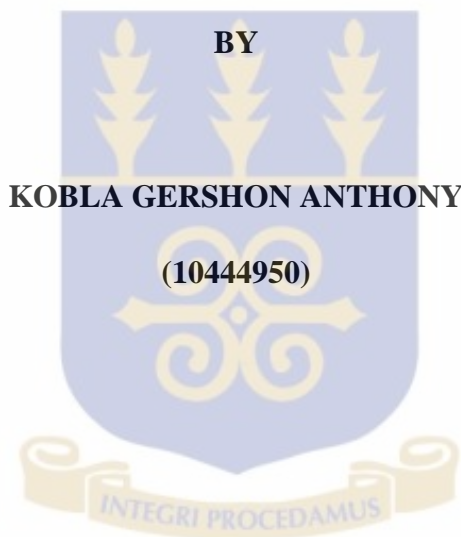


**SCHOOL OF PUBLIC HEALTH  
COLLEGE OF HEALTH SCIENCES  
UNIVERSITY OF GHANA**

**FACTORS INFLUENCING UTILISATION OF INSECTICIDE TREATED  
MOSQUITO NET IN AGONA EAST-CENTRAL REGION**



**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON  
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE  
AWARD OF THE MASTER OF PHILOSOPHY DEGREE IN APPLIED  
EPIDEMIOLOGY AND DISEASE CONTROL**

**JULY, 2015**

**DECLARATION**

I, **KOBLA GERSHON ANTHONY** of the University Of Ghana School Of Public Health, do hereby declare that except for duly acknowledged citations and ideas, this dissertation is an original work produced by me from a study personally undertaken under supervision. This work has never on any previous occasion been submitted in part or whole to any Institution or Board for the award of any degree.

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(CANDIDATE)

DATE.....



SIGNATURE.....

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(ACADEMIC SUPERVISOR)

DATE.....

## **DEDICATION**

This work is dedicated to my lovely family and my most cherished mother.



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## ABSTRACT

### Background

Many countries across Sub Saharan Africa are rapidly stepping up insecticide –treated nets (ITN) coverage to combat malaria and Ghana is not left out in this trail. Studies have been done in Ghana on ITN utilization but a few of such studies have been done in the Agona East District of the Central of Ghana. This study was conducted to assess factors influencing the utilisation of ITNs in the Agona East district in the Central Region of Ghana, an area with an in-between in terms of household bed net utilisation in Ghana.

### Method

A cross-sectional study with a household as the unit of the study, was done between the period February 2015 and July 2015 in Agona East District of the Central Region of Ghana. The study used both quantitative and qualitative methods. The quantitative arm included questions that were used to establish the demographic characteristics of household heads, household factors affecting ITN use and level of awareness in terms of use. Descriptive statistics were used to describe house hold net use and univariate and multivariate logistic regression analysis used to identify factors associated with use and non- use of nets. A qualitative component consisting of questions used to assess the level of awareness, observation of nets at home, some open ended questions related to use, and key informant interview provided further understanding of the reasons for ITNs use and non-use.

### Results

The study covered 390 households inhabiting 1068 persons including 198 under- fives, 519 non-pregnant women and 12 pregnant women in the Agona East District in the Central Region of Ghana. The ITN possession in households was 76.2% and utilisation in households was 38.2%; 50% utilisation among pregnant women and 52.4 % utilisation among children under five. Significantly households with heads who have discussed net use with their household or friends are more likely to have slept under a net (aOR= 3.50 CI 1.84-6.65). The most common reason for non-use of ITN identified were the hot weather conditions, not having a net and the cost. Those who use the net also did so because they believed it protected them from mosquito bites.

**Conclusion**

The low ITN utilisation compared to possession in the study area shows a clear gap between possession and usage. This suggests that campaigns and messages that persuade recipients to use ITNs will contribute towards closing the gap between ownership and usage alongside factors such as household net density and household size.

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**LIST OF ABBREVIATIONS**

ANC	Antenatal Clinic
DFID	Department for International Development
DE	Design Effect
FGD	Focus group discussion
DHD	District Health Directorate
DHS	Demographic and Health Survey
GDHS	Ghana Demographic and Health Survey
GMP	Global Malaria Protection
GHS	Ghana Health Service
ITN	Insecticide Treated Bed Net
LLIN	Long Lasting Insecticide Treated Bed Net
MDG	Millennium Development Goals
MICS	Malaria Indicator Cluster Survey
MOH	Ministry of Health
NMCP	National Malaria Control Programme
PMI	Presidents Malaria Initiative
PSU	Primary sample unit
PE	Protected Efficacy
RBM	Roll Back Malaria
SSU	Secondary sample unit
UNICEF	United Nations Children's Fund
USAID	United States Agency International Development
WHO	World Health Organization

## CHAPTER ONE

### INTRODUCTION

#### 1.0 Background

#### 1.1 Malaria Burden

Globally, an estimated 3.4 billion people were at risk of malaria in 2013, according to the WHO 2013 malaria report and approximately 207million cases of the disease were reported in 2012. An estimated 627,000 lives were lost as result of the disease, mostly children under five years of age (77%) in Africa: meaning 1300 young lives lost every day to malaria. Increased prevention and control measures have led to a reduction in malaria mortality rates by 47% globally since 2000 and by 54% in the WHO African Region according to World malaria report 2014. Malaria control is crucial in achieving the Millennium Development Goal 6 (MDG6), which seeks to combat the spread of HIV/AIDS, malaria and other diseases by 2015 and begin to reverse the incidence of these diseases with malaria inclusive. But malaria control also contributes to other MDGs, in that it accounts for an estimated 13% of post natal child death globally in 2010 and 21% in Sub Saharan Africa (World Malaria Report., 2014). This is crucial to MDG 4 – to achieve a two third reduction in the mortality rate amongst children under five between 1999 and 2015. The focus of the World Health Organisation (WHO) and Roll Back Malaria (RBM) is to reduce malaria cases and deaths by 75% by 2015. But the call for elimination and eradication has inspired the ambitious objective of reducing deaths due to malaria to zero. Malaria is endemic in all parts of Ghana and a serious barrier to health and development. It is the leading cause of morbidity, accounting for about 38 percent of all out-patient attendance, 35 percent of all admissions and about 34 percent of all deaths in children under five years of age and 9 percent of maternal deaths(According to a report from The President’s Malaria Initiative, 2011). Ghana is among the 35 countries (30 countries in

Africa) responsible for the majority of the total deaths globally (“Global Malaria Action Plan: Introduction to Regional Strategies,” 2005.). All of Ghana’s population is at risk of the disease and risk is higher in children under five years of age and pregnant women. Malaria transmission occurs all year round with slight seasonal variation (Roll Back Malaria in Ghana, 2010). In 2010 there were almost 4,000 deaths due to malaria and most of these deaths were in children under five years a report from Roll Back Malaria Ghana, 2012. Malaria is therefore a significant cause of morbidity and mortality at all ages, and a cause of work days lost due to illness. The annual economic burden of malaria is estimated at 1-2 per cent of the Gross Domestic Product in Ghana (UNICEF., 2007) thus the need for better prevention and control.

Malaria is caused by five species of parasite that affect humans belonging to the genus Plasmodium: *P. falciparum*, *P. ovale*, *P. vivax*, *P. malariae* and *P. knowlesi*. In Africa the predominant is the deadly *P. falciparum*(CDC, 2012a). Malaria is preventable and treatable provided the currently recommended intervention are implemented. (i) Vector control through the use of insecticide treated bed nets (ITNs), indoor residual spraying (IRS) and, larval control; (ii) chemoprevention for pregnant women; (iii) confirmation of malaria diagnosis via microscopy or rapid diagnostic tests (RDTs); and (iv) timely treatment with appropriate antimalarial. Prevention and control strategies have led to a reduction in malaria mortality rates by 42 percent globally since 2000 and by 49 percent in Sub-Saharan Africa(WHO, 2013). WHO recommends the universal coverage of all people at risk of malaria in areas targeted for malaria prevention with ITNs to realize its full potential as a vector control intervention (WHO ITN position statement, 2007). ITNs reduced the incidence of uncomplicated malarial episodes in areas of stable malaria by 50% compared to no nets, and 39% compared to untreated nets; and in areas of unstable malaria: by 62% compared to no nets and 43% compared to untreated nets

for *Plasmodium falciparum* episodes. When compared to no nets and in areas of stable malaria, ITNs also had an impact on severe malaria (95% CI 20 - 63), parasite prevalence, high parasitaemia, splenomegaly, and their use improved the average haemoglobin level in children by 1.7% packed cell volume (Smith, Leuenberger, & Lengeler, 2001). WHO/GMP now recommends that Long Lasting Insecticide treated Nets (LLINs) be distributed to and used by all people ("universal coverage") in malarious areas, not just by the most vulnerable groups: pregnant women and children under 5 years. It is also calling on all national malaria control programmes and their partners involved in nets interventions to purchase only LLINs and to distribute them free of charge or at a highly subsidized price (WHO/GMP, 2014). LLINs are most commonly distributed through mass campaigns approximately every 3 years. Between 2008 and 2010, a total of 294 million nets were distributed in sub-Saharan Africa (CDC, 2014). The percentage of households owning at least one ITN in sub-Saharan Africa is estimated to have risen from 3% in 2000 to 56% in 2012. With improved accessibility, utilization has increased to 42% in 2013 ("WHO | World Malaria Report 2013,") representing a gap between ownership and usage. Several companies have developed long-lasting insecticide-treated nets (LLINs) that maintain effective levels of insecticide for at least 3-5 years, even after repeated washing. LLINs have been associated with sharp decreases in malaria in countries where malaria programs have achieved high LLIN coverage.

### **1.1.1 Insecticide Treated Nets (ITNs)**

An insecticide-treated net is a mosquito net that repels, disables and/or kills mosquitoes coming into contact with insecticide on the netting material. There are two categories of ITNs: conventionally treated nets and long-lasting insecticidal nets. A conventionally treated net is a mosquito net that has been treated by dipping in a WHO-recommended

insecticide. To ensure its continued insecticidal effect, the net should be re-treated after three washes, or at least once a year. A long-lasting insecticidal net is a factory-treated mosquito net made with netting material that has insecticide incorporated within or bound around the fibres. The net must retain its effective biological activity without re-treatment for at least 20 WHO standard washes under laboratory conditions and three years of recommended use under field conditions.

### **1.1.2 Net Materials and Insecticides**

Nets may vary by size, shape, colour, material, and/or insecticide treatment status. Most nets are made of polyester, polyethylene, or polypropylene.

Only pyrethroid insecticides are approved for use on ITNs. These insecticides have been shown to pose very low health risks to humans and other mammals, but are toxic to insects and kill them, even at very low doses. Pyrethroids do not rapidly break down unless washed or exposed to sunlight (Fishel, 2014). Previously, nets had to be retreated every 6 to 12 months, or even more frequently if the nets were washed. Nets were retreated by simply dipping them in a mixture of water and insecticide and allowing them to dry in a shady place. The need for frequent retreatment is a major barrier to widespread use of ITNs in endemic countries. In addition, the additional cost of the insecticide and the lack of understanding its importance resulted in very low retreatment rates in most African countries (Kaliyaperumal, et al., 2010).

### **1.1.3 How Do Long Lasting Insecticide Nets Work?**

Bed nets form a protective barrier around people sleeping under them. However, bed nets treated with an insecticide are much more protective than untreated nets. The insecticides

that are used for treating bed nets kill mosquitoes, as well as other insects. The insecticides also repel mosquitoes, reducing the number that enter the house and attempt to feed on people inside. In addition, if high community coverage is achieved, the numbers of mosquitoes, as well as their length of life will be reduced. When this happens, all members of the community are protected, regardless of whether or not they are using an insecticide treated bed net. To achieve such effects, more than half of the people in a community must use an ITN(CDC, 2014)

#### **1.1.4 ITNs in Ghana**

According to the Multiple Indicator Cluster Survey-Ghana, final report of 2011, more than half of all households (51%) own at least one mosquito net, treated or untreated and 49 percent of all households have an insecticide treated net (ITN), the large majority(48%) are long-lasting insecticidal net (LLIN). The average number of LLIN in households in Ghana is 1.3. About one in every four households in Ghana has at least one LLIN net for every two persons who stayed in the household the night prior to the survey.

Several projects in Ghana have been rolled out to enhance ITN ownership by households since 2001, (Kudom & Mensah, 2010). In the late 2006, 2.1 million ITNs were distributed free of charge as part of the measles immunization campaign. Between December 2010 and August 2012, GHS/ MOH/NMCP with support from World Bank, WHO, UNICEF, DFID, USAID/PMI and other partners has distributed close to 12.8 million ITNs through a universal mass distribution campaign in all ten Regions of Ghana. The 2008 Ghana Demographic and Health Survey (DHS) indicated that only 32.6% of households owned at least one insecticide-treated net (ITN). The 2008 NetMark Household Survey on ITNs also found that almost 45% of ITNs owned were not hung and ready to use. Although ITNs are increasingly accessible to many in the country getting people to

correctly and consistently use them still remains low .At this rate it would not be possible for the country to achieve the national and international targets of ITN use unless factors hindering utilization are recognized and appropriate solutions found to it.

Ghana since 2002 has waived taxes on ITN importation and benevolent partners have aided in its supply and distribution. The Ghana Demographic and Health survey 2008 data showed that 45 percent of households in Ghana owned a mosquito net whether treated or not treated and 19 percent own more than one net. ITNs have been shown to significantly reduce malaria –related morbidity and all-cause child mortality by 14-33 percent in sub-Saharan Africa (Binka & Adongo, 1998). In Ghana ITNs are associated with 17 percent reduction in all-cause mortality in children (Adongo et al, 1998.) resulting in advocacy for the inclusion of ITNs in malaria prevention and control strategy. This strategic tool forms the cornerstone for Ghana Health Services (GHS) bid to reduce malaria – related deaths and morbidity by 75 percent by the year 2015 as reported by the National Malaria Control Program.

Insecticide-treated bed nets (ITNs) are a major intervention for malaria control. They offer a form of personal protection that has been shown to reduce malaria illness, severe disease, and death due to malaria in endemic regions. In community-wide trials in several African settings, ITNs have been shown to reduce the death of children under 5 years from all causes by about 20%(CDC, 2012). ITNs have been effective in reducing maternal anaemia, placental infection and low birth weight in pregnant women and reduction of anaemia, lower infant and child mortality, and fewer episodes of uncomplicated malaria in young children(Haghdoost, Alexander, & Smith, 2007).

## 1.2 Problem Statement

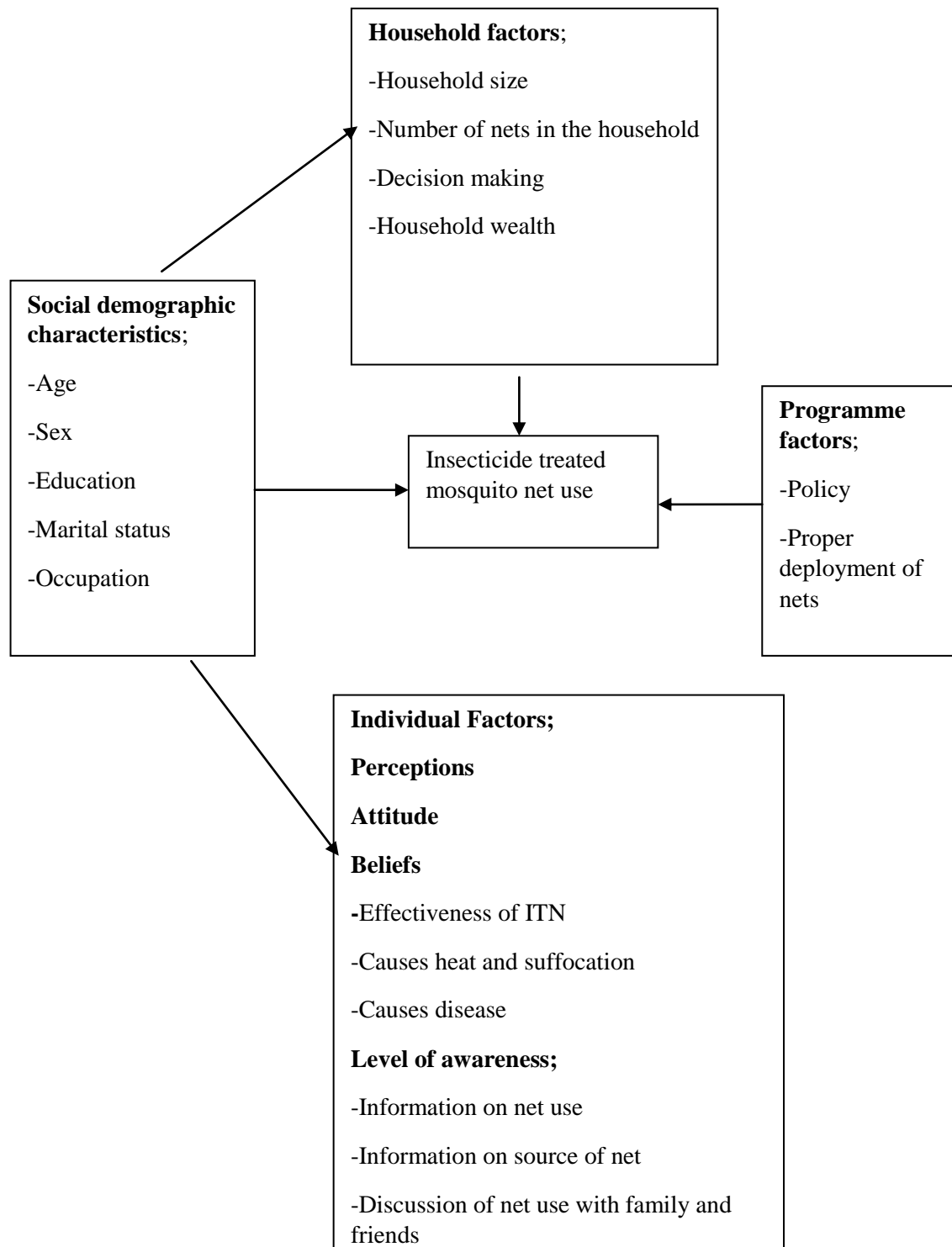
According to the Ghana DHS 2008 survey, households owning at least one mosquito net (ITN) is 33% of the population. Mosquito net use however is low, 28% in children under five and 20% in pregnant women. The post hang up campaign evaluation report released on May 2013, revealed that the proportion of households owning at least one ITN after the campaign was 79.7% in Central Region, the proportion of all individuals sleeping under ITN however was 45.0% (Smith Paintain et al., 2014).

ITN utilisation is influenced by certain socio demographic characteristics, (Ng'ang'a et al., 2009) household factors and level of awareness, knowledge and perceptions of the households (Hightower et al., 2010). Studies have shown that children under five and women in reproductive age are more likely to sleep under nets (Baume & Marin, 2007); Tsuang, Lines, & Hanson, 2010). Low level of education of household head (Pettifor et al., 2008), low homestead wealth (Githinji et al., 2010) are less likely to sleep under nets. Household factors such as decision making, sleeping space (Lam et al., 2014), fewer nets in the households (Baume & Franca-Koh, 2011) large household size or family size (Oresanya, Hoshen, & Sofola, 2008) affect the use of ITN as well as poor sleeping arrangements (Iwashita et al., 2010). Level of awareness, perception and beliefs (Bennett et al., 2012) on effectiveness of ITN (Nuwaha, 2001) as a preventive measure affects its utilisation within the household. Good household practices, perception and improved level of awareness towards ITN utilisation, proper deployment of ITNs and consistence in usage of net will lead to increased utilisation.

In Ghana studies have been done to prove that ITNs are highly effective in reducing malaria morbidity and mortality if correctly and consistently used (Lengeler, 1996), yet utilization is below the target level of 75% (World Health Organization, 2013).

### 1.3 Conceptual Framework

Figure 1; presents the summary of data frame work for analysis of association between sleeping under ITN and explanatory factors.



**Figure 1: Conceptual Framework relating dependent factors to the exploratory variables.**

The utilization of ITNs is influenced by the socio demographic factors like age, sex, educational level, occupation, income of the household and marital status that work through the intra-household factors like structure of the household, number of household occupants, number of nets that a household can possibly afford to buy if need be ,sleeping arrangements and decision making which may involve the household head. Utilization is also influenced by perceptions towards ITNs, beliefs, attitudes, knowledge on proper use in terms of consistence in usage. Therefore, with the good intra-household practices, perceptions and attitudes towards ITNs, utilization is possibly manifested through proper deployment of ITNs, consistence on usage. This leads to increased utilization of ITNs within households and especially with children under five years.

#### **1.4 Justification**

Studies have been done in Ghana, but a few done in Agona East in the Central Region of Ghana especially after several efforts made at improving on ownership (possession of a net or ITN). It is of essence to distinguish between net ownership and net use (actual use of net owned). The focus going forward for the National Malaria Control programme in the country is to get people to use the ITNs. Information from such a study will inform any efforts at increasing utilization of ITNs. It is also expected to be of immense help to policy planners, the ministry of health specifically in the department of malaria control and contribute to the body of literature, provide appropriate guide to policies for the promotion of ITNs and basis for further research on ITNs in malaria prevention. This study seeks to unravel these factors that may be contributing to the gap between possession and use, and to address problems associated with actual use of nets within the households, rather than net ownership.

## **1.5 Objectives**

### **1.5.1 General Objective**

To assess factors that influence use of ITNs in the Agona East, Central Region

### **1.5.2 Specific Objectives**

1. To determine the prevalence of ITNs utilisation among households in Agona East in the Central Region.
2. To assess level of awareness in terms of ITN use among households in Agona East in the Central Region.
3. To assess household factors affecting ITN use in Agona East in the Central Region.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

In 2013, almost half of the population of Sub Saharan Africa were at risk of malaria, 49% had access to an ITN in their households compared to 3% in 2004. An estimated 44% of the population at risk were sleeping under an ITN in 2013, compared to 2% in 2004. A total of 214 million nets are projected to be delivered to countries in Sub Saharan Africa by the end of 2014. A key indicator for assessing progress towards Global Malaria Action Plan (GMAP) target is the 'proportion of population that slept under an ITN the previous night. Although an increasing number of studies have documented ITN ownership and use, including Ghana (Baume & Franca-Koh, 2011)(Agyepong & Manderson, 1999), a few have systematically investigated ITN use.

The use of insecticide treated bed nets is an intervention in earnest to curb malaria transmission in Ghana according to the Ghana DHS (Ghana DHS,. 2014).The current LLINs are designed to last for 3 to 5 years after which it could be replaced. The average number of ITN per a household in Ghana is 1.3 and is same in the Central Region where the study was under taken. The universal net coverage is measured by assuming that there is one net for every two people in household. Households with at least one net is 69.7% of study population. Net use by the vulnerable ones mentioned in the DHS especially children was 43% and pregnant women is 47% .Net use is still on the low side in Ghana and this is what we seek to find in this study. Compared to a malaria indicator survey done in the southern part of Sudan, which showed that the utilization of insecticide-treated nets was low; 25.3% (95% CI: 23.9-26.7) for children under five (U5) and 35.9% (95% CI: 31.9-40.2) for pregnant women (OR: 1.66 (1.36-2.01); P =0.175) (Eyobo et al., 2014). Rural setting is found to significantly associated with net use in Ghana according to this

study (Baume & Franca-Koh, 2011). Agyepong and Manderson in their study found far higher bed net ownership and use in rural than urban areas, which was related partly to perceived affordability and partly to the different contexts of and reasons for avoiding mosquitoes (Agyepong & Manderson, 1999)(Gunasekaran, Sahu, Vijayakumar, & Jambulingam, 2009). Most nets are gotten as a result of free distribution in mass campaigns and the rural folks realizing the importance of net use in this respect take advantage of such situations. In another cross sectional study done in the rural area of Western Kenya found only 59% of household residents sleeping under a net during the night prior to the survey(Githinji et al, 2010). 77% of those who slept under a net used an insecticide-treated net (ITN) or long-lasting insecticide-treated nets (LLIN). Nuwahu (2011), in their study in the Mbarara municipality of Uganda 50% percent (356 of 643) of the households used bed net. In another study in 6 different countries in Sub Saharan Africa with Ghana inclusive women of reproductive age and children under 5 (without gender bias) were most likely to use the net; least likely were children of age 5-14 and adult males(Baume & Marin, 2007).In a Ugandan hospital based survey it was observed that though the prevalence of ITN utilization among children was 34.2%, ITN utilization was higher among children of age <5 years [37.0, 95% CI 31.81-42.21] as compared to children aged  $\geq 5$  years [22.9, 95% CI 13.77-32.01](Nankinga et al., 2012). In a cross sectional study using existing data in Tanzania involving mainly pregnant women and their children it was observed that ITNs were most likely to be used by infants, young children (1-4 y), and women of childbearing age; they were least likely to be used by older women ( $\geq 50$  y), older children (5-14 y), and adult men(Tsuang et al., 2010).

## 2.2 Demographic Factors

Demographic factors such as age, gender, occupation, level of education and marital status of head of household have been shown to be associated with net use or non-use (Nankinga et al., 2012) (Baume & Franca-Koh, 2011) (Negash, Haileselassie, Tasew, Ahmed, & Getachew, 2012). According to a study in India, West Bengal population, factors independently associated with net use in multivariate analysis included age < 35 years ( $P < 0.001$ ) (Biswas et al, 2010). In a study conducted in Ethiopia by Graves et al., (2006), it was found that an increase net use was associated with age 25-49 years (OR=1.4 CI 1.2-1.7) as compared to children under 5 years., but reduced net use was associated with age 5-24 years (OR=0.2, CI 0.2-0.3) compared to the under-fives. Another study done in Ethiopia in Afar region of the country, examining ownership and utilisation of nets, found that among the potential determinants explored regarding utilization of LLINs, age to be significantly associated with LLIN utilization and the under-fives were more likely to sleep under bed nets, similarly a cross sectional survey conducted in central Kenya revealed a similar finding with bed net use with age ( $\chi^2 = 74.483$   $P = 0.000$ ), (Ng'ang'a et al., 2009) (Negash et al., 2012). A cross sectional study done by Graves et al (2011) in assessing factors associated with mosquito net use by individuals in households owning nets in Ethiopia also showed increased net use associated with age (OR=1.4, 95% CI 1.2-1.7) compared to children under five.

Gender has been found to be very much associated with net use (Ng'ang'a et al., 2009) in some households Gender norms and values that influence the division of labour, leisure patterns, and sleeping arrangements may influence net use for men and women., a female gender (OR=1.4 CI 1.2-1.5) was associated with net use, according to Graves et al (2006). A cross sectional study done in Central Kenya also revealed significant variation in bed net use with gender ( $\text{Chi}^2 = 4.25$   $P = 0.039$ ). Gqrley et al, (2013) found that females

used ITNs compared to males (57.2% vs 48.8%). After controlling for several covariates, females remained more likely to use ITNs compared to males (OR: 1.5, 95% CI: 1.3-1.7) in a post campaign survey in Kano State in Nigeria.

According to a study done in Afar in northeast Ethiopia regarding utilization of nets, occupation of household head was significantly associated with net use( Negash et al, 2012) (Ng'ang'a et al., 2009). so also is a study done in Central Kenya in a rice farming community, a cross sectional study where the predominant job was farming found occupation( Chi<sup>2</sup>-7.955 P-0.047) to be associated with net use. Households whose heads were engaged as a farmer (adjusted OR 0.137; 95% CI: 0.04-0.50) and housewife (OR 0.26; 95% CI: 0.08-0.82) were less likely to use ITN than those of other occupations (Biadgilign, Reda, & Kedir, 2012) According to this study done in Uganda involving care givers, a hospital based cross sectional study, ITN utilisation was significantly associated with formal employment by head of household (OR = 6.00, 95% CI = 1.95-18.48)(Nankinga et al., 2012)

Level of education of heads of households is crucially associated with net use(Ng'ang'a et al., 2009)(Noor et al). Positive predictors for LLINs utilization are increasing educational levels (Jombo,et a 2011)(Rhee et al., 2005), being able to read instructions on leaflets attached to nets is good enough to enhance the correct use of it, Women who had secondary school or higher education were 3.4 times more likely to own a net and 2.8 times more likely to have used a net compared to women with less than secondary school education (Pettifor et al., 2008) a cohort study done in Kinshasa in the Democratic Republic of Congo among pregnant women on attending the clinic and given nets free of charge and followed up for use. In multivariable analyses examining factors associated with net ownership and use, level of education remained strongly associated with both. To re enforce this observation a hospital-based descriptive study done in Imo State, South-

Eastern Nigeria. Bivariate analysis showed that Parents who had secondary education and above used ITNs more than those who had primary education and below (57.3% vs 42.7%,  $P$  value = 0.009) (Iloh et al, 2013). Adogu and Ijemba, in 2013 found that the use of ITN the night before was only 12.7% for those with tertiary education but significantly increased to 29.8% and 24% for those with secondary and primary education respectively ( $p=0.05$ ). Fugie et al, (2015) found in his study in Shashogo southern Ethiopia, that level of education was a high determinant of net use ( $p < 0.05$ ). In another cross sectional study done in Azendabo village in Ethiopia the association between educational status and frequency of ITNs utilization was statistically significant ( $\chi^2 = 13.99$ ;  $p = 0.029$ ;  $df = 6$ ) (Kaliyaperumal et al., 2010). A contrary view was observed in a community based cross sectional study in Lagos state in Nigeria among care givers, educational level of care givers was not significant determinants ITN utilisation (Okafor & Odeyemi, 2012).

Marital status of heads of households is observed to be an insignificant factor in terms of utilisation of nets (Mudeny & Nobuyuki, 2010). In another study done in Makueni district, Kenya among caregivers it was observed that ITN utilisation of nets by the under-fives was positively associated with the marital status of the care givers (Malusha, 2009).

### **2.3 Household Factors**

House hold factors are known to play a vital role in net ownership and use, nets in most instances are given for free, households with good socioeconomic status and know the importance of this preventive measure may not hesitate to purchase a net (Gebresilassie & Mariam, 2011), but in a situation where one has to purchase the net then the socio economic level of the house becomes important. According to a cross sectional survey in rural area of Southern Mozambique it was observed that the lower the socioeconomic

status of a household the likelihood that it was going to receive a free bed net (Chase et al., 2009). In a knowledge attitude and practices study done Kimbibi sub district hospital in Kenya it was observed that almost 90% of households reported owning and using an insecticide treated bed net and 81% reported buying the nets emphasizing the need to protect oneself from getting malaria (Okech et al., 2008) if it meant purchasing it yourself. According to a cross sectional study in suburban Accra where groups of families were assessed for treatment delays in accessing health care, only half of families in the lowest income group utilized insecticide-treated mosquito nets, while all six families in the highest income group use the precaution (Wong, 2011). In a cross sectional study conducted in rural Kenya to assess determinants of retail sector acquisition of nets, homestead wealth (adjusted OR = 10.17, 95% CI = 5.45-18.98), was significantly associated with use of retail sector nets by children aged less than 5 years (Noor et al, 2006). But in a cross sectional study done at the Medical Research unit of the Albert Schweitzer hospital in Lambrene, Gabon, where women were classified into levels of socioeconomic status, it was found to be inversely related to bed net use (Goesch et al., 2008). Bennet et al, (2012), found no difference by socioeconomic status of house hold head 6 months after a mass distribution of nets country wide in Sierra Leone to determine possession and use of the nets, a cross sectional study. In another study in Northern Nigeria among women of varying wealth quintiles it was observed that ITN use (individuals reporting having slept under an ITN the night before the survey visit) among individuals from households owning at least one ITN, was 53.1% with no statistically significant difference between the lowest, second, third and fourth wealth quintiles and the highest wealth quintile (lowest: odds ratio (OR) 0.87, 95% confidence interval (CI) (0.67 ; 1.13); second: OR 0.85, 95% CI (0.66 ; 1.24); third: OR 1.10 95% CI (0.86 ; 1.4) and fourth OR 0.91 95% CI (0.72 ; 1.15) (Ye, Patton, Kilian, Dovey, & Eckert, 2012) But in

this study low socioeconomic status is strongly associated with net use (Baume & Franca-Koh, 2011). Positive predictors for LLINs utilization were increasing educational levels, increasing wealth index and presence of an under five child, while lower wealth index and cultural beliefs negatively contributed to LLINs utilization (Jombo, et al 2011). According to a study done by Macintyre et al., (2002) it was found that wealth and formal education were significantly associated with net use.

Ownership and use of insecticide treated bed nets by pregnant women attending antenatal clinics in Anambra state, south eastern Nigeria, it was found that 60% of the women owned nets at home, 46% used the net partially or fully and 56% never used the nets. (Ukibe et al., 2013). Increased ownership as witnessed in a post campaign household survey comparing 4 countries; Nigeria, Senegal, Ghana and Zambia comparing data from 2000, 2004 and 2006. All countries made commensurate gains in the proportion of under-fives sleeping under a net and again in all countries the proportion of pregnant women sleeping under a net increased greatly. In a cross sectional study assessing several countries for net utilisation concluded that intra-household access to ITNs is the strongest and most consistent determinant of use among children (Eisele, Ke, et al 2009).

It is expected that most nets hanged are to be used or slept under, in a household survey conducted in some Regions in Ghana which included the Region of the study, LLIN use was greater in households in which one or more campaign LLINs were hung by a volunteer (OR = 1.57; 95% CI = 1.09, 2.27; p = 0.02) (Smith Paintain et al., 2014). This goes to emphasize the essence of hung up campaigns, an adoptable strategy. Not all nets deployed or hanging are used the night prior in a study conducted in semi urban community in River state in Nigeria on use and misuse of nets it was observed that, of the 102 ITNs that were properly deployed, only 27.5% were occupied the night before the survey (Ordinioha, 2012). But in several countries, a sizable minority of nets owned were

not used (Baume & Marin, 2007). Bed net use is affected by the weather conditions as witnessed in a study in communities in Malaita, Solomon Island, bed net use was affected by seasonality; 99% of the population used bed nets during the rainy season, 52% used them all year (Yohannes et al., 2000). The hot weather conditions makes the use of bed nets uncomfortable worse off in Ghana where electricity is a problem.

Bed net density is associated with net use (Hightower et al., 2010) (Belay & Deressa, 2008), the number of nets in the household will determine how many of the household would sleep under net, priority given to the head of households. In a descriptive study in 4 districts in Uganda examining household net allocation preferences, sleeping space surveys revealed that heads of household sometimes receive priority over children less than five years of age when households have too few nets to cover all members (Lam *et al.*, 2014) but in other situations such as in households in Tanzania under-fives were more likely to sleep under net compared to older women ( $\geq 50$  years) and older children (5-15 years) (Tsuang *et al.*, 2010). Bed net density is found to be significantly associated with a reduction in under five mortality in a rural Southern Tanzania where the spatial distribution of net was assessed for its effect on childhood mortality (Gosoni *et al.*, 2008). Fewer nets is significantly associated with net use as envisaged in some studies (Baume & Franca-Koh, 2011). In several countries, a sizable minority of nets owned were not used. In a cross sectional study involving Ghana and several other countries in sub Saharan 91% of household owned at least one ITN, but only 65% of ITNs owned had been used the prior night. The multivariate analysis found that the factors significantly associated with an ITN being used was family size (Baume, Reithinger, & Woldehanna, 2009) in another study in Mopti Region of Mali it was observed that one of the significant predictors of ITNs use was household with larger family size (Rhee *et al.*, 2005), this is

tied down to the high level of education of the household head and level of awareness in terms of net use (SMITH GREENAWAY, LEON, & BAKER, 2012).

In a descriptive study conducted in Uganda on prioritizing net use among households, it was unanimously agreed that priority be given to pregnant women, infants and children under five when it came to the use of net, in the same study sleeping space survey revealed that sometimes priority was given to the head of the household when households had few nets to allocate (Lam *et al.*, 2014). Sleeping arrangement coupled with decision making in the household affect net use among household members(Iwashita *et al.*, 2010)(Chicuecue *et al.*, 2012)

#### **2.4 Level of Awareness on Net Use**

Level of awareness has a lot of influence on net use (Vanden Eng *et al.*, 2010), a constant awareness is important in net usage. A constant hammering of the need to use nets and the benefits with it is the key to achieving a universal coverage (Hetzl *et al.*, 2014), of course low level of awareness is associated with low level of use of nets(Singh, Brown, & Rogerson, 2013) . Households who received or were told about ITN in the last 6 months were three times more likely to have used ITN than those who were not (OR 3.25; 95% CI 1.5-7.10) a clear indication of the essence of the longevity of information and its effect on net use (Biadgilign *et al.*, 2012). In another study in rural Uganda only half the nets owned were being used correctly by those most vulnerable to the illness(Williams *et al.*, 2009). The findings suggest that mosquito nets must be provided with an effective education program and may be more successful if conducted in whole districts simultaneously rather than on a per-community. In a study in Ghana assessing the impact of mass media education on net use by children, individual Messages delivered by a health worker or a dedicated radio programme, had the highest effect for one or more children sleeping under

a net the night before (OR adjusted=1.65; 95% CI=1.44) while hearing of more messages resulted in the highest odds for one or more children (OR adjusted=3.06; 95% CI=2.27 to 4.12) sleeping under a bed net (Owusu Adjah & Panayiotou, 2014). A descriptive study carried out in the Northern state of Nigeria found a third of the women were aware of ITN prevention but less than a third ever used it. A little over 70% of the respondents had never used ITN before because of lack of awareness, (Musa *et al*, 2009). Another study done by BO *et al* in 2010 in Enugu, Nigeria found awareness of ITN to be high (80%) of respondents interviewed but only 26% used nets for their children. In a cross sectional study involving caregivers, the utilisation of net by their wards was found to positively associated with knowledge about ITN use (Malusha *et al.*, 2009).

In a cross sectional study designed to assess the level of awareness, in Anambra state, south eastern Nigeria, it was found that 93% of the women in the study were fully aware of the use of nets, 60% owned nets at home, 46% used the net partially or fully and 56% never used the nets. (Ukibe *et al.*, 2013).

Baume *et al* in 2009, reported in the qualitative aspect of a household survey determining factors associated use and non-use of nets owned in Oromia and Amhara Regional states in Ethiopia, that the most common reason for net non-use was there are few mosquitos around or malaria was not a serious problem. Pulford *et al* in review of studies that examined barriers to mosquito net use looking at self-reported reasons for not using a mosquito net amongst 'net owning' individuals found that, discomfort primarily due to heat, and perceived (low) mosquito density were the most widely identified reason for non-use. Social factors, such as sleeping elsewhere, or not sleeping at all, were also reported across studies as were technical factors related to mosquito net use (i.e. not being able to hang a mosquito net or finding it inconvenient to hang) and the temporary unavailability (Pulford *et al.*, 2011). Baume *et al* in 2009, observed an increase in the

proportion of pregnant women sleeping under a net, after an improved level of awareness with distribution of nets. In a household survey done by Bennet *et al* in 2012, among the individuals in households possessing  $\geq 1$  ITN, 76.5% slept under an ITN the night before. Individuals in households where the household head heard malaria messages were more likely to have slept under ITN. The use of the media in creating awareness cannot be over emphasized in outlining the impact of awareness through mass media campaign on net use, a cross sectional survey done by Bowen in 2013 in Cameroun where a mass distribution was followed by a Night Watch Programme to ensure use of net at night, revealed that Camerounians with at least one net in their households exposure to the Night Watch programme was associated with a 6.6% point increase in last night net use among the respondents' children (79.6% vrs. 67.6%  $p < 0.025$ )(Bowen, 2013). Level of awareness is not enhanced by only what one sees or hears but also the ability to discern, hence the level of education with awareness in a study done by BO *et al* in 2014. There was statistically significant difference in terms of awareness of ITN between the mothers with tertiary education and those with secondary education and below ( $p = 0.000$ ). In terms of use of ITN among those that have the awareness, however, there was no significant difference between the two groups of mothers ( $p = 0.404$ ). Use of insecticide treated bed nets by pregnant women attending antenatal clinics in Anambra state, south eastern Nigeria, it was found that 93% of the women in the study were fully aware of the use of nets, 46% used the net partially or fully and 56% never used the nets. (Ukibe *et al.*, 2013)

A review of published literature on net use when one owned one by Pulford *et al* in 2011 revealed discomfort, primarily due to heat, and perceived (low) mosquito density were the most widely identified reason for non-use. Social factors, such as sleeping elsewhere, or not sleeping at all, were also reported across studies as were technical factors related to mosquito net use (i.e. not being able to hang a mosquito net or finding it

inconvenient to hang) and the temporary unavailability of a normally available mosquito net (primarily due to someone else using it).

A cross-sectional surveys done in Western Kenya conducted on ITN ownership (possession), compliance (actual usage among those who own ITNs), and malaria infections in occupants of randomly sampled houses in the dry and the rainy seasons of 2009, observed that despite ITN ownership reaching more than 71%, that part of Kenya compliance was low at 56.3%. The compliance rate was significantly higher during the rainy season compared with the dry season (62% vs. 49.6%) (Atieil *et al*, 2011), this is because of the heat that comes with this weather conditions(Cohee *et al.*, 2009) . Awareness of ITN was found in 184 (80%) of the mothers. Only 46 (20%) did not know about ITN. Of the mothers that know about ITN, 48(26.1%) had their children sleep under the net (Bo et al, 2014).

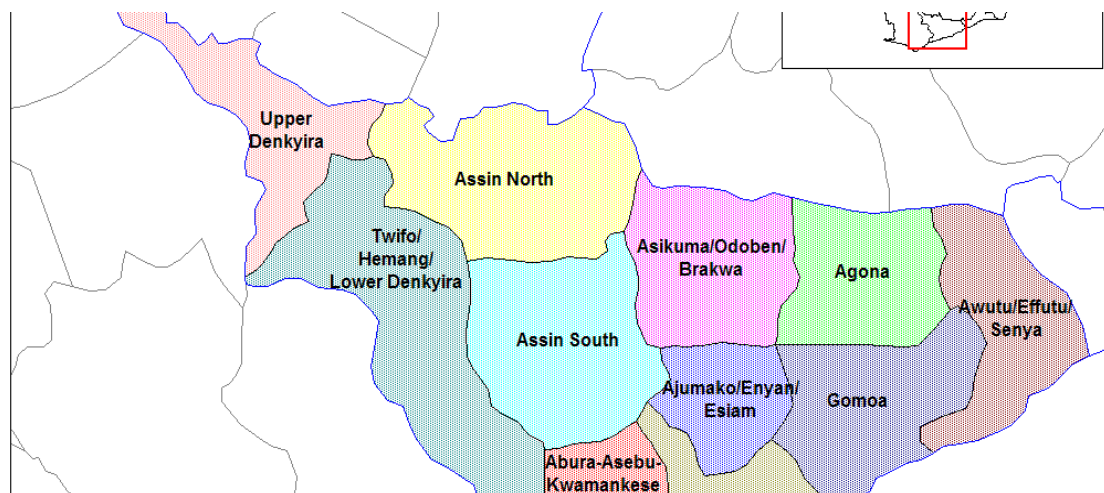
## CHAPTER THREE

### METHODS

#### 3.1 Study Design

A Cross-sectional study with a household as the unit of study and the head the respondent, was done between the period February 2015 and July 2015. The study used both quantitative and qualitative methods. The quantitative arm included questions that were used to establish the household factors and demographic characteristics of household heads, ITN ownership and questions regarding the characteristics and use of household ITN. The qualitative component was integrated into the questionnaire and it included questions used to assess the level of awareness, observation of nets at home, some open ended questions related to use, and in-depth interview with key informants.

#### Study Area



**Figure 2: Map of Agona East District, Central Region of Ghana**

**Source: Courtesy Agona East District Assembly**

The study was conducted in Agona East District. Agona East District is situated in the eastern corner of the Central Region within latitudes 5030' and 5050'N and between longitudes 0035' and 0055' W. It has a total land area of 667square kilometers; the district

is divided into Five (5) sub-districts or Town/Area Councils namely Nsaba, Duakwa, Asafo, Kwanyako and Mankrong area councils. The district is among the 20 districts and municipalities of Central Region of Ghana, Nsaba is the administrative capital. Generally, the District lies in the wet semi-equatorial climatic zone. It has a bio-modal pattern of rainfall with the maximum occurring in May/June and September/October. The annual rainfall figure lies within the range of 1000mm – 1400mm. The dry season starts in December and ends in March with the highest mean monthly temperature of 33.80 occurring between March/April and the lowest of about 29.40 C in August (“District Assembly, Agona East,. 2012). The Agona East District’s Estimated Population now stands at 85,920 with about 21,021 households and a household size of 4. Female slightly dominating at an estimated population of 44,885 while the male population was estimated at 41,035 (source: 2010 population census). The number of pregnant women is 4004 and children under five is 20,010 (Agona East DHD., 2015). There are 134 communities district wide; 70 in Nsaba-Duakwa, 9 in Asafo, 42 in Kwanyako and 13 in Mankrong. The district has 5 health centers situated in all 5 Subdistricts. Malaria remains a major cause of ill-health in the Agona East District and it is one of the districts in the Central Region that benefitted from the house to house hang up campaign in 2010. The Central Region on the average has 1.3 ITNs per a household, 69.7% households own at least one net and 58% of households with access to ITN. It has approximately 526,764 households and a population size of 2,201,863 (GDHS, 2014 and Population Census, 2010).

### **3.2 Sample Size Determination**

For the quantitative aspect of this study, a modified form of the Expanded Program for Immunization (EPI) 30 cluster survey method for random cluster sampling was used. Assuming a desired precision ( $d$ ) of  $\pm 5\%$  with 95% confidence level ( $t$ ) and a frequency of

net use of 45% ( $P$ ) {which is the prevalence of population sleeping under nets in the Central Region which is used as a proxy} (GDHS, 2015), imputed into the formula below gives a sample size( $n$ ) as 380.

*Formula:*

$$n = \frac{t^2 \times p(1-p)}{d^2}$$

*Description:*

**n** = required sample size

**t** = confidence level at 95% (standard value of 1.96)

**p** = estimated prevalence of ITN use in Agona East District in the Central Region

**d** = desired precision at 5% (standard value of 0.05)

Taking into account contingencies such as non-response, recording errors and using the standard number of clusters (i.e. 30) established by the EPI on cluster survey, the number is adjusted to 390, as the final sample size.

Number to sample per cluster:

$$= n/m$$

Where **m** = number of clusters, this gave 30 clusters with a cluster size of 13.

For the qualitative aspect of the study, 13 key informants were interviewed.

### 3.3 Sampling Technique

#### Quantitative Arm

A two stage cluster sampling was used for the study. Thirty communities (cluster) out of 134 communities were selected. The number of communities selected per a sub district were proportionate to the population size of the sub district. This was followed by selection of 13 households per a community. The following procedure was used to select each household. In each selected cluster the interview team stood at the centre of the Main Street in the community and a direction was randomly chosen by spinning a pencil and the

direction of the tip of the pencil was chosen. Each household in that direction was visited till target number of households per community were reached. If target was not reached we came back to the starting point and took the opposite direction until a target of 13 households per community was achieved.

### **Qualitative Arm**

The key informants for the in-depth interview were purposively selected. The following categories of key informants were selected purposively; all 5 in charges of health centres, 2 midwives, 2 opinion leaders, 1 district malaria focal person, 2 women traditional leaders and the district director of health. These key informants were considered because they are believed to be more knowledgeable about ITN as a preventive tool for malaria.

## **3.4 Variables**

### **3.4.1 Dependent variables**

The dependent variable was sleeping under an ITN the night before.

### **3.4.2 Independent variables**

The independent variables were age and sex of the household heads, household factors and the level of awareness on ITN utilisation.

Categorized as;

- I. Sociodemographic characteristics of household head;** the age, sex, marital status, level of education; whether respondent was educated or not, employed or unemployed and the occupation of the household head. The socioeconomic status of households were measured using the International Wealth Index (IWI) scale. The household wealth index was derived from possession of consumer durables

e.g.: television, refrigerator, telephone, car, motor bike, or a bicycle, access to basic services e.g.: source of drinking water and electricity., and housing characteristics as in number of rooms used for sleeping and material used for construction of house. These items have weight derived from the IWI formula, which is the central component of the IWI. Using this formula, each household for which the asset values are known can be ranked on the IWI scale. The scale is additive the scores are from 0 to 100 and are grouped into 5 quintiles (q), from the lowest q1, (score of between 0 to 19) to the highest q5, (between 80 to 100). (Smits, Jeroen & Roel Steendijk, 2014).

**II. Household characteristics;** household size.

**III. Household nets use and source;** the presence of nets and the number of nets and source of the net.

**IV. Household level of awareness on net use;** This included information on net use such as, regular use of net, airing of nets before use, to hang nets before night fall, the fact that torn nets can be sewn, not lighting candles under nets and washing dirty nets. The sources of the information on net use e.g. the media, the health worker, posters and vouchers and others. And lastly having discussed with family or friends, why they should sleep under net, what these nets are, and how to care for these nets and so on.

### **3.5 Data Collection**

The tool for data collection was a questionnaire for the quantitative data collection and an interview guide for the qualitative data collection. The head of the household answered

questions on behalf of all household members including those relating ITN ownership and usage among all household members.

Data collection was done during the start of the dry season (February to March) using a modified Malaria Indicator Cluster Survey ((MICS) structured questionnaire about household ownership and utilization of mosquito nets (treated or untreated). The modified questionnaire was shared for inputs from stake holders. It was then finalized and pre tested to check its validity and reliability.

### **3.6 Data processing and Analysis**

Data collected was entered into Epi-data, version 3.1 and backed up in Excel 2013. It was cleaned and checked for accuracy and completeness in Excel 2013. The data is transferred to Stata SE 13 software for analysis.

The association of each possible independent variable with the dependant variable (ITN used or not used the night before) was tested by estimating bivariate odds ratio (OR).

Multivariate logistic regression was used to assess independent predictors of ITN use. All variables that were significant via the bivariate analysis ( $p < 0.05$ ) were used in the multivariate analysis.

The qualitative analysis was done manually. The data was analysed by summarizing findings at the end of the day per each interview using these tentative themes bringing together similar views from different respondents together. Trends by various key informants were looked at, described and interpreted.

### **3.7 Ethical Issues**

Proposal was submitted to the Research and Ethical Review Committee for approval. Permission was also obtained from the Regional and district director of health services as well as the District Chief executive and the chiefs and elders of the community. Informed consent was sought from respondents. This was done both verbally and in a written form and the calibre of people to be interviewed.

A written Consent was sought from heads of house-holds before interview was conducted, and they had the right to opt out if so wished.

All information gathered was handled anonymously and confidentiality and privacy was assured. The information was re-coded and numbers alone assigned, only supervisor and principal investigator had access to this information.

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### **3.8 Limitations**

Failure of key informants to fulfil appointments made with them.

The poor road network and dusty nature of the roads rendered some places inaccessible.

## CHAPTER FOUR

### RESULTS

#### 4.1 Characteristics of the Sample

Overall 390 households were involved in the study. Of the 390 household heads, 52.6% (205) were males and 47.4% (185) were females. The average age of the household head was 45.1 (CI 43.42-46.78) years; with a minimum age of 17 years and the maximum of 108 years. With regards to marital status 73.6 % ( 287) were either married or co habiting, 10 % ( 39) were widowed, 7.4% (29) were divorced and 9.0% (35) were never married or currently single.

The majority, 49.5% (193) of the respondents (household heads) had attained primary education, while 20.0% (78) had no education, 26.5% (104) had attained secondary education and a few, 4.0% (15) had attained tertiary education. Majority of the respondents, 52.8% (196) were peasant farmers followed by traders 19.7% (73), professional workers government or privately employed were 12.4% (46) and artisans and labourers were 15.1% (56). Most of the surveyed households in Agona East were in the second wealth quintile (32.9%), this is followed by those in the third quintile (29.3%) and then the fourth quintile (Table1).

**Table 1: Sociodemographic characteristics of household heads in Agona East in the Central Region of Ghana, 2015**

Sociodemographic characteristic	Proportion (%)
<b>Age group (years)</b>	
≤19	4(1.0)
20-29	81(21.0)
30-39	86(22.0)
40=49	92(23.5)
≥50	127(32.5)
<b>Gender</b>	
Male	205(52.6)
Female	185(47.4)
<b>Level of education</b>	
No education	78(20.0)
Primary	193(49.5)
Secondary	104(26.5)
Tertiary	15(4.0)
<b>Employment status</b>	
Employed	369(94.6)
Unemployed	21(5.4)
<b>Occupation</b>	
Professional	46(11.8)
Trader	73(18.7)
Artisan	54(13.8)
Labourer	2(0.6)
Farmer	215(55.1)
<b>Marital status</b>	
Married	287(73.6)
Never Married	35(9.0)
Divorced	29(7.4)
Widowed	39(10.0)
<b>Wealth quintile</b>	

Poorest	37(9.5)
Second	108(27.7)
Middle	94(24.0)
Fourth	66(17.0)
Richest	85(21.8)

A total population of 1196 were in the 390 households, 45.9 % (549) were males 54.1% (647) were females and 2.3% of these females were pregnant. Of the total population 17.6% (210) were children under age five.

House hold size ranges from 1to 12 with a mean size of 4.2 (95% CI 4.05-4.43) (Table 2).

**Table 2: Household characteristics in Agona East in the Central Region of Ghana, 2015.**

Characteristics	Proportion (%)
<b>Age of household members(years)</b>	
<5	210(17.6)
5-14	384(32.1)
15-49	518(43.3)
≥50	84(7.0)
<b>Gender of household members</b>	
Male	549(45.9)
Female	647(54.1)
<b>Women pregnant</b>	12(2.3)
<b>Household size</b>	
1-4	209(53.6)
5-7	163(41.8)
≥7	18(4.6)

#### 4.2 ITN Ownership and sources in the households

Of the 390 households interviewed, 76.2% (297) were in possession of any net either retreat able or long lasting insecticide treated bed nets, while 2.8% did not have any mosquito net. The mean of net ownership of 2 nets per a household (95% CI 1.72-1.80) . It was found out that there was a relationship between net ownership and level of education of head of household (Table 3). Majority of the household heads (36.4%) who had any kind of nets in their households had attained primary education. Table 3, revealed that those with no education were least likely to possess nets. Out of the household heads with no education 4.4 % (17) had no nets..

**Table 3 Distribution of level of education of head of household with household net possession in Agona East in the Central Region of Ghana, 2015.**

Level of education of head of head of household	Net possession	
	Yes (%)	No (%)
No education	61(15.7)	17(4.4)
Primary	142(36.4)	51(13.0)
Secondary	80(20.5)	24(6.1)
Tertiary	14(3.6)	1(0.3)
<b>Total</b>	<b>297(76.2)</b>	<b>93(23.8)</b>

p-value=0.339

Household heads engaged in farming formed the majority (55.0%) of those who owned nets (42.8%), they also formed majority those that do not possess any net (12.2%) (Table 4).

**Table 4 Distribution of occupation of head of household with household net possession in Agona East in the Central Region of Ghana, 2015.**

Occupation of head of household	Net possession	
	Yes	No
	Proportion (%)	Proportion (%)
Professional	36(9.2)	10(2.6)
Trader	50(12.8)	23(5.9)
Artisan	42(10.8)	12(3.1)
Labourer	2(0.5)	0
Farmer	167(42.8)	48(12.2)
<b>Total</b>	<b>297(76.2)</b>	<b>93(23.8)</b>

p- value= 0.431

### 4.3 Prevalence of net use Among Household Members

Of the total households 64.4% (251/390) reported use of any kind of net. Of this total number of households that reported use, 23.1% had more than 3 nets in their households, 35.5% of these households had 2 nets and the majority (41.4%) of households with only 1 net. (Table 5). And out of this 59.4% (149/251) of them used nets, giving a total household net use of 38.2% (149/390) Household number of nets was found to be significantly associated with household net use in the bivariate analysis and the odds of net use is

increased with higher household net density compared to households with lower net density (Tables 6 & 7) Majority of these nets (38.7%) were sourced from mass campaigns and from the clinic (24.4%), the least sourced was the vending sites. Of the total nets used, 96.4% of them were reported to be the long lasting insecticide treated net (LLIN) type of net and the rest 3.6% were the retreatable ones.

**Table 5: Reported net use in households in Agona East in the Central Region of Ghana, 2015**

Number of household nets	Proportion (%)
1	104(41.4)
2	89(35.5)
□3	58(23.1)

Table 6 Distribution of net use in households in Agona East in the Central Region of Ghana, 2015.

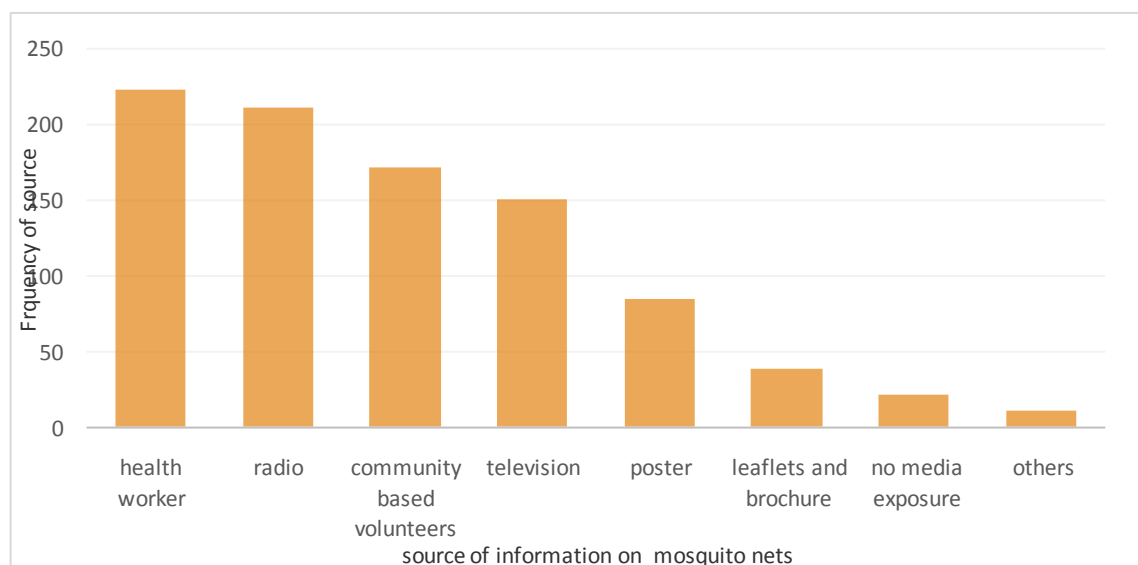
Number of household nets	Use of net No (%)	Non- use of net No (%)	Significance (P - value)
1	64(61.5)	40(38.5)	
2	50(56.2)	39(43.8)	<b>0.001</b>
□3	35(60.3)	23(39.7)	

Table 7 Estimates of the effect of number of household nets on the probability that a net was used the prior night in Agona East in the Central Region of Ghana, 2015.

Number of household nets	Use of net No (%)	Non -use of net No (%)	OR(95% CI)
1	64(61.5)	40(38.5)	1.0
2	50(56.2)	39(43.8)	1.2(0.7-2.2)
□3	35(60.3)	23(39.7)	1.2(0.5-2.0)

The odds of net use in the household is increased with a higher number of household nets compared to a low number of household net ownership (Table 7).

To ascertain source of information on net use the heads were asked their source of information on net use. More than one option was possible. The predominant source of information on net use were the mass media and through health workers (figure 3).



**Figure 3: Sources of information on net use in Agona East in the Central Region of Ghana, 2015**

**Table 8: Net use among household in Agona East in the Central Region of Ghana, 2015.**

Category	Sleeping under ITN		Significance (P - value)
	Yes (%)	No (%)	
<b>Age of household members (years)</b>			
<5	110(9.2)	100(8.4)	0.244
5-14	212(17.7)	172(14.4)	
15-49	306(25.6)	212(17.7)	
≥50	49(4.1)	35(2.9)	
<b>Women pregnant</b>	6(0.5)	6(0.5)	0.117

#### 4.4 Level of Awareness on net use

The level of awareness on net use amongst the 390 households in Agona East indicated that, majority of the household heads 87.2 % ( 340) responded 'yes' to having had an information on the use of net and 12.6% denied having had any information on net use.

Thirty three percent (130) of the house heads responded 'yes' to having discussed the use of net with the family or friends but a majority of them (66.7%) did not discuss net use with their family members or friends (table 9). Examining net use with level of awareness indicates that a majority of heads (34.2%) who used nets had ever had information on net use. On the other hand, having discussed net use with the family or friends was least likely to have used net (7.4%). Majority of those who did not discuss net use (66.7%) used it (35.8%). Those who discussed net use (33.3%) a majority of them (25.9%) failed to use nets the prior night (Table 10). Level of awareness of head of household on net use was significant in the univariate analysis. The odds of net use is increased by almost 4 times comparing not having had any information on net use to having had any information on net use. Similarly having discussed net use with family or friends is 4 times likely to have used a net compared to having ever discussed net use in the past month with friends or family members (Table 11). The predominant subject discussed was why the family should sleep under a bed net, all other reasons were equally predominantly discussed (Table 6) (Table 9). The predominate source of information on net use were the health worker (224/390) followed by the radio (211/390), the community based volunteers (172/390) and through posters (85/390). A minority of the heads (21/390) had no form of media exposure, the other sources of information included family members and at school amongst others (figure 2). Predominate sources of information are obvious since in most district set ups these are the foot soldiers and with radio it is one of the commonest source.

**Table 9 level of awareness in household heads in Agona East in the Central Region of Ghana, 2015**

Subject	Proportion (%)
<b>House hold head has ever had information on net use</b>	
No	50(12.8)
Yes	340(87.2)
<b>House hold head has discussed with family or friends about net use the last one month</b>	
No	260(66.7)
Yes	130(33.3)

**Table 10: Awareness of head of household on net use in households in Agona East in the Central Region of Ghana, 2015**

Issue on awareness in terms net use	Use of net No (%)	Non-use of net No (%)	Total (%)	P value
<b>House hold head has ever had information on net use</b>				
No	35(9.0)	15(3.8)	50(12.8)	0.001
Yes	134(34.2)	206(53.0)	340(87.2)	
<b>House hold head has discussed with family or friends about net use the last one month</b>				
No	140(35.8)	120(30.9)	260(66.7)	0.001
Yes	29(7.4)	101(25.9)	130(33.3)	

**Table 11 Effect of level of awareness of head of household on net use in households in Agona East in the Central Region of Ghana, 2015**

Issue on awareness in terms net use	Use of net No (%)	Non-use of net No (%)	Total (%)	cOR (95% CI)
<b>House hold head has ever had information on net use</b>				
No	35(9.0)	15(3.8)	50(12.8)	1.0
Yes	134(34.2)	206(53.0)	340(87.2)	3.59(1.86-6.92)
<b>House hold head has discussed with family or friends about net use the last one month</b>				
No	140(35.8)	120(30.9)	260(66.7)	1.0
Yes	29(7.4)	101(25.9)	130(33.3)	4.06(2.45-6.72)

**Table 12: Subjects discussed by house hold heads to their family or friends in Agona East in the Central Region of Ghana, 2015**

Subject	Proportion (%)
Why you and your family should sleep under nets	89(22.8)
What treated nets(LLIN) are	61(15.6)
How to use treated nets	60(15.4)
How to care for the treated nets	68(17.4)
How to hang nets	55(14.0)
Who should use treated nets	60(15.4)

#### **4.5 Household Factors Influencing ITN use**

Household factors were cross tabbed with household sleeping under any net prior to the survey. A majority (17.7) of those who slept under nets were from households whose heads were 50years and above, interestingly the majority of those who did not also sleep under nets were from households with heads of similar age group. The likelihood of a household member sleeping under net was more with older household heads. However, influence of household head age on the household use of net did not show significance (Table 13),

Household use of net the prior night with level of education of head of household indicated a greater likelihood of net use among households with heads who had attained primary education or no education (39.5%) as compared to those households with heads with higher educational attainment (17.2%). A critical look at the table shows that even though there were a few of household heads with tertiary education, two thirds of them had their households sleeping under nets. Level of education of household head did not show significance with household net use (Table 13).

Households with male heads (33.5%) were more likely to have slept under nets compared to households with female heads (23.2%). More than half of the households with female heads (24.3%) did not sleep under nets (Table 13). Influence of household head gender on household use of net is significant and the likelihood household net use with female heads is decreased by 55% compared to households with male household heads (Table 14).

Majority of Households (54.4%) with heads engaged in some form of employment used net and similarly majority of households (40.2%) with employed household head did not sleep under net. Most these household heads are peasant farmers and they form the chunk of the employed household heads. Influence of employment on household use of net however, was not significant (13).

Household level of wealth was not significantly associated with household net use, however individuals from the richest households (13.1%) and second quintile households (17.2%) and middle quintile (13.3%) were more likely to have slept under net the previous night compared to households in the poorest quintile (Table 13).

House hold size was not significantly associated with household sleeping under net, however increasing household size decreased the likelihood of the household sleeping under net the previous night (Table 13) (Table 14).

**Table 13: Distribution of households who slept under ITN the prior night in households with at least one ITN in Agona East in the Central Region of Ghana, 2015.**

Socio-demographic Characteristics	Non-use of net No (%)	Use of net No (%)	Significance (P - value)
<b>Age of head of household (years)</b>			
<19	2(0.5)	2(0.5)	0.680
20-29	38(9.7)	43(11.0)	
30-39	37(9.5)	49(12.6)	
40-49	34(8.7)	58(14.8)	
>50	58(14.9)	69(17.7)	
<b>Level of education of head of household</b>			
No education	32(8.2)	46(11.8)	0.651
Primary	85(21.8)	108(27.7)	
Secondary	47(12.0)	57(14.6)	
Tertiary	5(1.3)	10(2.6)	
<b>Gender of head of household</b>			
Male	74(19.0)	130(33.5)	<b>0.003</b>
Female	95(24.3)	91(23.2)	
<b>Employment status of head of household</b>			
Employed	157(40.2)	212(54.4)	0.190
Unemployed	12(2.1)	9(2.3)	
<b>Occupation of head of household</b>			
Professional	18(4.6)	28(7.2)	0.329
Trader	36(9.2)	37(9.5)	
Artisan	26(6.7)	28(7.2)	
Labourer	0(0)	2(0.5)	

Farming	77(19.7)	119(30.5)	
<b>Household wealth quintile</b>			
Poorest	20(5.1)	17(4.4)	0.167
Second	41(10.5)	67(17.2)	0.185
Middle	42(10.8)	52(13.3)	0.762
Fourth	32(8.2)	34(8.7)	0.354
Richest	34(8.7)	51(13.1)	0.483
<b>Household size</b>			
1-4	99(25.5)	105(27.0)	
5-7	57(16)	98(24.2)	
≥7	10(2.5)	21(5.5)	<b>0.003</b>

Table 14 Estimates of effect of household occupants on the probability that a net was used the night before in Agona East in the Central Region of Ghana, 2015.

Characteristics	Use of net No (%)	Non-use of net No (%)	OR(95% CI)
<b>Gender of head of household</b>			
Male	74(36.3)	130(63.7)	1.00
Female	95(51.1)	91(48.9)	0.55(0.36-0.82)
<b>Household size</b>			
1-4	68(32.5)	141(67.5)	1.0
5-7	76(46.6)	87(53.4)	0.6(0.4-0.8)
≥7	10(83.3)	2(16.7)	0.1(0.1-0.4)

In the final model of analysis there was significant difference in net utilisation between individuals who come from households where the head of the household had discussion with family or friends compared to those in households where heads had no discussion about net use. (aOR=3.5) (Table 15).

**Table 15: Logistic regression of predictors of households sleeping under an ITN a night before in households with at least one ITN in Agona East in the Central Region of Ghana, 2015.**

Characteristics	aOR 95% CI	P value
<b>Household size</b> (compared to a 1-4 household size)		
5-7	1.34(0.58-3.09)	0.498
□7	1.60(0.17-16.48)	0.655
<b>Sex of head of household</b>		
Female	0.67(0.39-1.17)	0.159
<b>Number of nets in household</b>		
1	0.66(0.32-1.38)	0.272
2	1.22(0.56-2.70)	0.615
≥ 3	1.00	
<b>Having discussed net use with family or friends</b>		
Yes	3.50(1.84-6.65)	<b>0.001</b>
<b>House hold head has ever had information on net</b>		
Yes	1.03(0.41-2.64)	0.07

**Note; aOR-** adjusted odds ratio, **CI** confidence interval

Household reasons for not sleeping under net the previous night were clustered around the respondent (head of the household). These reasons could be cited once or more by the respondents. The predominantly cited reasons bordered around environmental and social factors associated with net use. Amongst them were the hot weather conditions (50/169), not having a net (72/169), disruption of sleeping arrangements (18/169), the feeling of lying in a tomb (23/169) and of course the cost of the nets (22/169) (Grabowsky et al., 2005) amongst others (Table 16). Key informants gave similar reasons for the non-use of nets. One of the women leaders had this to say; *‘the weather at this time is too hot for us to use the nets, more so the net generates a lot of heat making sleep difficult for me’* some went onto say that it made them sweat and to develop heat rashes. One of the respondents commented. *‘my children and myself sleep in one room, if we are to use nets we may not have enough space to sleep and the nets may affect our sleeping arrangement’*. One of the midwives had this to say; *‘I am alone here in this vicinity as the chief midwife and so on*

*call, I know very well that I must use nets but I get home so tired and don't even think I need to put down my net for sleep' . One of the respondents said 'the nets are not given to us for free sometimes we have to pay some money to have it especially from the market place and with our meagre income I don't think I can purchase a lot for my huge household and again I cannot go buy a net when I have so many mouths to feed' lack of financial capability was frequently mentioned by key informants as an important barrier to owning a net(. Another respondent said*

*'I have bad dreams when I sleep under the nets it is as if I am being chased in my dreams so I have stopped using it'.*

This is a belief that is held tight by some of them and was admitted by the director of health services.

*'instructions given to the nurses are that they should give the nets to the newly registered pregnant women and so some of us who did not start our antenatal clinics early did not get one', and 'I prefer the conical ones to the rectangular ones since they occupied lesser space'*

was the reason given by one of the informants who had just delivered.

*'I don't have a net because when the nets arrived at the health centres we are told it was meant it was meant for the children and pregnant women'*

was what one of the respondents said.

Some knew that it was the responsibility of the government to provide the under to provide ITNs to children under five. *'The nets brought are not enough to cater for everybody'.* Some of the informants at another breath expressed doubts about securing a net from the open market or the vending sites, *'I don't know where in this town that they sell nets'* this was what one of the respondents said. Some people expressed interest in the nets but did not know where to get one or was not sure if some were available to buy.

Reasons for sleeping under net the previous night were predominantly social and environmental, they included the presence of mosquitoes in the environment (197/221), and followed by the obvious reason that it protected us from mosquito bites (195/221) amongst others (Table17).

**Table 16: Household head reasons for not using nets in Agona East in the Central Region of Ghana, 2015**

	<b>Reasons</b>	<b>Proportion (%)</b>
<b>Environmental</b>	The weather is hot	50(30)
	There are no mosquitoes here	10(6)
<b>Social</b>	I forgot to hang the net last night	3(2)
	It makes me feel like I am lying in a tomb	23(14)
	It disrupts our sleeping arrangement	18(11)
	I don't have a net	72(42)
	It is expensive to buy	22(13)
	It is not available to buy	12(10)
	<b>Technical</b>	The size of the room are too small to hang nets
	The type of roof construction will not allow us to hang net	7(4)
	The size of net to bed is too small making it difficult to hang nets	2(1)
	I have difficulty putting down or up net	6(4)
	The net is torn so I can't hang it	21(12)
	Net is washed or retreated	3(2)

**Table 17: Household head reasons for using net the prior night in Agona East in the Central region of Ghana, 2015.**

<b>Factor</b>	<b>Reasons</b>	<b>Proportion (%)</b>
<b>Environmental</b>	There are mosquitoes here	197(89)
<b>Social</b>	It protects us from mosquito bites	195(88)
<b>Technical</b>	The size of the rooms are o k to hang nets	69(31)
	The type of roof construction allows us to hang nets	34(15)
	The size of net to bed is o k	57(26)
	It is not difficult putting up or down the net	57(26)

## CHAPTER FIVE

### DISCUSSION

Key indicator for the universal coverage in terms of net use as outlined in the WHO report is ownership. Net ownership is important to assess the effectiveness of the distribution channels of the policy implementers and suggest program modifications where there are lapses. Studies have shown the importance of ownership on utilisation in several countries including Ghana (Baume & Franca-Koh, 2011) and elsewhere. ITN ownership in study area (Atona East) was high compared to the Region (76.2% versus 69.7%, at least one net) similarly in studies done in Oromia and Amhara Regions of Ethiopia where the prevalence was 49.1% (Deressa *et al.*, 2011) and some places in Africa (Korenromp *et al.*, 2003) and in Mozambique in a post household mass campaign (Macedo de Oliveira *et al.*, 2010) where ownership was 20.6%. This reflects the massive efforts in ITN distribution in the past years especially to the hinterlands primarily implemented by NMCP/GHS. And it suggests that a strategy targeting free ITNs to rural and poorer households optimizes ownership (Pettifor *et al.*, 2008). Educational level of head of household in this study was found to influence possession of net in this study population though not significant. Respondents who had no education were least likely to possess nets (Baume & Franca-Koh, 2011). Household heads engaged in farming were the majority and therefore majority of those who possessed net. Professionals were only a few but a majority of them owned nets, this is due to the fact that the professionals are implicitly richer and could afford to buy a net.

Households with higher number of nets were likely to use nets as witnessed in most studies done elsewhere (Baume *et al.*, 2009). Campaigns aimed at giving free nets to individuals can increase ownership (Ordinioha, 2012) and by extension improve on utilisation (Koenker & Kilian, 2014). We should not forget that improving ownership alone

does not always lead to utilisation (Vanden Eng *et al.*, 2010)(Githinji *et al.*, 2010), it involves other factors which may be household factors associated with net use.

Reported household use of any kind of net was 38.2%. Net use in pregnant women is higher in Agona East District compared to the Central Region (50% verses 44.7%) according to the GDHS and similarly high in children under five in the study area compared to the Central Region (52.4% verses 51.2%), and to the findings done in Southern Sudan involving children under five and pregnant women (Eyobo *et al.*, 2014). However, this is low compared to the National target of 70% for children under age five (MOH., 2012). In the study, even though net use was good in household with children under five and pregnant women in the Agona East compared to other places, much needs to be done if we are to achieve the universal coverage and utilisation of ITNs.

Households where ITN utilisation is discussed with households and friends were more likely to use nets and least likely to use net if the head did not discuss net use with family or friends. This stresses the need for awareness in net use to optimize its use (Baume & Marin, 2007) especially through health personnel and the mass media (Bowen, 2013).

The study did not observe an association between net use and age of the heads of the households, however households with under- fives are more likely to have slept under a net the prior night. This was in contrast to the study conducted in Ethiopia by Graves *et al.*, (2006) who found that an increased net use was associated with age 25-49 years (OR=1.4 CI 1.2-1.7) as compared to children under 5 years. Ng'ang'a *et al* in 2009 in Central Kenya in their study to assess bed net use and associated factors in rice farming communities observed a significant variation in bed net use with age, unlike in Agona East district which is also predominantly a farming community. Most of the heads were in the middle age group 20-49 years and odds of net use was high within this age group as compared to the extreme age groups in the bivariate analysis. It is obvious that a

household head will be in a certain age group at least above 18 years in Ghana, since at this age most Ghanaians will want to be on their own.

Levels of education of the heads was not observed in the study to be significantly associated with net use by the household heads. This was in contrast with the Ng'ang'a *et al* study in central Kenya, where educational levels of the household head or spouse was significantly associated with net use. Most of the household heads in Agona East either had no education or attained a secondary education. The odds of net use was three times in those who attained tertiary education compared to their compatriots who had no education. Higher educational standard is known to be associated with net use as witnessed in a study in a rural population in northern Ethiopia (Belay & Deressa, 2008) In the bivariate analysis of the hospital based study conducted by Iloh *et al* in South Eastern Nigeria observed that secondary education and above used ITNs more than those who had primary education and below. It is believed that well educated people are the most informed in the and likewise their household in terms of net use. There are a few of them in such semi urban areas as envisaged in the study but with a relatively high use of nets in their households. Contrastingly Adogu and Ijemba, in 2013 found that the use of ITN the night before was low for those with tertiary education but significantly increased for those with secondary and primary education respectively. This is to say that level of education is quiet crucial, but with our folks in such areas attaining higher education is difficult because of the associated cost of education. May be with promised free education we hope to see a lot people in school and graduating to high levels to improve on net use and to help eradicate malaria.

Gender of the household head was clearly significant with household use of nets. This finding were found in studies done in Ethiopia(Agyepong & Manderson, 1999). The study observed that for female heads the odds of household net use was reduced by 5 folds

comparing them to the males, this was a significant finding but was in contrast with what Ngondi *et al* saw in the individual study done in Ethiopia, the study found female gender to be significantly associated with increased net use (Ngondi *et al.*, 2011), Pethifor *et al* , 2008, also found same with net use in Kinshasa, Democratic Republic of Congo. This difference in findings may be attributed to the settings as a 'nursing mother 'and a' household head'. Secondly, being a household head is not a common place for women in Ghana and possibly elsewhere in Sub Saharan Africa.

Our study did not observe a significant probability of household net use with occupation of head of household, .Ng'ang'a *et al.*, (2009) on the other hand observed a level of significance with net use. And so also was Negash *et al*, (2012) in Ethiopia. A number of the heads were farmers and the least were professionals, the odds of net use in the other forms of occupation were low compared to the professionals. This may be seen in the trend of level of education, professionals are the more educated.

A study done at the Medical Research unit of the Albert Schweitzer hospital in Lambrene, Gabon, found levels of socioeconomic status to be inversely related to bed net use (Goesch, 2008). Socioeconomic status of heads of households in the study on the other hand did not come out to be significant in terms of net use. The extremes of wealth quintile in the study showed high odds of net use compared to the second and middle groups. Most respondents' households in the study lie within the second and middle wealth quintile.

Household size in the study was not observed to be significant in terms of net use, but the dominant house hold sizes were one and two. The bivariate analysis showed an increasing odds of net use in households with high density population as compared to the ones with low density population. Much is not known about household sizes and net use, but

nevertheless they are good parameters used during household net distribution, hence ownership.

Level of awareness was observed to significant in the study, the odds of net use in households whose heads have discussed mosquito net with family members or friends are 3.5 times likely to use nets the previous night compared to those in households whose heads failed to discuss mosquito nets with their friends or families, In outlining the impact of awareness through mass media campaign on net use, studies have shown the impact of awareness in net use (Bowen *et al.*, 2013)(Owusu Adjah & Panayiotou, 2014). Bennet *et al* in 2012, in their study in Sierra Leone household heads who heard malaria messages were more likely to have slept under ITN. We cannot therefore down play the essence of creation of awareness within the populace to encourage net use within households. A descriptive study carried out in the Northern state of Nigeria found a third of the women were aware of ITN prevention but less than a third had ever used (Musa *et al.*, 2009). Awareness though an important tool in assessing net use, increased awareness is not always commensurate with net use in households, that is to say that there is more to it than the awareness or discussing net use with people or having an information on net use. In this study a number of households whose heads had information on net use were more likely to have used net compared to having had information on net use.

In assessing household reasons for non-use of nets the dominant answers given were equally observed in a review of published literature on net use when one owned one by Pulford *et al* in 2011 that, discomfort, primarily due to heat, and perceived (low) mosquito density were the most widely identified reason for non-use. Baume *et al* in 2009, also observed that the most reason for net non-use was there are few mosquitos around or malaria was not a serious problem. In the study issues about weather was obvious because of the study period, which was actually during the hot dry season. In a study done by

Atieil *et al* in 2011, the compliance rate in terms of net use was significantly higher during the rainy season compared with the dry season. In the qualitative analysis some of these issues came up during the key informant interview. Unavailability of air conditioners in these homes and even in the presence of an air conditioner there is a power crisis in the country will hamper net use in some homes. Most of our folks want to be given nets free of charge and would not be prepared to even pay a penny to acquire it, hence the cost issue even when nets are available at certain vending sites. The dominant use of LLINs in households is a manifestation of benefit from mass campaigns, more than half of the nets in households were as a result of free donations from mass campaigns and from health personnel.

The dominant reason for use of nets was obvious, protection from mosquito bite was the definition given for an ITN in the key informant interview. These are tangible reasons and need to be encouraged.

This obvious reason for the use of net was the predominant answer to what a mosquito net was in the key informant interview with some of the respondents. This definition runs through most of the interviews held, the name given to the net was put literally as '*mosquito house*' not to mean a house for mosquitoes but are 'house' protecting us from the bite of the mosquito. This is to say that most people had knowledge of ITN but putting this knowledge to action was the problem.

The major source of information on net use clearly states the role of the media in improving the health needs of the populace (Owusu Adjah & Panayiotou, 2014)(Bowen, 2013)

## CHAPTER SIX

### CONCLUSION AND RECOMMENDATIONS

#### 6.1 Conclusion

This study clearly shows a gap between household possession of net and usage and it also demonstrates that in Agona East District of Ghana ITN use in households is significantly associated with household head level of awareness in terms of ITN use, which should be incorporated into programme policy. ITN use in Agona East in the Central Region of Ghana is low and could be stepped up by increasing the level of awareness and stepping up mass campaigns offering free nets to the populace. Household factors such as household net density and household size have an influence on net use, they affect the affect consistency in utilisation of ITNs and the proper deployment. This is the knowledge of the study.

#### 6.2 Recommendations

##### **National Malaria Control Programme (NMCP)**

1. Should continue the free distribution of ITNs to improve on household ownership and utilisation.
2. Should continue mass education through the media and health education or talks in the communities by health workers so as to improve on level of awareness on net use.
3. Coerce government to support the use of ITN as a preventive measure for malaria.

##### **Agona East District Health Directorate**

1. Communities should be sensitized on the importance of ITN as a preventive measure for malaria
2. Improved information and communication could be used to erase erroneous perceptions and in addition improve on the awareness level in the community.

### **Agona East District Health Centers**

1. Educate clients on the use of ITN as a preventive measure for malaria.
2. Educate clients on the consistent and correct use of ITNs.

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## Appendix A: Questionnaire for Household Heads

### FACTORS INFLUENCING INSECTICIDE TREATED MOSQUITO BED NET USE IN THE AGONA EAST DISTRICT-CENTRAL REGION.

#### INTRODUCTION AND CONSENT

Hello, my name is .....(*Interviewers name*) I am working with..... (*Name of organization*). My telephone number is..... (*Interviewers' telephone number*) and our E-mail address is *gkobanthony@yahoo.com*. We are conducting a survey about the use of Insecticide treated bed nets (ITNs) in the Agona East District. Malaria is gotten through the bite of a mosquito, we can prevent ourselves from getting the disease if we protect ourselves from the bite of the mosquito. A number of strategies or interventions have been put in place to prevent us from getting malaria, and one of such is the use of ITNs. The past decade has witnessed the distribution of ITNs in various ways so as to increase ownership. This survey is to determine the factors that influence the use of ITNs. The information we collect will help address future issues on ITNs use. I am assuring you that all the information you give will be kept confidential. Furthermore, privacy will be upheld and there will be no mention of name should the results of the study be published or at any medical meetings. The questions asked may make you or the rest of the household feel uncomfortable. I must also make you aware that there is no personal benefit to you and the rest of the household for participating. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go onto the next question or you can stop the interview at any time.

Do you have any questions?

May I begin the interview now?

SIGNATURE OF INTERVIEWER .....OR

**THUMB PRINT**

DATE.....

Did respondent agree to be interviewed?.....Yes/ No

**IDENTIFICATION**

Sub district Name.....

Community Name.....

Household Number.....

Total Persons in House hold.....

**DERMOGRAPHIC CHARACTERISTICS OF HEAD OF HOUSEHOLD** (*tick or write appropriately*)

Name .....

Age .....

Sex .....M/F

Marital status.....

Married

Never Married

Divorced

Widowed

Last educational level attained.....

No education

Primary

Secondary

Tertiary

Employment status.....

Employed

Not employed

Occupation.....

Professional

Trader

Artisan

Labourer

Farmer

**SOCIOECONOMIC STATUS OF HOUSEHOLD**

Does your house hold own or have .....

A television

A refrigerator

A telephone (mobile or land)

A bicycle

A motor bike

A car

An electricity

What is the main source of drinking water?

- Piped borne water
- Bore hole
- Dug well
- Water from spring
- Rain water
- Tanker truck
- Surface water (river/dam/lake/pond/stream etc.)
- Bottled water
- Others (specify)

How many rooms are used for sleeping?

- One
- Two
- Three
- Others (specify)

What is the main floor material? (*Observed*)

- Natural floor
- Rudimentary floor (palm branches/wood/etc.)
- Finished floor (carpet/cement/ceramic tiles/ etc.)
- Others (specify)

## HOUSEHOLD LISTING

We would like to have some information about the people living in your household or staying with you now.

USUAL RESIDENTS AND VISITORS	RELATIONSHIP TO HEAD OF HOUSEHOLD *	SEX	RESIDENCE		AGE	CURRENTLY PREGNANT
Please give me the name(s) of the person(s) who usually live in your household and guest(s) who stayed overnight	What is the relationship of (NAME) to head of household? ( <i>quote code below</i> )	Is (NAME), male or female? ( <i>circle appropriately</i> )	Does (NAME) usually live here? ( <i>circle appropriately</i> )	Did (NAME) stay overnight? ( <i>circle appropriately</i> )	How old is (NAME)?	If female and in reproductive age ASK, is (NAME) Pregnant? ( <i>circle appropriately</i> )
(1)	*	M F	YES NO	YES NO	IN YEARS	YES NO D/K N/A
(2)	*	M F	YES NO	YES NO		YES NO D/K N/A
(3)	*	M F	YES NO	YES NO		YES NO D/K N/A
(4)	*	M F	YES NO	YES NO		YES NO D/K N/A
(5)	*	M F	YES NO	YES NO		YES NO D/K N/A
(6)	*	M F	YES NO	YES NO		YES NO D/K N/A

## \*CODES FOR RELATIONSHIP TO HEAD OF HOUSEHOLD

02-WIFE/HUSBAND    03-SON/DAUGHTER    04-SON IN-LAW/DAUGHTER IN-LAW

05-GRAND CHILD    06-PARENT    07-PARENT IN-LAW

08-BROTHER/SISTER    09-OTHER RELATIVE    10-ADOPTED/FOSTER/STEPCHILD

11-NOT RELATED    12- DON'T KNOW

## NET POSSESSION AND USAGE

Does your household have any mosquito nets that can be used while sleeping?.....Yes/No? (*Circle appropriately*)

How many mosquito nets does your household have.....?

How many people in the house hold slept under a mosquito net last night?

Ask respondents to show you all net(s) in household	Net 1	Net 2	Net 3	Net 4
	Observed ...yes/no Hanging...yes/no	Observed ...yes/no Hanging...yes/no	Observed.....yes/no Hanging....yes/no	Observed.....yes/no Hanging....yes/no
	LLIN Source.....	LLIN Source.....	LLIN Source.....	LLIN Source.....
	RETREATABLE NET Source.....	RETREATABLE NET Source.....	RETREATABLE NET Source.....	RETREATABLE NET Source.....
	ORDINARY NET Source.....	ORDINARY NET Source.....	ORDINARY NET Source.....	ORDINARY NET Source.....
	OTHERS Source.....	OTHERS Source.....	OTHERS Source.....	OTHERS Source.....
	DON'T KNOW Source.....	DON'T KNOW Source.....	DON'T KNOW Source.....	DON'T KNOW Source.....
	NET 1	NET 2	NET 3	NET 4

*Example of sources; clinics, vendors, pharmacy shops, recent mass campaign, health personnel (nurse or midwife or health care worker or community based volunteers)*

What are the Conditions of the net(s)? *(Tick or circle good or bad)*

Net 1	Net 2	Net 3	Net 4
Good	Good	Good	Good
Bad	Bad	Bad	Bad

Did you sleep in the mosquito net last night? *(For individual members of the house hold to answer followed by filling of the table below accordingly)*

NAME(S) of person(s)	Is (NAME), male or female? <i>(circle appropriately)</i>	Age IN YEARS	Pregnant or not	Slept (Y/N) <i>(write Y or N)</i>
(1)	M    F		YES NO D/K N/A	
(2)	M    F		YES NO D/K N/A	
(3)	M    F		YES NO D/K N/A	
(4)	M    F		YES NO D/K N/A	
(5)	M    F		YES NO D/K N/A	
(6)	M    F		YES NO D/K N/A	

Did you sleep under the mosquito net.....Yes/No (*for head of house hold to answer*)

If yes, why?

Suggested options (tick appropriately)

- Environmental

The weather is too cold

There are mosquitoes here

- Social

It protects us from mosquito bites

- Technical

The size of the rooms are ok to hang nets

The type of roof construction allows us to be able to hang nets

The size of net to bed is o k

It is not difficult putting up or down the net

- Other reasons

If no, why?

Suggested options (*tick appropriately*)

- Environmental
  - The weather is too hot
  - There are no mosquitoes here
- Social
  - I forgot to hang the net last night
  - 'It makes me feel like I am lying in a tomb'
  - It disrupts our sleeping arrangement
  - I don't have a net
  - I returned home too late to hang the net
  - It is expensive to buy
  - It is not available to buy or purchase
- Technical
  - The size of the rooms are too small to hang nets
  - The type of roof construction will not allow us to hang net
  - The size of net to bed is too small making it difficult to hang nets
  - I have difficulty in putting up or down net
  - The net is torn so I can't hang it
  - Net is washed or retreated
- Other reasons

LEVEL OF AWARENESS ON NET USE (*tick appropriate response*)

Has your household ever had any information on mosquito nets?.....Yes/ No

Where did you get this information?

Television	<input type="checkbox"/>
Radio	<input type="checkbox"/>
Poster	<input type="checkbox"/>
Leaflets /brochures	<input type="checkbox"/>
Health worker	<input type="checkbox"/>
Community based volunteer	<input type="checkbox"/>
No media exposure	<input type="checkbox"/>
Others (specify)	<input type="checkbox"/>

If yes what was the information about? (*Open ended question with options*)

Air the net in the shade 24 hours before use.	<input type="checkbox"/>
Regularly OR daily sleep under nets to protect us from mosquito bite	<input type="checkbox"/>
Choose nets that fit the size of the bed	<input type="checkbox"/>
To hang nets before nightfall	<input type="checkbox"/>
Wash dirty net with water and mild soap and dry in only shady areas	<input type="checkbox"/>
Tuck in net under the mattress or mat	<input type="checkbox"/>
Torn nets can be sewn	<input type="checkbox"/>
Do not place lighted candle near the net	<input type="checkbox"/>
Others (specify)	<input type="checkbox"/>

Have you discussed with your family or friend in the last month about ITNs?..... Yes/No

If yes, what did you discuss? (*Open ended question with options*)

Why you and your family should sleep under a treated net?

What treated nets (LLIN) are?

Who should use a treated net?

How to use treated nets (LLIN)?

How to care for your treated net?

How do you hang your treated nets when you want to sleep?

Others (specify)

## **Appendix B: Key Informant Guide**

### **FACTORS INFLUENCING THE UTILIZATION OF INSECTICIDE TREATED NETS IN AGONA EAST IN THE CENTRAL REGION OF GHANA.**

Hello, I am Dr. Kobla Gershon Anthony, a student of University of Ghana and with the Ghana Field Epidemiology and Laboratory training and the convener. We are conducting a survey on the use of insecticide treated mosquito nets.

Malaria is a disease caused by the bite of a mosquito .Every year several hundreds of millions of become ill with malaria. Over 90% of cases and deaths occur in sub-Saharan Africa with children and pregnant women being affected mostly. In Ghana the disease is the number one cause of out –patient attendance and admissions. A number of strategic Interventions are available for the prevention of malaria and one of such interventions is the use of insecticide treated mosquito nets. The past decade has witnessed the country wide distribution of insecticide treated mosquito nets in various ways so as to increase ownership. . This survey is to determine the factors that influence the use of ITNs. The information we collect will help address future issues on ITNs use. This discussion would be audio taped, but I am assuring you that all the information you give will be kept confidential and tapes kept as long as possible but well secured with me the principal investigator the only one with access. Furthermore, privacy will be up held and there will be no mention of name should the results of the study be published or at any medical meetings. The discussions may make you feel uncomfortable. I must also make you aware that there is no personal benefit to you and the rest of the household for participating in this discussion but should the interview go too long or late you have the right to stop me. You don't have to be in this interview session, but we hope you will agree to be part since your views are important. If interview is going too much into you time and session is becoming irrelevant, just let me know and I will act accordingly.

If you wish to have some matters relating to the study, farther clarified, do not hesitate to contact me on phone number 0244751602.

If there are no questions can we set the ball rolling?

## Background Information

*The following must be recorded*

- Name and Designation
  - Gender
  - Location
  - Date and time of interview
- 
- What is ITN?
  - What is it used for?
  - Who has to use ITN?
  - Why do/ don't we use it?
  - Which other way do you use the nets for?
  - Do you use ITNs
  - If yes. Why?
  - If no, why?
  - How can we get more people to sleep under an ITN every night?
  - Why are treated Nets the best way to prevent malaria? Bearing in mind the following
  - Convenience in terms of net set up and dismantling
  - Potential hazard and safety concerns
  - Issue of family composition and nature of accommodation
  - Humid weather conditions
  - Perception of effectiveness of net
  - Beliefs

- Views of acceptability, typical conditions when a net is used and when not used
- Factors that put people off not using the net, aspects of the net that the people like or did not like and so not use the net
- Decision making on the use of nets
- Sources of information on net use

THANK YOU VERY MUCH FOR YOUR TIME