have developed immunity in areas of high transmission, they lose it with pregnancy, becoming highly susceptible to infection. Placental infection with malaria has a strong effect on intrauterine nutrition of the foetus. Malaria in pregnancy is associated with low birth weight, which in turn is one of the main causes of infant mortality and diminished intellectual development (Teklehaimanot & Mejia, 2008). Malaria is also a frequent cause of anaemia in the mother, an important risk factor in maternal mortality (Teklehaimanot & Mejia, 2008).

Malaria is hyper endemic in all parts of the country. Ghana's entire population of 24 million is at risk of malaria, although transmission rates are lower in the urban areas.

Transmission occurs year-round with seasonal variations during the rainy season. According to Ghana Health Service (GHS) health facility data, malaria is the number one cause of morbidity, accounting for about 38% of all outpatient illnesses, 36% of all admissions, and 33% of all deaths in children under-five years of age. Between 3.1 and 3.5 million cases of clinical malaria are reported in public health facilities each year, of which 900,000 cases are in children under five years old. An estimated 14,000 deaths in children under five were attributable to malaria in 2008. The verbal autopsy component of the 2008 DHS household survey found that malaria accounted for 43% of all deaths in children aged 29 days to 5 years, and that roughly half of deaths in children under five occurred at home.

Insecticide treated mosquito nets are currently one of the most viable options to prevent malaria transmission in large parts of Africa. To be effective, mosquito nets have to be treated by dipping them in suitable insecticides at least once a year. Less than 5% of the nets currently used in Africa are properly treated or re-treated. Looking for practical solutions, W.H.O. stimulated industry to produce long lasting insecticide-treated mosquito nets (LLINs), using new bioactive fabric technologies. Long-lasting nets are treated only once, at factory level. The insecticide can resist multiple washes and is released over time to the surface of the netting fibres. The major criteria for LLIN is that, efficacy should last as long as the average lifespan of the net, i.e. 4–5 years. Compared with nets treated by conventional dipping, LLINs have several important advantages: no need for re-treatment; reduced insecticide consumption; and minimum potential environmental impact: release of insecticide in natural water bodies during washing is greatly reduced. There are two LLINs commercially available, currently being evaluated

through the WHO Pesticide Evaluation Scheme (WHOPES). Second-generation LLINs are now emerging with even better performance. They are major technical breakthroughs, significantly changing prospects for successful implementation of ITN programmes, especially in Africa. To protect the most vulnerable groups in Africa (children under five years old, pregnant women and people living below the poverty line) and to meet the objective set by the Heads of State of African countries in Abuja (60% of net coverage by 2005), (Guillet et al., 2001).

The insecticide on the LLINs has a repellent effect on mosquitoes and most commonly kills them or has a knock-down effect so that the malaria parasite can no longer be transmitted even to those not covered by mosquito nets. When used correctly, LLINs have been shown to reduce malaria cases by approximately 50 per cent, effectively reducing all causes of child mortality by 20 per cent (Lengeler, 2004).

ITNs can be compared in their cost-effectiveness in preventing deaths and morbidity to that of measles vaccination. Like vaccines, ITNs have both a personal protective effect to the individual user, as well as a community-wide effect because the nets act like baited traps for mosquitoes. The higher the percentage of the whole population covered with ITNs, the greater the number of mosquitoes killed, thus benefiting both individuals using ITNs and others who sleep nearby. To really achieve the full potential of the community effect of ITNs on the vector population, it will be necessary to cover a considerably higher percentage of the whole population (Curtis et al., 2003).

The Ministry of Health of Ghana and its agent, the Ghana Health service, have mandated the National Malaria Control Programme (NMCP) to lead in the national effort of reducing the malaria burden in Ghana. The NMCP together with its multi and inter-sect

oral partners are making prevention and treatment strategies widely available in every part of the country.

Distribution of insecticide treated nets (ITNs) and long-lasting insecticidal nets (LLINs) have been a key malaria prevention and control strategy in Ghana for many years. In the past, this strategy was implemented mainly through social marketing using vouchers, subsidised ITN or LLIN sales at health facilities, and distribution through measles campaigns. The targets of all these approaches were the two vulnerable groups of the population most likely to suffer severe consequences or die from malaria: children under 5 years of age and pregnant women. The combined strategy of social marketing using vouchers, discounted sales and distribution through measles campaigns led to a significant improvement in net coverage: the percentage of children under 5 and pregnant women sleeping under an ITN rose from 4% in 2003 to 28% in 2008 according to the 2008 DHS. After five years of promoting this strategy, ITN coverage leveled off at about 28% of children under 5 and 20% of pregnant women respectively (Harvey, 2010).

In an effort to quickly boost LLIN coverage and utilization to a much higher level, the National Malaria Control Program (NMCP) in 2010 switched to mass distribution. This strategy began with a distribution to pregnant women and children under 5 in the Northern Region in May. With support from various local and international partners, the NMCP distributed over half a million LLINs. During this campaign, paid volunteers distributed nets door-to-door and hung them in recipient households immediately. The effect of immediate hang-up on use is still under study, but it is hoped that the strategy will lead to significantly higher utilization. With increased availability of more LLINs, the NMCP switched its strategy to universal coverage, defined as one LLIN for every two

people in every household. As the name implies, the objective of universal coverage is to ensure that all members of the population sleep under an LLIN regardless of age or sex. Universal coverage is consistent with the goal of malaria eradication: rather than decreasing morbidity and mortality by protecting only those most vulnerable, universal coverage aims to interrupt transmission by eliminating the human reservoir of parasites (Harvey, 2010).

1.2 Statement of the problem

Coverage of entire populations will be required to accomplish large reductions of the malaria burden in Africa. While coverage of vulnerable groups (children < 5 years of age and pregnant women) should still be prioritized, the equitable and communal benefits of wide-scale ITN use by older children and adults should be explicitly promoted and evaluated by national malaria control programmes. ITN use by the majority of entire populations could protect all children in such communities, even those not actually covered by achieving existing personal protection targets of the MDG, Roll Back Malaria Partnership, or the US President's Malaria Initiative (Killeen et al., 2007). As Ghana strives toward the target of universal coverage the NMCP has refocused and streamlined their distribution approach to emphasize free mass distribution and hanging campaigns and Kpone-on-Sea Township has been one of the latest beneficiary communities. To meet this target several intermediate steps need to be accomplished after free mass distribution campaigns to ensure that:

1. ITN programmes have sufficient geographical reach to provide ITNs to all households;
2. Sufficient nets are provided to households to cover all people living in them; and
3. People within households use the available nets.

This study is therefore set out to fulfill the above requirements and also to explore other household characteristics that influence LLINs use, whether the bed nets are used for the intended purpose and how many of the people associate malaria with mosquito bites.

1.3 Justification of study

Maintaining high coverage and usage limit parasite transmission and are essential for achieving community-wide protection. It is therefore necessary that, after every free distribution campaign of ITNs, an assessment is done especially regarding coverage, access in remote areas and equity so as to develop targeted strategies to fill the remaining gaps.

Information available indicates that, there has not been any study conducted to assess the coverage and usage of LLINs in Kpone-On-Sea Township. This therefore presents the need for research to obtain accurate, up-to-date, reliable and valid data on the coverage and consistent use of LLINs in the community especially among pregnant women and children and also to assess how effective the LLINs distribution programme has been. The findings and recommendations of this study will provide a way forward for policy makers at the district, regional and national levels in making pragmatic policies as far as malaria prevention and control programmes are concerned.

1.4 Study Objectives

1.4.1 General objective

To assess the National Malaria Control Programme's LLINs mass distribution campaign in Kpone–On–Sea Township

1.4.2 Specific objectives

1. To establish the coverage of LLINs in the community
2. To estimate the usage of LLINs by children under five years of age
3. To estimate LLINs usage among pregnant women

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Malaria

Globally, more than two million are at risk of getting malaria (Snow, Guerra, Noor, Myint, & Hay, 2005) which mainly affects poor people who live in tropical and subtropical regions of the world, where the temperature and rainfall are most suitable for the development of the malaria-causing *Plasmodium* parasites in *Anopheles* mosquitoes. Every year over 500 million people are infected with malaria parasites and cause at least 100 million cases of acute illness. Literature has it that, malaria once widely occurred in temperate areas such as Western Europe and the United States but it receded with better economic conditions and public health issues (Greenwood et al., 2008). Twenty-five million pregnant women are currently at risk of malaria and according to the World Health Organization (WHO), malaria accounts for over 10,000 maternal and 200,000 neonatal deaths per year (Schantz-Dunn & Nour, 2009).

Africa accounts for about 90% of all deaths (especially in young children) due to malaria. It is Africa's leading cause of under-five mortality (20%) and constitutes 10% of the continent's overall disease burden. Malaria also accounts for 40% of public health expenditure, 30-50% of inpatient admissions and up to 50% of outpatient department visits in areas with high malaria transmission (Roll Back Malaria, 2006).

There are multiple and complex links between malaria and poverty. The correlation between malaria and poverty is strong, but understanding the direction and magnitude of the correlation is more difficult. Most likely, causality works both ways: Poverty sustains

the conditions where malaria thrives, and malaria impedes economic growth and keeps communities in poverty. With a potential dual causation between poverty and malaria, where poor households experience high malaria prevalence that in turn maintains them in poverty, these households are trapped in reinforcing cycles (Teklehaimanot & Mejia, 2008). This link explains why malaria is still endemic in most poor African countries.

Ghana can be stratified into three malaria epidemiologic zones: the northern savannah; the tropical rainforest; and the coastal savannah and mangrove swamps. The major vectors are *Anopheles gambiae* and *Anopheles funestus*. Characteristically, these species bite late in the night, are indoor resting, and are commonly found in the rural and peri-urban areas where socio-economic activities lead to the creation of breeding sites. *Anopheles melas* is found in the mangrove swamps of the southwest and *An. arabiensis* in savannah areas of northern Ghana. The Northern part of Ghana experiences pronounced seasonal variations with a prolonged dry season from September to April. The normal duration of the intense malaria transmission season in the northern part of the country is about seven months beginning in April/May and lasting through to September. There are no areas of epidemic malaria in Ghana (PMI, Malaria Operational Plan, 2011).

2.2 LLIN Ownership and use

In Ghana, the ownership and use of insecticide-treated mosquito nets, particularly the long-lasting insecticide net is being promoted by the Ghana Health Service as one of the primary interventions for reducing malaria transmission and morbidity in the country. It has adopted a multipronged approach for the distribution of the ITNs. More than four in ten (45 percent) households in Ghana own a mosquito net (treated or untreated), while

one-third (33 percent) own at least one insecticide-treated net (ITN). Household ownership of mosquito nets increased substantially between the 2003 GDHS and the 2008 GDHS. During the five-year period, ownership of a mosquito net (treated or untreated) increased from 18 to 45 percent, and household ownership of more than one net increased from 6 to 19 percent. In 2008, 33 percent of households owned at least one ITN, compared with 3 percent of households in 2003. These increases demonstrate remarkable improvements in Ghana's bed-net distribution programmes in just five years(GSS & Macro, 2009). Even though, ITN ownership averaged 33% for the country but varied from 47% in the Upper East Region to a low of 20% in the Greater Accra Region. The largely rural Northern Region had only 27% ITN ownership and is the focus of PMI net distributions in 2010 (PMI, Malaria Operational Plan, 2011).

A study conducted in three regional states in Ethiopia suggested that overall, net use and LLIN use by persons of all ages in all households went up between baseline 2006 and MIS 2007: from 27.7% to 36.7% for any type of net and from 15.3%to 34.5% for LLIN, with slightly higher rates for children under five years of age and pregnant women (Shargie et al., 2010).

Also, a comparative analysis of net use covering 15 countries over the period 2003 to 2006 suggested that higher net use by children under five (in households owning ITN) was associated with increased availability of nets in the household. Thus, as the number of nets per household member increased (i.e., mean ratio of residents per net decreased from 6.8 to 3.7 by country), children under 5 were 2.1 to 5.5 times more likely to have slept under an ITN the previous night (Eisele, Keating, Littrell, Larsen, & Macintyre, 2009).

Findings of a study conducted in Madagascar suggested that free mass distribution allows equitable ownership of nets and high coverage; and once a household acquires a net(s), they are highly likely to use them regardless of their socio-economic status.

A cross-sectional survey carried out during the rainy season in Mali showed a high rate of ownership of nets with more than 91.0 % of households having at least one net of any type. There were regional differences, with the lowest rate in Bamako (87.2%) and the highest in Gao (95.1%). Nationwide, 82% of households have at least one impregnated insecticide net of which the vast majority of treated nets owned by households were LLINs (Cervinskas, Berti, Desrochers, Mandy, & Kulkarni, 2008).

Several studies have shown that using an insecticide treated net (ITN) is effective in reducing the man-vector contact and prevent malaria. The use of ITNs on a large scale reduces clinical malaria episodes by 48% and saves 6% of 1,000 children below five years of age. Despite the evidence that the use of ITNs decreases malaria-related morbidity and mortality, the use of ITNs in sub-Saharan Africa remains relatively low. Estimates from Africa as a whole indicated that, in 2005, only 3% of children less of than five years of age sleep under ITNs, while up to ten times as many are thought to sleep under any bed net. Recent campaigns with free distribution of bed nets have largely increased the ownership of ITNs, but some studies show that the incidence of use does not follow that of ownership and especially that the rate of use declines at the beginning of the dry season (Toé et al., 2009).

A household survey conducted in 18 malaria endemic countries in Africa, a common pattern of ITN use emerged with highest coverage among children aged less than five years, dropping to lowest levels of coverage among children and adolescents aged 5-19

years and rising again through adulthood before a drop among the oldest household members. Similar patterns of ITNs use between young children and older age groups have been indicated in studies conducted in Tanzania, South Central Somalia, Ethiopia and Nigeria. These observed patterns could likely be due to the fact that; historically, ITNs delivery programmes focused on ensuring young children have access to nets either through routine clinic visits, attendance at regular vaccination visits, their mothers while pregnant or nets delivered as part of mass-catch-up immunization campaigns that target young children. Consequently this age group would be expected, following recent efforts to scale coverage, to show the highest reported ITNs use. Also, another reason could be linked to the way people share sleeping structures in a household, where nursing and younger children will sleep with their mothers and/or both parents, who will most often be between 20-44 years of age. Conversely older children will sleep on separate beds or mats elsewhere in the household (Noor, Kirui, Brooker, & Snow, 2009).

2.3 Accessibility and cost

The cost of ITNs is a barrier to their widespread use. As one element in reducing prices, the Abuja Declaration committed governments to reduce or waive taxes and tariffs for nets and materials, insecticides, anti-malarial drugs and other recommended goods and services that are needed for malaria control strategies (Bay, 2003).

It usually sounds promising when high targets are set for net coverage at country and regional levels, but it is widely evident that affordability of ITNs is a problem everywhere in Sub-Saharan Africa (SSA). This is a challenge since in some settings ITNs

are less accepted because they are ranked very lowly in priority compared to other household needs (Mubyazi, Kassembe, Mahundi, & Njunwa, 2011).

There has been a raging debate internationally as to whether health interventions such as ITNs should be fully subsidised by governments or donor agency or there should be cost-sharing. It is also argued that charging a positive price for a commodity is necessary to ensure that it is effectively used, wastage is reduced and the efficiency of foreign aid is enhanced. The cost-sharing model of selling nets for $0.50 to mothers through prenatal clinics is believed to reduce waste because "it gets the nets to those who both value them and need them" (Easterly, 2006). A randomized pricing experiment in Western Kenya however, found no evidence to support this assumption. There was no evidence that cost-sharing reduces wastage by sifting out those who would not use the net: pregnant women who receive free ITNs are no less likely to put them to intended use than pregnant women who pay for their nets. This suggests that cost-sharing does not increase usage intensity in this context. Although it doesn't increase usage intensity, cost-sharing does considerably dampen demand. At the time of the study, a cost-sharing scheme that was implemented in Kenya resulted in a coverage rate 75 percentage points lower than with a full subsidy (Cohen & Dupas, 2010).

Even though literature has it that cost-sharing could lead to greater usage intensity than free distribution, it may also negatively affect program coverage by reducing demand. A number of experimental and field studies indicate that there may be special psychological properties to "zero financial price" and that demand may drop precipitously when the price is raised slightly above zero (Ariely & Shampan'er, 2006; Kremer & Miguel, 2007). Beyond reducing demand, selection effects are not straightforward in the context of credit

and cash constraints: if people who cannot afford to pay a positive price are more likely to be sick and need the good, then charging a positive price would screen out the neediest and could significantly reduce the health benefits of the partial subsidy (Cohen & Dupas, 2010).

2.4 Knowledge on Malaria and LLIN use

According to a study conducted in Southeast Iran, a quarter of illiterate respondents stated that drinking dirty water and contaminated food could cause malaria. This revealed a gap of their knowledge on malaria transmission. The above misconception could adversely affect the people's preventive behaviour. This fact brought about the need for effective educational intervention to improve the level of knowledge in the study population which is critical for the malaria prevention and control using LLINs. In the study, following the educational program, knowledge of illiterate respondents regarding malaria transmission significantly increased. Active educational intervention plays an important role in people's perception, and knowledge promotion has a great impact on success and sustainability of malaria control strategies (Ahmadi, Eshraghian, Madani, & Safari, 2012). Another study conducted in Kenya to investigate the extent of LLINs misuse in fishing villages concluded that the misuse of bed nets for fishing and drying fish is considerable in the study area. Many villagers were not yet fully convinced of the effectiveness of LLINs for malaria prevention. Misuse of bed nets may hamper the efforts of NGOs and governmental health organisations for malaria prevention (Minakawa, Dida, Sonye, Futami, & Kaneko, 2008).

2.5 Socio-cultural beliefs

A qualitative study conducted in Tanzania outlined the following beliefs as associated with malaria:

Mosquito bites are traditionally symbolic of a woman's suffering when in mourning. It also indicated that sleeping under a net at a funeral or a son building his own brick house before he builds a home for his father results in punishment by witchcraft. Furthermore, keeping a woman under a net at funerals is one of many ways in which men use symbols of modernity to discipline women's behavior (Darkwah & Nyarko, 2011).

A baseline survey for the implementation of insecticide treated mosquito nets in Malaria control in Ethiopia indicated that although the association of malaria with mosquitoes is widespread in these communities, other causal factors of malaria such as traditional beliefs like eating maize stalks, contact with malaria patients, exposure to rains and cold weather, bad smell and dirty water were frequently suggested (Jima et al., 2005).

In a study conducted in Uganda, it was realized that over half of the participants in all Focus group discussions (FGDs) seemed to believe that ITNs are treated with chemicals which affect pregnant women, especially their breathing, and that if the chemicals can kill mosquitoes instantly, they can also kill people. In the same study, it was also noted that the main reason given by participants as to why pregnant women and children are vulnerable to malaria was that their bodies are weak, a reference to low immunity against disease. In this community, adolescents, primigravidae and men were not perceived to be at risk of malaria (Mbonye, Neema, & Magnussen, 2006).

Some respondents in another study in Burkina Faso identified various types of food as a cause of malaria. For example, a particular respondent attributed his malaria disease to

some sweet milk he drank from a farmer. Another respondent attributed the cause of malaria to coldness and sleeping in the cold in addition to mosquito bites (Toé et al., 2009).

Baume and Marin mentioned some cases of non-use of nets during the rainy season and explained it in part by the desire to use new nets rather than old nets. This poses a problem for net usage in the long term. Whether the net is free or for sale, it is the perception of the individual that determines its consistent use. If the individuals are not sufficiently motivated to use ITNs in their daily life, their widespread use on a long-term basis will not be successful (Baume & Marin, 2007). Preliminary studies in a rural area in Burkina Faso revealed that the population used ITNs at high rates for the first few months and then gave it up for non-objective reasons, such as the reduction in the number of mosquitoes, difficulty in fixing the nets etc (Toé et al., 2009).

CHAPTER THREE

3.0 METHODS

3.1 Study site

The study was conducted at Kpone-On-Sea, a GIS mapped study site developed by the School of Public Health (Quakyi et al., 2004).

Kpone-On-Sea (pronounced "Pone") is a well-demarcated fishing village situated in the Kpone-Katamanso Municipality (a newly created district) in the Greater Accra Region of Ghana. It is bordered on the east by Prampram, on the south by the Gulf of Guinea, on the west by Tema, and on the north by the Industrial Free Zone. The village is surrounded immediately by shrub land except for the southern aspect that is bounded by the sea. Most villagers speak Ga and English, the official language of Ghana. The main occupation of villagers is fishing, although a sizable proportion is engaged in agriculture and animal husbandry. A centrally located clinic founded in 1992 by the Rotary Club of Tema was completed and equipped with the assistance of the Tema Municipal Assembly. The clinic is currently working under the direction of Ghana's Ministry of Health, is supervised by a Medical Assistant, and is staffed by several nurses and orderlies. Malaria transmission is perennial although the intensity varies throughout the year. Maximum transmission occurs during and after two distinct rainy seasons (April to July, September to October) and declines during the dry seasons (November to March, August) (Tchouassi et al., 2012). It is expected that all children in Kpone-On-Sea will experience at least one episode of malaria each year.

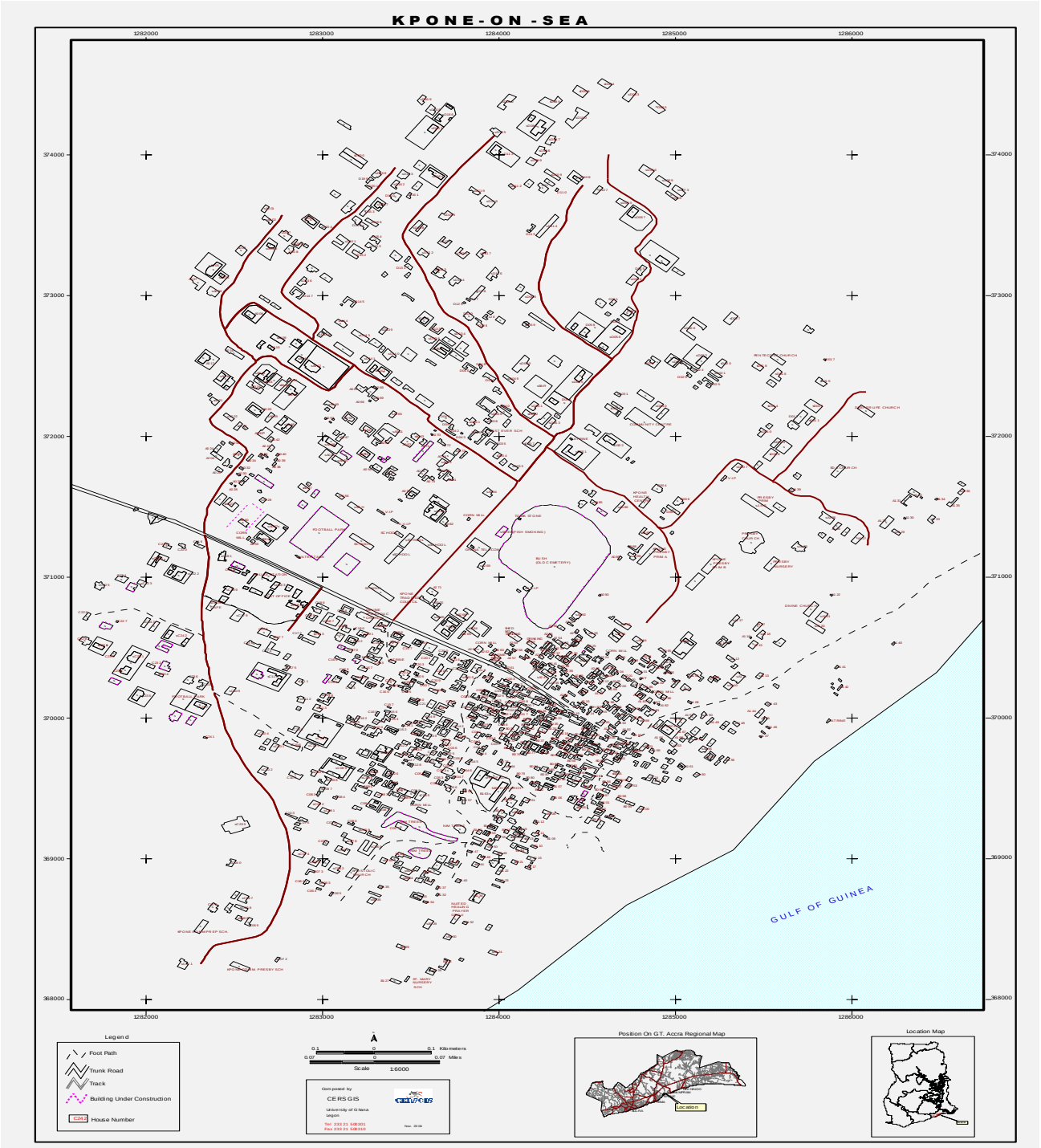

Figure 1: GIS map of Kpone-On-Sea

Source: (Quakyi et al., 2004)

3.2 Study design

This was a cross-sectional study without any interventions where data was collected from 400 households from sections of the population in Kpone-On-Sea Township.

Data on insecticide treated net ownership, usage; awareness, were obtained from the study subjects one at a time. Background information such as age, sex, marital status, and level of education, number of children in a household, occupation and religion were captured.

3.3 Study population

The study population included head of households in selected communities in Kpone-On-Sea with focus on children less than five years of age and pregnant women. Data collected prior to the distribution campaign indicated that Kpone Township had a population of 13,097 and 5,931 households (source: focal person of LLIN distribution campaign in Kpone-On-Sea).

3.4 Study population variables

Dependent variable: Long Lasting Insecticide Nets (LLINs) coverage and use.

Independent variable: Ownership, education (awareness) on malaria and knowledge of LLIN.

3.5 Sample size determination

The sample size was estimated to be 400 participants as shown below

$$n = \frac{Z^2 \text{ x } PQ}{d^2}$$

Where:

n = desired sample size

Z = the standard normal deviation, set at α = 0.05 based on a 95% confidence level

P = sample proportion (the proportion of the sample that is assumed to be using ITNs = 50% or 0.5).

Q = 1 – P

d = the allowable margin of error = 0.05 $n = \frac{(1.96)^2 0.5 * 0.5}{(0.05)^2} = 384$

n= 384

Upward adjustment of 5%

THEREFORE: A minimum of 400 households were selected.

3.6 Sampling procedure

As mentioned earlier, Kpone-On-Sea has been developed as a study site by School of Public Health and has therefore been GIS-mapped into 4 sectors, A, B, C and D. 100 households were selected from each sector making a total of 400 households for the study. The first house from each sector was identified by the use of the GIS-map. From the first house the next three houses adjacent to the first house was selected. This pattern continued until the whole sector was covered. In cases where a house had more than one household, a representative household was selected by simple random sampling method (lottery).

3.7 Data collection techniques

Data was collected through home visits during the study period. Home visits were not pre-arranged and lasted between 20 to 30 minutes. After getting approval from the participants through informed consent, the research assistants administered the questions to the respondents, one at a time, face to face and in their preferred language. Responses

from the respondents were then recorded accordingly. Interviewers also inspected the nets in the sleeping areas of respondents who permitted them and ascertained whether they actually owned LLINS, whether the nets were hung (properly) and also to find out if they were in good condition.

3.7.1 Data collection tools

Tools which were employed in the collection of the data included observational checklist, and structured questionnaires as indicated in appendices III and II respectively.

3.8 Data Processing and Analysis

Data collected from the field in the form of answered questionnaires and checklists were stored in plain plastic files pending analysis. Computer software Statistical Package for Social Science (SPSS) version 16.0 was used for the data entry and analysis was done using STATA version 11.0 software. The data from the questionnaire were coded and fed into the computer for onward analysis based on the study objectives and the main study variables. Frequency tables and bar charts were used to indicate proportion of households that own LLINs, the proportion of children under five years and pregnant women that slept under the net the night before the study. Chi-squared test was used to test associations.

3.9 Quality Control

The following steps were taken to ensure the quality and validity of the data:

1. Six research assistants who could speak and understand the local language and had been engaged in previous surveys were recruited to become interviewers for the study. The content of the training included the purpose and objectives of the

study, data collection techniques and tools to be used, translation of questionnaires into their local language (Ga or Twi), actual data collection and ethical issues or considerations.

2. Questionnaires returned were checked for mistakes and completeness. Errors and omissions detected were discussed with the respective assistants and asked to go back and make the necessary corrections.
3. All data collected were entered twice by two different qualified personnel to ensure validity.

3.10 Ethical considerations

Ethical clearance was sought from the Ghana Health Service Ethical Review Board. The study subjects were adult household heads or their representatives. Written informed consent was sought from all study subjects through an informed concerned form as shown in appendix I and the study was explained to all respondents. The potential risks of the project were the respondents' time and privacy. The study would be beneficial to the participants since information from them will help to improve on health intervention and promotion activities in the area and also add up to existing knowledge. There was no compensation for participants. The data collected was used for analysis, soft copies were password protected and hard copies stored in locked cabinets. Only the researcher had access to the data. Potential study participants were made to understand that their participation in the study was entirely voluntary. Their decisions not to enter the study, failure to answer any question or termination of the interview were respected. The study was funded by the researcher. There were no issues of conflict of interest.

3.11 Pilot Study

Data collection tools and observation checklist were pre-tested at Kpone-Ete, a neighbouring rural community of Kpone-On-Sea for reliability before actual data collection. 20 households were used for the pre-test.

CHAPTER FOUR

4.0 RESULTS

This household survey was conducted between May and June, 2012 approximately, six months after NMCP's free distribution and hanging campaign to assess the coverage and usage of LLINs in households at Kpone-On-Sea. 400 households were involved in this survey and respondents were interviewed on issues of LLIN ownership, affordability, knowledge on malaria and LLIN use and socio-cultural beliefs. The results presented below are from 400 (100%) completed questionnaires.

4.1 Socio-Demographic Information

Age, sex, marital status, level of education, occupation and religion of respondents were included. Information on the number of people in a household, number of children less than five years old and number of pregnant women in the household was also included.

Far more than half (70.8 percent) of the respondents were females while 29.2 percent were males. In terms of educational status majority of the respondents (87.8 percent) had varying degrees of education ranging from primary to tertiary education while 12 percent had no formal education at all. About 71.2 percent of the respondents were self-employed, while 16.2 percent were public workers and 12.5 percent were unemployed.

With regards to number of people living in a household, a little above half (59.0 percent) of the respondent had 2-4 persons, 24.2 percent had 5-7 persons, 11.0 percent had 1 person and 5.8 percent had above 7 persons. Furthermore, out of 400 respondents that were interviewed, 60.5 percent alluded to have 1-3 children in the household, 6.8 percent had 4-6 children, 1.2 percent had above 6 children and 31.5 percent had no child. Also,

75 percent of the respondents had at most 2 pregnant women in a household, 0.5 percent had more than 2 pregnant women and 24.5 percent had none as shown in Table 1 below.

Table1: Demographic characteristics of respondents

Characteristic	Number (400)	Percentage (%)
Age (years)		
< 25	66	16.5
26 – 35	156	39.0
36 – 45	101	25.2
>45	77	19.3
Sex		
Male	117	29.2
Female	283	70.8
Marital Status		
Single	76	19.0
Married	241	60.2
Divorced	24	6.0
Widowed	17	4.2
Co-habiting	42	10.5
Level of education		
No education	48	12.0
Primary	49	12.2
JHS/middle school	153	38.2
Secondary	97	24.2
Tertiary	53	13.2
Occupation		
Farmer	9	2.2
Businessman/woman	208	52.0
Public worker	65	16.2
Unemployed	50	12.5
Other	68	17.0
Religion		
Christianity	360	90.0
Islam	23	5.8
Traditional	16	4.0
Other	1	0.2
Number of people in a household		
1	44	11.0
2-4	236	59.0
5-7	97	24.2
Above 7	23	5.8
Number of children in a household		
No child	126	31.5
1-3	242	60.5
4-6	27	6.8
Above 6	5	1.2
Number of pregnant women in a household		
None	98	24.5
1-2	300	75.0
Above 2	2	0.5

4.2 Possession/ownership of LLIN

Questions on ownership of LLIN were asked the respondents. Out of 400 respondents of households as much as 93.3 percent (373) alluded to owning any type of bed net whilst about 6.7 percent (27) said otherwise. Also, out of the 373 respondents that own any type of bed nets 89.8 percent (335) had at least one LLIN, 7.8 percent (29) had retreatable insecticide net and 2.4 percent (9) own untreated nets. When asked whether they bought the LLIN, 83.5 percent (334) answered no whilst the remaining 16.5 percent (66) answered yes. For those who did not buy, 93.1 percent (311) got it free from community volunteers and 6.9 percent (23) from other sources such as supermarket, pharmacy shop, hospital and from friends. Upon inspection, 72.3 percent (289) of ITNs were hung as shown in Table 3. There is a significant association between seasonal period of net use and possession (x^2=9.87, p = 0.020).

4.3 Possession and usage of LLIN in relation to some socio-demographic characteristics of respondents.

Age

Majority (89.6 percent) of those who reported to have owned LLINs were above 45 years and the same (89.6 percent) were reported to have used the LLIN they own. Interestingly, those respondents up to 25 years old had a relatively lower possession 75.8 percent of the LLIN but a relatively higher percentage usage (82.0 percent) as compared to those in the age range of 26-35 who had the lowest (30.2 percent) percentage use as shown in Table 2.

Sex

Majority of female respondents (86.2 percent) owned at least one LLIN, while 77.0 percent alluded to using it. Their male counterparts however had 77.8 percent owning LLIN while 69.2 percent of those who possessed used them. As shown in table 4, there is significant association between sex and possession and use of any type of net respectively (x^2=7.15, p = 0.008; x^2=5.01, p = 0.025).

Marital status

With reference to marital status, married respondents turned out to possess highest percentage (87.1 percent) of LLIN while those single had the least (75.0 percent). In terms of usage, divorced respondents were reported to have had the highest percentage usage (94.7) while those single still reported the least proportion in terms of LLIN usage. Marital status has an association with the possession of any type of net and not usage as shown in table 4 (x^2= 11.63, p = 0.020).

Level of education

LLIN possession with regards to the respondents' level of education indicated that a significantly high proportion (91.8 percent) of those who own LLINs had primary education while those with secondary education had the least (75.3) possession. Interestingly, those who had just primary education recorded the least proportion (57.8

percent) for usage whiles those with secondary and tertiary education had 78.1 percent each in terms of usage.

Children less than 5 years old in a household

The survey recorded 274 children in the households which represents 68.5 percent of households. Out of 274 children 84.7 percent had LLIN whiles 69.4 percent of those who had the net used them. Households with 1-3 children recorded the highest possession (86.8 percent) of LLIN whiles those with more than 6 children recorded the least (40.0 percent). Meanwhile, respondents with more than 6 children recorded an impressive 100 percent usage. There is a significant association between households that have children less than five years old and possession of any net (x^2=13.39, p = 0.004) as shown in Table 4.

Pregnant women in a household

There were a total of 302 households with pregnant women recorded in the survey which represents 75.5 percent of the households. Out of these 302 households with pregnant women (256) 84.8 percent possessed at least one LLIN whiles (185) 72.3 percent of those who owned the net slept under it. For those who alluded to having 1-2 pregnant women in the household, (254) 84.7 percent possessed LLIN while (183) 72.0 percent of those who possessed used it. For those households that had more than 2 pregnant women 100 percent possessed LLIN and same 100 percent used the nets as detailed in Table 2). There

is an association between households that had pregnant women and possession of any bed net but not usage (x^2=11.77, p = 0.003) as indicated in Table 4.

Table 2: Household LLIN possession and usage with socio-demographic characteristic

Characteristic	All respondents N= 400	LLIN Possession N (%)	LLIN Usage N (%)
Age (years)			
< 25	66	50 (75.8)	41 (82.0)
26 – 35	156	126 (80.8)	38 (30.2)
36 – 45	101	90 (89.1)	47 (52.2)
>45	77	69 (89.6)	125 (89.6)
Sex			
Male	117	91 (77.8)	63 (69.2)
Female	283	244 (86.2)	188 (77.0)
Marital Status			
Single	76	57 (75.0)	38 (66.7)
Married	241	210 (87.1)	154 (73.3)
Divorced	24	19 (79.2)	18 (94.7)
Widowed	17	14 (82.4)	12 (85.7)
Co-habiting	42	35 (83.3)	29 (82.9)
Level of education			
No education	48	42 (87.5)	31 (73.8)
Primary	49	45 (91.8)	26 (57.8)
JHS/middle school	153	134 (87.6)	105 (77.8)
Secondary	97	73 (75.3)	57 (78.1)
Tertiary	53	41 (77.4)	32 (78.1)
Number of children < 5yrs in a household			
No child	126	103 (81.8)	90 (87.3)
1-3	242	210 (86.8)	145 (69.1)
4-6	27	20 (74.1)	14 (70.0)
Above 6	5	2 (40.0)	2 (100.0)
Number of pregnant women in a household			
None	98	79 (80.6)	66 (83.5)
1-2	300	254 (84.7)	183 (72.0)
Above 2	2	2 (100)	2 (100)

Note: calculation of percentage of possession is with reference to all respondents. Usage is calculated based on number that possess LLIN

Table 3: Summary of proportion of household ownership and use of LLIN

	Number	Percentage
Proportion of households that own LLIN	335/400	83.8
Proportion of households that use LLIN	251/335	74.9
Proportion of children < 5yrs in households that own LLIN	232/274	84.7
Proportion of children < 5yrs who use LLIN	161/232	69.3
Proportion of pregnant women in household that own LLIN	256/302	84.8
Proportion of pregnant women who use LLIN	185/256	72.3
Proportion of bed nets observed to be hung	289/400	72.3

4.4 Knowledge of malaria

Respondents answered questions to test their knowledge on what causes malaria, the signs and symptoms of malaria, whether mosquitoes can transfer malaria from person to person and how malaria can be prevented. Close to three-quarters (73.8 percent) of the respondents had good knowledge of malaria, while about 21.2 percent had very good level of knowledge and 5.0 percent had low knowledge of malaria (figure 2). There was no significant association between knowledge and usage of any type of bed net (x^2=2.24, p= 0.326), (see table 4)

4.5 Knowledge of LLIN

Interviewees responded to questions on if they had heard about LLINs, through which medium they heard it, what it is used for and where one can purchase or get it. Out of 400 respondents majority (89.5 percent) had heard about LLINs whilst 10.5 percent had not heard about it. For those who answered yes to the question posed, 86.8 percent indicated that the LLINs were used to protect oneself from mosquito bites, whilst 11.5 percent said it afforded good sleep and 1.7 percent said it was used for room decoration. In respect of where they had information about LLINs; relatives/ peers accounted for 35.5 percent, television and F.M. stations together accounted for about 50.3 percent, district health education, hospital/clinic and others accounted for 7.2 percent, 5.5 percent and 1.4 percent of responses respectively. Also, 46.4 percent of responses from the respondents indicated that they could purchase LLIN in a pharmacy shop, 37.7 percent from hospital/clinic 12.2 percent from community volunteers and 3.7 percent from others. Table 4b indicates a strong association exists between household heads that have heard about LLIN and possession and usage respectively (x^2 = 4.22, p = 0.040; x^2 =18.65, p = < 0 .001).

4.6 Accessibility and cost of LLIN

Accessibility is a major factor that affects use of ITNs in the households. For ITNs to be effectively utilized within the household, they must be readily available within the community. Out of 364 heads of households that answered questions on where they got their LLIN, 81.6 percent said they got them free from community volunteers, 15.4 percent bought them whiles 3.0 percent got them free from hospital/clinic. Respondents were asked if some LLINs were sold in the community. The majority 57.3 percent

answered yes and 42.7 percent said no. When asked where they bought their nets, majority 63.0 percent said they bought them from community volunteers, 26.0 percent bought them from a pharmacy shop 5.3 percent bought them from a hospital/clinic, 4.3 percent from supermarket while other sources accounted for 1.3 percent. When asked if the nets were hung by the volunteers, only 20.8 percent said yes out of the 400 respondents. 54.8 percent of the respondents said the volunteers demanded some money from them. The amount of money demanded ranged from 5.00 Ghana pesewas to 10.00 Ghana cedis with an average of 2.00 Ghana cedis.

Table 4: Association between some factors that influence ownership and use of any bed net

Variable	All respondents n = 400	Net possession n= 373(93.3%)	x^2	P-Value	Net usage n=275(68.8%)	x^2	P-Value
Age (years)	%	%	5.87	0.118		4.77	0.189
<25	16.5	87.9			65.2		
26 – 35	39.0	92.8			64.1		
36 – 45	25.2	91.8			72.3		
>45	19.3	96.1			76.6		
Sex			7.15	0.008*		5.01	0.025*
Male	29.2	88.0			60.7		
Female	70.8	95.4			72.1		
Marital Status			11.63	0.020*		7.26	0.123
Single	19.0	85.5			57.9		
Married	60.2	95.9			69.7		
Divorced	6.0	91.7			83.3		
Widowed	4.2	100			76.5		
Co-habiting	10.5	90.5			71.4		
Level of education			5.14	0.273		5.38	0.251
No education	12.0	97.9			68.8		
Primary	12.2	95.9			55.1		
JHS/middle school	38.2	94.1			72.6		
Secondary	24.2	90.7			70.1		
Tertiary	13.2	88.7			67.9		
Number of children in a household			13.39	0.004*		5.63	0.131
No child	31.5	86.5			75.4		
1-3	60.5	96.3			66.5		
4-6	6.8	96.3			55.7		
Above 6	1.2	100			80.0		

***significant at 5% level of significance** **x^2= chi squared**

Table 4 continued

Variable	All respondents n=400	Net possession n=373	x^2	P-value	Net usage n=275	x^2	P-value
	%	%			%		
Number of pregnant women in a household			11.77	0.003*		1.81	0.404
None	24.5	85.7			72.5		
1-2	75.0	95.7			67.3		
Above 2	0.5	100			100		
Period of net use			9.87	0.020*		27.77	< 0.001*
All year	52.3	96.7			79.6		
Rainy season	46.0	89.7			57.6		
Dry season	1.7	80.0			20.0		
Heard of LLINs			4.22	0.040*		18.65	< 0.001*
Yes	89.5	94.1			72.9		
No	10.5	85.7			40.5		
Knowledge of malaria						2.24	0.326
Low knowledge	5.0	100	1.75	0.418	70.0		
Good knowledge	73.7	93.2			66.8		
Very good knowledge	21.3	91.8			75.3		

***significant at 5% level of significance** **x^2= chi squared**

CHAPTER FIVE

5.0 DISCUSSION

The government and other partners including Roll Back Malaria initiative (RBM), Millennium Development Goals (MDGs) for health and United States President's Malaria Initiative (PMI) goal is to increase ITN coverage and use to 80% in children under five and pregnant women the high risk groups to ultimately achieve universal coverage. In Ghana, for instance, the objective of the National Malaria Control Programme, and its allies is to scale up the distribution of bed nets such that 100 per cent of all households will own at least one treated mosquito net by 2015(GHS, 2011). This goal is still far off to be reached in most of the African countries south of the Sahara. This study's findings show how much the free LLIN distribution campaign has contributed in increasing ITN coverage among people living in Kpone-On-Sea.

5.1 Possession/ownership of LLIN

Ownership of any type of bed nets among households was an impressive (373) 93.3 percent whiles only (27) 6.7 percent did not possess any net. Among those who owned any type of bed nets (335) 89.8 percent had at least one LLIN, (29) 7.8 percent had retreatable insecticide net and (9) 2.4 percent own untreated nets.

Household heads that were above 45 years had the highest (69) 89.6 percent possession of the LLIN whiles households having more than 6 children recorded the least possession (2) 40.0 percent. Considering that the level of knowledge or awareness of LLIN was 89.5 percent, it is not surprising the level of ownership is high. This far exceeds the Abuja target of 60% coverage by 2010 and the RBM partnership's Global Strategy Plan to

ensuring 80 percent coverage of people at risk of malaria are protected by the year 2015 (Jane, Hamat, & Osman, 2012; NetMark, 2004). Generally, it was found that the proportion of households that had pregnant women that owned LLIN was 84.8 percent which is approximately the same as that of children less than five years old, 84.7 percent, but slightly higher than the general household ownership which is 83.9 percent. Results from this study show a remarkable improvement of ownership of ITN compared to the Ghana Demographic Health Survey's national household ownership of 33 percent, of which the Upper West region had the highest 71 percent whiles the Greater Accra region had the lowest, 30 percent (GSS & Macro, 2009). These high ownership proportions particularly for children less than five years and pregnant women are encouraging. This is because these are the most vulnerable groups in a population and must always be protected. In a one year post distribution survey to assess the retention and utilization of LLIN in Plateau state of Nigeria, it was reported that ownership coverage with at least one LLIN was 97.9 percent (Agbo & Zoaka, 2012). This is higher than that which is reported in this study and is an indication that ownership of LLIN in this study community could be better. The household possession of any type of bed nets showed a significant association with households that had children less than 5 years old ($p = 0.004$). This finding is consistent with a similar study in Tanzania where it was reported that there was a positive association between children less than five and ITN ownership (Matovu, Goodman, Wiseman, & Mwengee, 2009). An association also exists between possession of any type of bed net and gender (sex) ($p = 0.008$). This is similar to results of a study in Nigeria that shows that gender is a predictive factor for ITN ownership (Oresanya, Hoshen, & Sofola, 2008).

5.2 LLIN Usage

In determining ITN usage, only persons who reported to have slept under a net the night before the survey were considered users of ITNs. Out of 335 heads of households that alluded to possessing at least one LLIN, 74.9 percent of them slept under it the night before the survey which turned out to be the highest percentage usage. In the study, households that had more than six children and households that had more than two pregnant women recorded 100 percent usage respectively. Just over two-thirds (69.3 percent) of 232 of households that had children less than five years who owned at least one LLIN, used it. This is recorded as the lowest in terms of usage in this study. Households that had pregnant women also recorded 72.3 percent out of 256 that possessed at least one LLIN.

Even though the 80 percent target set by the Roll Back Malaria Programme was not met in this study, there has been a marked improvement in terms of usage when compared to proportion of usage recorded in the Ghana Demographic Health Survey 2008. For the households that own at least one ITN, a substantially larger proportion of children less than five years old slept under an ITN the night before the survey (58 percent). More than half, (52 percent) of pregnant women slept under an ITN the night before the survey.

In this study just like other surveys conducted elsewhere there is a gap between mosquito net ownership and eventual usage. For example, while ownership of LLIN by households with children less than five years in this study was 84.7 percent, usage was reduced to 69.3 percent. A similar nationwide study conducted in Mali reported that at the national level, 81.0% (CI 78.5-83.5) of households having children less than five years old had owned at least one LLIN whiles usage at the national level was 78.5% (Cervinskas, Berti,

Desrochers, Mandy & Kulkarni, 2008) which is consistent with the trend in this study. Another study conducted in Sierra Leone confirms this assertion where it reports that six months after a free ITN distribution campaign, 87.6% of households own at least one ITN whiles 76.5% slept under an ITN the night preceding the survey (Bennett et al., 2012). In search of some reasons for this trend, preliminary studies in a rural area in Burkina Faso revealed that the population used ITNs at high rates for the first few months and then gave it up for non-objective reasons, such as the reduction in the number of mosquitoes, difficulty in fixing the nets etc (Toé et al., 2009).

In sharp contrast to the above trend, a study conducted in Bangladesh reported that proportion of households with at least one LLIN increased to 62-67 percent over time whiles they achieved more than 80 percent coverage in sleeping under an LLIN/ITN in the case of under-five children and pregnant women, especially in the high-endemic districts. This goes a long way to confirm that with much effort even more than 80 percent could be achieved. This study shows an association between whether the respondent had heard about LLIN and usage ($p = < 0.001$) which is in line with a study in Zambia: 'determinants of hanging and use of ITNs in the context of near universal coverage in Zambia' (Macintyre et al., 2012).

5.3 Knowledge of malaria

This study among other things sought to assess the knowledge of heads of households or their representative on the cause of malaria, mode of transmission, signs and symptoms of malaria and how it can be prevented. 21.2 percent of respondents had very good knowledge, 73.8 percent had good knowledge and just 5.0 percent had low knowledge. The good level of knowledge on malaria exhibited by the respondents could be due the

fact that the study area has been a field research site for school of public health, University of Ghana where a lot of malaria researches and education involving people of the community have been conducted.

5.4 Knowledge of LLIN

An impressive 89.5 percent of respondents alluded to knowing and having heard about LLIN and 86.8 percent knew it is used to protect oneself from mosquito bites. This could be due to the level of information and education the populace had prior to and during the distribution campaign since their level of knowledge of LLIN was high.

5.5 Accessibility and cost of LLIN

Many studies have evidence that accessibility and cost could influence ownership of ITN by a population. This informed the decision of the National Malaria Control Programme to embark on free distribution campaigns in Ghana. Responses from this study indicate that 81.6 percent out of 364 households had the LLIN free from community volunteers which is quite good. However there were some misconceptions about the nature of the free distribution and hang campaign. This arose from the fact that about half (45.3) of the respondents said that the community volunteers demanded money from them which made some of them feel that they bought the nets. This confirms the reason why about 63.3 percent said they bought the nets from the community volunteers.

5.6 Limitations

Most of the findings of this study was based on self reported possession and usage. This is because not all respondents allowed interviewers to enter their sleeping areas to observe if they actually have the nets and whether they were hung or not. Also, usage was

self reported since most of the interviews were done in the evening which was the most convenient time to find household heads or their representatives.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

This was a cross-sectional study aimed at assessing LLIN coverage and usage after a free distribution and hanging up campaign in Kpone-on-Sea. The conclusion and the recommendations made from the study are as presented below.

6.1 Conclusion

This study has revealed that the free mass LLIN distribution campaign has improved the coverage and usage of LLINs among households in the Kpone-on-Sea community as compared to the national levels and particularly that of the Greater Accra region as reported by the Ghana Demographic Health Survey, 2008.

It has been established that 83.9 percent of households in the community own at least one LLIN and 74.9 percent of those who own the nets used them regularly.

It has also been established that 84.7 percent of households with at least one child under five years old owned at least one LLIN and 69.3 percent of these children used the nets.

The proportion of households with at least one pregnant woman that owned at least one LLIN was 84.8 percent whiles 72.3 percent used the net.

In conclusion, even though the target of the National Malaria Control Programme of 100 percent coverage and 80 percent usage of ITN was not met by the findings of this study, the free LLIN distribution hanging campaign can be said to be successful. If current coverage and usage levels are maintained and continuous up-scaling done, NMCP's target could be met by the 2015 set date.

6.2 Recommendations

1. The NMCP should identify, register and distribute LLINs to households that did not get it during the previous campaign.

2. Distribution within households should be increased to cover all persons living in a household.

3. More community education on malaria and the importance of the use of LLIN should be done continuously by the District Health Directorate.

4. Periodical assessment on the ownership and usage of LLIN could be commissioned by the NMPC to update it with coverage and usage in this community.

REFERENCES

Agbo, N. A., & Zoaka, A. I. (2012). Retention and utilization of the long lasting insecticide nets: a one year post nationwide mass distribution survey in Plateau State Nigeria. Retrieved from http://crownjournals.org/ENVULADU%20et%20al.pdf

Ahmadi, M., Eshraghian, M. R., Madani, A. H., & Safari, R. (2012). Effects of Educational Intervention on Long-Lasting Insecticidal Nets Use in a Malarious Area, Southeast Iran. *Acta Medica Iranica*, *50*(4). Retrieved from http://journals.tums.ac.ir/abs/20794

Ariely, D., & Shampan'er, K. (2006). *How Small is Zero Price? The True Value of Free Products* (SSRN Scholarly Paper No. ID 951742). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=951742

Baume, C. A., & Marin, M. C. (2007). Intra-household mosquito net use in Ethiopia, Ghana, Mali, Nigeria, Senegal, and Zambia: are nets being used? Who in the household uses them? *American Journal of Tropical Medicine and Hygiene*, *77*(5), 963–971.

Bay, A. (2003). 2. Insecticide-treated nets. Retrieved from http://rbm.who.int/amd2003/amr2003/pdf/ch2.pdf

Bennett, A., Smith, S. J., Yambasu, S., Jambai, A., Alemu, W., Kabano, A., & Eisele, T. P. (2012). Household Possession and Use of Insecticide-Treated Mosquito Nets in Sierra Leone 6 Months after a National Mass-Distribution Campaign. *PloS one*, *7*(5), e37927.

Breman, J. G., Egan, A., Keusch, G. T., & Breman, J. G. (2001). Ears of the hippopotamus: manifestations, determinants, and estimates of the malaria burden. Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK2615/

Cervinskas, J., Berti, P., Desrochers, R., Mandy, J., & Kulkarni, M. (2008). Evaluation of the ownership and the usage of long lasting insecticidal nets (LLINs) in Mali eight months after the December 2007 integrated campaign. *Ottawa, Canada: HealthBridge*. Retrieved from http://www.healthbridge.ca/Nov30%20Final_Mali_ReportENG.pdf

Cohen, J., & Dupas, P. (2010). Free Distribution or Cost-Sharing? Evidence from a Randomized Malaria Prevention Experiment*. *Quarterly Journal of Economics*, *125*(1), 1.

Curtis, C., Maxwell, C., Lemnge, M., Kilama, W. L., Steketee, R. W., Hawley, W. A., Bergevin, Y., Campbell, C.C., Sachs, J., & Teklehaimanot, A. (2003). Scaling-up coverage with insecticide-treated nets against malaria in Africa: who should pay? *The Lancet infectious diseases*, *3*(5), 304–307.

Darkwah, I. A.-, & Nyarko, S. K. B.-. (2011). Knowledge of Malaria Prevention and Control in a Sub-Urban Community in Accra, Ghana. *International Journal of Tropical Medicine*, *6*(3), 61–69. doi:10.3923/ijtmed.2011.61.69

Easterly, W. (2006). The White Man's Burden: Why the West's Efforts to Aid the Rest Have Done So Much Ill and So Little Good, 417.

Eisele, T. P., Keating, J., Littrell, M., Larsen, D., & Macintyre, K. (2009). Assessment of insecticide-treated bednet use among children and pregnant women across 15 countries using standardized national surveys. *The American journal of tropical medicine and hygiene*, *80*(2), 209–214.

GHS. (2011). *GHS (Ghana Health Service). 2011. National Malaria Control Programme . Available at: http://www.ghanahealthservice.org/malaria_control.php (retrieved July 11, 2011)*.

Greenwood, B. M., Fidock, D. A., Kyle, D. E., Kappe, S. H. I., Alonso, P. L., Collins, F. H., & Duffy, P. E. (2008). Malaria: progress, perils, and prospects for eradication. *The Journal of clinical investigation*, *118*(4), 1266.

GSS, G., & Macro, I. C. F. (2009). Ghana demographic and health survey 2008. *Accra, Ghana: Ghana Statistical Service, Ghana Health Service, and ICF Macro*.

Guerin, P. J., Olliaro, P., Nosten, F., Druilhe, P., Laxminarayan, R., Binka, F., Kilama, W.L., Ford, N., & White, N. J. (2002). Malaria: current status of control, diagnosis, treatment, and a proposed agenda for research and development. *The Lancet infectious diseases*, *2*(9), 564–573.

Guillet, P., Ahnvick, D., Cham, M. K., Neira, M., Zaim, M., Heymann, D., & Mukelabai, K. (2001). Long-lasting treated mosquito nets: a breakthrough in malaria prevention. *BULLETIN-WORLD HEALTH ORGANIZATION*, *79*(10), 998–998.

Harvey Steven. (2010). *Eastern Region LLIN mass-distribution campaign, December 2010 Process Evaluation* (p. 1).

Jane, B., Hamat, R. A., & Osman, M. (2012). A promising role of Insecticide Treated Bed-Nets (ITNs) against Malaria: A Way Forward. *Journal of Natural Sciences Research*, *2*(3), 91–100.

Jima, D., Tasfaye, G., Deressa, W., Woyessa, A., Kebede, D., & Alamirew, D. (2005). Baseline survey for the implementation of insecticide treated mosquito nets in malaria control in Ethiopia. *Ethiopian Journal of Health Development*, *19*(1), 16–23.

Killeen, G. F., Smith, T. A., Ferguson, H. M., Mshinda, H., Abdulla, S., Lengeler, C., & Kachur, S. P. (2007). Preventing childhood malaria in Africa by protecting adults from mosquitoes with insecticide-treated nets. *PLoS Medicine*, *4*(7), e229.

Kremer, M., & Miguel, E. (2007). "The Illusion of Sustainability". *Quarterly Journal of Economics*, *112*(3).

Lengeler, C. (2004). Insecticide-treated bed nets and curtains for preventing malaria. *Cochrane database of systematic reviews (Online)*, (2), CD000363. doi:10.1002/14651858.CD000363.pub2

Macintyre, K., Littrell, M., Keating, J., Hamainza, B., Miller, J., & Eisele, T. P. (2012). Determinants of hanging and use of ITNs in the context of near universal coverage in Zambia. *Health policy and planning*, *27*(4), 316–325.

Matovu, F., Goodman, C., Wiseman, V., & Mwengee, W. (2009). How equitable is bed net ownership and utilisation in Tanzania? A practical application of the principles of horizontal and vertical equity. *Malaria Journal*, *8*(1), 109.

Mbonye, A. K., Neema, S., & Magnussen, P. (2006). Preventing malaria in pregnancy: a study of perceptions and policy implications in Mukono district, Uganda. *Health policy and planning*, *21*(1), 17–26.

Minakawa, N., Dida, G. O., Sonye, G. O., Futami, K., & Kaneko, S. (2008). Unforeseen misuses of bed nets in fishing villages along Lake Victoria. *Malaria Journal*, *7*(1), 165. doi:10.1186/1475-2875-7-165

Mubyazi, G. M., Kassembe, Y. M., Mahundi, J., & Njunwa, J. K. (2011). Advantages and shortcomings of eliciting people's willingness to pay using mixed techniques: evidence from a study of Olyset bednets in three village settings in north-eastern Tanzania. Retrieved from http://www.ajhe.org/UPDATED_revised_FINAL_Revised_MUBYAZI_NJUNWA_OLYSET_WTP_AJHE_March_2011-1-2_process.pdf

NetMark. (2004). *A Survey on insecticide treated nets in Ghana. A regional partnership for sustainable malaria prevention, Washington DC.*

Noor, A., Kirui, V., Brooker, S., & Snow, R. (2009). The use of insecticide treated nets by age: implications for universal coverage in Africa. *BMC Public Health*, *9*(1), 369.

Oresanya, O. B., Hoshen, M., & Sofola, O. T. (2008). Utilization of insecticide-treated nets by under-five children in Nigeria: assessing progress towards the Abuja targets. *Malar J*, *7*, 145.

PMI, Malaria 0perational Plan, 2011. (2011). *PRESIDENT'S MALARIA INITIATIVE Malaria Operational Plan — FY 2011 (Year 4) GHANA.*

Quakyi, I. A., Addison, E. A., Bosompem, K. M., Wilson, M. D., Kumar, N., Boakye, D. A., Adjei, A., Armah, H., Koram K.A., Quansah, A.G., Dodo, A., Appawu, M.A., Mensah, G., Mckakpo, U., Lomotey, F., Brown, C., Ankrah, I., Bruce, J., Madjitey, P., Adjei, R., Amankwa, P., Laar, A.K., Soyiri, I.N., Koranchie &

Tagoe, B. A. (2004). *Malaria in Kpone-on-Sea: a fishing village in southern Ghana(l) Prevalence Studies, Report to WHO/TDR; 2004*.

Roll Back Malaria. (2006). Malaria in Africa. *accessed online at www. rbm. who. int on Jan*, *24*. Retrieved from https://apps.who.int/inf-fs/en/1InformationSheet03.pdf

Schantz-Dunn, J., & Nour, N. M. (2009). Malaria and pregnancy: a global health perspective. *Reviews in Obstetrics and Gynecology*, *2*(3), 186.

Shargie, E. B., Ngondi, J., Graves, P. M., Getachew, A., Hwang, J., Gebre, T., Mosher, A.W., Ceccato, P,. Endeshaw, T & Jima, D. (2010). Rapid increase in ownership and use of long-lasting insecticidal nets and decrease in prevalence of malaria in three regional States of Ethiopia (2006-2007). *Journal of tropical medicine*, *2010*. Retrieved from http://www.hindawi.com/journals/jtm/2010/750978/abs/

Snow, R. W., Guerra, C. A., Noor, A. M., Myint, H. Y., & Hay, S. I. (2005). The global distribution of clinical episodes of Plasmodium falciparum malaria. *Nature*, *434*(7030), 214–217. doi:10.1038/nature03342

Tchouassi, D. P., Quakyi, I. A., Addison, E. A., Bosompem, K. M., Wilson, M. D., Appawu, M. A., Brown C. A. & Boakye, D. A. (2012). Characterization of malaria transmission by vector populations for improved interventions during the dry season in the Kpone-on-Sea area of coastal Ghana. *Parasites & vectors*, *5*(1), 212.

Teklehaimanot, A., & Mejia, P. (2008). Malaria and poverty. *Annals of the New York Academy of Sciences*, *1136*(1), 32–37.

Toé, L. P., Skovmand, O., Dabiré, K. R., Diabaté, A., Diallo, Y., Guiguemdé, T. R., Doannio, J.M., Akogbeto, M., Baldet, T & Gruénais, M.E. (2009). Decreased motivation in the use of insecticide-treated nets in a malaria endemic area in Burkina Faso. *Malar J*, *8*(175), 27.

APPENDICES

Appendix I: Sample Informed Concerned Form

Project Title: Assessing the Coverage and Usage of LLINs at Kpone-On-Sea

Institutional affiliation: School of Public Health, College of Health Sciences, University of Ghana, Legon.

My name is **Tawiah Setsoafia Dzata**, a student from the School of Public Health conducting a research to assess the coverage and usage of LLINs at Kpone-On-Sea after a free hang up and distribution campaign. This is an academic research in partial fulfillment of the requirements for the award of a Master of Public Health (MPH) degree. The purpose of the study is to present data to help establish the proportion of people who own and use LLINs in households in your community. The study has been reviewed and approved by the School of Public Health and your opinion leaders.

With your permission I would like to collect background information about you (the head of the household) and other members of the house hold including children under five years and pregnant women. Information about ownership and usage of LLINs, affordability, awareness and sleeping arrangements would be needed. A brief survey of the sleeping area would be done to gather information on the type of net being used and if they are properly hung or not.

You may feel uncomfortable with some of the questions we will be posing. However answers to them will provide very vital information to us, health care providers and the National Malaria Control Programme. The information would inform health authorities about gaps to be filled to improve on coverage and usage of LLINs in the community and add to existing knowledge.

This interview will not take more than 30 minutes and will not be stressful, but if you are uncomfortable with the interview you are free to decline participation or refuse to answer particular questions. Your refusal to participate or continue with the interview will not deprive you of any benefits you are currently receiving. It is fine to refuse to participate. However, I will kindly ask that you participate since your opinion is needed.

Please be assured that the information you provide would be handled with confidentiality and analysis of the data would be done on aggregate level to ensure anonymity. Your names would be would not be used in any of our records.

If you have any questions about the research or participation feel free to ask or you can contact **Tawiah Setsoafia Dzata** at the **School of Public Health** on **0244790176 or Administrator, Ghana Health Service Ethical Review Committee, Ms Nana Abena Kwaa Addai-Donkor: 0244712919**

Consent:

In granting this permission,
I…… have fully understood this informed consent form thoroughly explained to me in English/Twi/Ga and have had

the opportunity to discuss any concerns and questions. I fully understand the nature and character of my involvement in this research programme and my foreseeable risks and consequences. I understand I may refuse to participate in this project and I am free to withdraw my consent and terminate my participation at any time without any effect on me or any member of my household. I also understand that I am free to refuse to answer any specific questions or items in the interview or questionnaire.

Signature/Thumbprint of Participant ……

Date……..

Appendix II: Sample Questionnaire

TOPIC: Assessing the Coverage and Usage of Long Lasting Insecticide-Treated Bed Nets (LLINs) in Kpone-On-Sea

This questionnaire is prepared for a dissertation for a Master of Public Health course. Please answer questions with all honesty.

IDENTIFICATION

Questionnaire Serial Number					
Respondent ID (H/No)					
Date of interview					

Name of Interviewer:……

Please tick [√] where appropriate or write down the appropriate response to each item as the question/statement may indicate

SECTION A

SOCIO-DEMOGRAPHIC DATA

1. Age [……..]

2. Sex [1] male [2] female

3. Marital status [1] married [2] single [3] widow [4] divorced [5] co-habiting

4. Level of education (last level attained) [1] primary [2] JHS/ middle school [3] secondary [4] tertiary [5] no education

5. Occupation: [1] farmer [2] petty trader [3] public worker [4] unemployed [5] businessman/woman [6] others (specify) .....

6. Which religion do you belong to? [1] Christianity [2] Islam [3] Traditional [4] Others (specify) .....

7. How much do you spend in a month? [1] <GH¢50 [2] GH¢50-100 [3] GH¢100-150 [4] GH¢150-200 [5] GH¢200-250 [6] >GH¢300

8. How many people are in this household? [1] 1 [2] 2-4 [3] 5-7 [4] 8-10 [5] more than 10

9. How many children are less than 5 years old are in this household? [1] no child [2] 1-3 children [3] 4-6 children [4] 7-9 children [5] more than 9 children

10. How many pregnant women are there in this household? [1] 0 [2] 1 [3] 2 [4] 3

SECTION B

KNOWLEDGE OF MALARIA

11. How do you know if someone has malaria? [1] High temperature [2] headache [3] Vomiting [4] shivering [5] weakness [6] yellowish eyes [7] mouth Bitterness/loss of appetite [8] others please specify ……

12. What causes malaria? [1] Overwork [2] witchcraft [3] mosquito bite [4] Exposure to sun/heat [5] malnutrition [6] others (specify) .....

13. Can mosquito transmit malaria from one person to another? [1] Yes [2] No [3] don't know

14. How can malaria be prevented? [1] clean our environment [2] avoid excessive heat [3] good personal hygiene [4] sleep under a net [5] eat balanced diet [6] can't be prevented [7] taking anti-malarial weekly [8] others (specify) .....

SECTION C

KNOWLEDGE OF LONG LASTING INSECTICIDE-TREATED NETS (LLINs)

15. Have you heard about LLINs? [1] Yes [2] No if No, skip to **D**

16. If Yes, what is it used for? [1] room decoration [2] protection against mosquito bite [3] affording good sleep [4] others pecify.....

17. Where did you hear about the LLINs?

[1] television [2] F.M station [3] district health education [4] hospital/clinic [5] relatives/peers [6] others (specify) .....

18. Where can you purchase a LLIN? [1] clinic [2] community volunteers [3] pharmacy shop [4] hospital [5] others (specify).....

SECTION D

POSSESSION/OWNERSHIP OF LLINs

19. Do you have any mosquito bed net? [1] Yes [2] No if No skip to **22**

20. How many mosquito bed nets do you have? [1] one [2] two [3] three [4] four [5] More than four

21. What type of bed net do you have? [1] Long Lasting Insecticide Treated Net [2] Retreatable Insecticide Treated Net [3] Untreated Net

22. Does any member of your household have a LLIN? [1] Yes [2] No

23. How many LLINs do you have in this house? [1] 1-3 [2] 3-5 [3] more than five

SECTION E

WILLINGNESS TO PURCHASE ITN

24. Did you buy the LLIN you are using? Yes/No

25. If No where did you get it?.....

26. Would you wish to purchase an LLIN in future? [1] Yes [2] No

27. If no, Why? [1] financial constraint [2] not part of top most priority

[3] allergy to use of net [4] look like burial shroud

[5] Other please specify ……..

28. If yes, how many nets would you wish to buy?

[1] one [2] two [3] three [4] for everyone in my family.

SECTION F

USE OF LLIN

29. Do you hang the net over your bed or sleeping area? [1] Yes [2] No

30. If no, why? [1] causes heat [2] no space to hang [3] looks like burial shroud

[4] allergic reasons [5] others(specify).....

31. Did your child(ren) under 5 years sleep under LLIN last night? [1] Yes [2] No

32. Did the pregnant women in the household sleep under LLIN last night? [1] Yes [2] No

33. Did other members of the household sleep under LLIN last night? [1] Yes [2] No

34. What time do you go to bed? [1] 7:00 pm – 8:00pm [2] 8:00- 9:00pm [3] 9:00pm – 1:00pm

35. Did you sleep under this mosquito net (LLIN) last night? [1] Yes [2] No

36. If no, why? [1] feels hot inside [2] looks like a burial shroud [3] no space to hang

37. Which periods do you use the net?

[1] All year round [2] During rainy season [3] During dry season

[4] Others (specify).....

38. Why do you use the net during that period?

[1] To prevent malaria [2] for warmth [3] As a partition in the room

39. What are the benefits of LLIN use?

[1] to prevent malaria [2] to sleep soundly [3] to provide warmth

[4] to prevent insects bites [5] others (specify).....

SECTION G

ACCESSIBILITY AND COST OF LLIN

40. How did you get the LLIN you have? [1] bought it [2] free from volunteers [3] free from

Clinic/Hospital

41. Are some sold in this town? [1] Yes [2] No

42. Where did you buy it?

[1] Hospital/clinic [2] Pharmacy shop [3] Supermarket

[4] Community volunteers [5] Others (specify).....

43. How much did you buy the net? [1] Gh¢ 5 [2]Gh¢ 8 [3] Gh¢ 10 [4] Gh¢ 15

[5] others (specify).....

44. Were the nets hung by volunteers? [1] Yes [2] No

45. Did the volunteers demand money from you? [1] Yes [2] No

46. How much did they demand? (Specify)…….

SECTION H

IMPROVING COVERAGE

47. How can everybody own a LLIN?

[1] Reduce the price [2] massive education on ITN in every community

[3] Nets should be free [4] others (specify).....

48. How can education on LLIN reach everybody in the community?

[1] Gong-gong beating in every town/village [2] Use Public Address System during market days [3] TV/FM stations [4] Community opinion leaders

[5] others (specify).....

SECTION I

PROBLEMS/IMPROVEMENTS WITH ITN

49. Have you encountered any problem with the use of the net? [1] Yes [2] No

50. If yes, what are the problems?

[1] skin rashes [2] generates heat [3] cumbersome to use

[4] others (specify).....

51. What in your view can be done to improve LLIN use?

[1] free distribution of LLIN [2] modification of shape and size of net

[3] intensive education on LLIN usage [4] others(specify)……

Appendix III: Sample Observational Checklist

Assessing the Coverage and Use of Long Lasting Insecticide Treated Nets in the Kpone-on-Sea Township of the Greater Accra Region

To be filled by interviewer. Please make careful observations of the facilities and responses where applicable.

Observational Checklist

Assessing the coverage and use of LLINs in Kpone-on-Sea

To be filled by interviewer. Please make careful observations of the facilities and tick responses where applicable.

Is it a LLIN? [YES] [NO]

Is it hung? [YES] [NO]

How many of LLINs are hung? [1] [2] [3] [4] > [4]

Are they properly hung? [YES] [NO]

Are there any tears? [YES] [NO]

Are there bushes and shrubs around the house? [Yes] [NO]

Nature of building; [ ] Mud house [ ] wooden structure [ ] cement building [ ] glass house

Please thank the respondent