SCHOOL OF PUBLIC HEALTH

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FACTORS INFLUENCING USAGE OF INSECTICIDE TREATED BED NETS IN THE SUNYANI WEST DISTRICT

BY

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DECLARATION

I Emmanuel Mensah Angmorteh declare that except for other people's investigations/ work which have been duly acknowledged, this work is the result of my own original research, and that this dissertation, either in whole or in part has not been presented elsewhere for another degree

Emmanuel Angmorteh Mensah Date

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Student

Dr. Francis Anto Date

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Supervisor

DEDICATION

This piece of work is dedicated to parents; Mr Peter Tetteh Mensah and Mrs Mary Koryoe Mensah

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All glory be to God for how far he has brought us. For giving me sound health and guiding/protecting me through this study successfully.

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ABSTRACT

Background: Although several strategies including large scale deployment of ITNs have been implemented by various stakeholders including the Ghana Health Service to fight malaria, the disease remains the leading cause of morbidity in the Sunyani West district. The study determined the level of household ownership and utilization of ITNs and associated factors in the Sunyani West District.

Methods: The Sunyani West district has five sub districts. These sub districts served as the strata. In every sub district, all the communities were numbered and random number generator used to select one community each. After these five communities have been selected from the sub districts, the sample size was shared proportionately per the population of the community. Systematic sampling method was used to select household participants using community registers as sample frame. Pregnant women were identified through snowball sampling.

Results: The study revealed that 78.93% of household respondents and 86.74% of pregnant women had at least one net but usage was 48.54% (CI: 43.39-53.71) for pregnant women and 69.06% (CI: 65.03-72.89) among under-fives. Use of other malaria prevention methods [AOR = 0.009, 95%CI (0.003-0.026)], partner influence [AOR = 0.68, 95%CI (0.140-0.359)] and receipt of free nets [AOR = 4.83, 95%CI (2.585-9.035)] were associated usage. About 30% of the study population used other malaria prevention methods to protect themselves against malaria.

Conclusion: ITN ownership was high but ITN use among pregnant women and children was lower than the expected levels of 85%. Among household respondents, receipt of free net and the use of other methods influenced ITN use. Partner influence reduced net use among pregnant women. Exposure to media messages and mass distribution of ITNs promoted net use at the community level.

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LIST OF ACRONYMS

AMPM(s)	Alternative Malaria Prevention Method(s)
ANC	Antenatal Care
BCC	Behavior Change Communication
CHN	Children
CWC	Child Welfare Clinics
CHPS	Community Based Health Planning and Service
DHD	District Health Directorate
DHMT	District Health Management Team
DHS	Demographic and Health Survey
GAR	Greater Accra Region
GHS	Ghana Health Services
GHS-ERC	Ghana Health Services Ethical Review Committee
GMPR	Ghana Malaria Programmes Review
IE&C	Information Education and Communication
IRS	Indoor Residual Spray
ITN(s)	Insecticide Treated Net(s)
IVM	Integrated Vector Management
IPTp	Intermittent Preventive Treatment in Pregnancy

LLIN(s)	Long Lasting Insecticide Nets(s)
MICS	Multi Cluster Indicator Survey
NMCP	National Malaria Control Programme
OPD	Out Patient Department
RCH	Reproductive and Child Health Unit
SWDHA	Sunyani West District Health Administration
SWDHD	Sunyani West District Health Directorate
UNICEF	United Nations Children's Fund
URTI	Upper Respitory Tracts Infections
USAID	United States Agency for International Development
UWR	Upper West Region
WHO	World Health Organiation
WIFA	Women In Fertility Age

CHAPTER ONE

INTRODUCTION

1.1 Background

The World Health Organization's universal plan for malaria control recommends that the malaria control efforts of its member states should ensure that all people living within high risk of malaria zones are protected through the provision, use and timely replacement of long-lasting insecticidal nets or, where appropriate, the application of indoor residual spraying (WHO, 2015). For this reason, insecticide-treated nets (ITNs) coverage to fight malaria have been increased tremendously by many malaria endemic countries including Ghana through mass free distribution and continuous distribution of ITNs. In spite of all this efforts, not much success have been achieve against the fight of malaria because individual who receive the nets are not using them. It has also been realized that the programmes lack sufficient follow-up and appropriate assessment of factors affecting the use of ITNs (Berkessa, Oljira, & Tesfa, 2015). Even though ITN delivery has tremendously increased in most Sub-Saharan countries where malaria rates are high since 2005, there is poor feedback on population based use of nets owned, area exact reasons for non-use and potential impacts of variation in usage of ITN on malaria transmission (Atieli et al., 2011). To attain continued control of malaria in malaria rampant countries, increasing domestic coverage of nets alone is not adequate. ITNs must be consistently and appropriately used for maximum effectiveness. Public health strategies and efforts should address issues concerning utilization and care of ITNs. Rigorous health education and community mobilization efforts should be used to effect the exact reasons identified as affecting the acquisition and use of ITN (Berkessa et al., 2015). Some these public health intervention

could be intensive Behaviour Change Communication after mass ITNs distribution to encourage beneficiaries to hang and use the nets (Kilian et al., 2016).

1.2 Problem Statement

Although several strategies including large scale deployment of ITNs have been implemented by various stakeholders including the Ghana Health Service to fight malaria, the disease remains the foremost cause of illness in the Sunyani West district (DHMT Report, 2015). Available data indicate that 45.5% of all hospital cases for the year 2013 was due to malaria and 38.5% of all cases in 2014 was also attributed to malaria.

ITNs have been shown to reduce the burden of malaria by 50% in several malaria endemic settings (WHO, 2014). An estimated 278 million individuals in Africa still live in households without an insecticide-treated bed net (Chan, 2014). Although the Multi Cluster Indicator Survey (MICS) indicated a rise in households with at least one ITN from 19% in 2006 to 49% in 2011. Similar gains were also reported by the Demographic and Health Survey (DHS) from 42% in 2008 to 68% in 2014, the household availability of ITNs has not yet reached levels that may have significant impact on the incidence of malaria (Quive, Candrinho, & Geelhoed, 2015). In addition to low coverage, the 2014 DHS revealed that less than half of population most risk (children [46%] and pregnant women [43%]) sleep under ITN. The low acceptance to sleeping under ITNs can be associated to several factors including educational level of household head, absence of nuisance mosquitoes, high indoor temperatures and also unavailability of ITNs (Atieli et al., 2011). Additional reasons include belief of the individuals on the effectiveness of the ITN, marital status and family sizes (Wagbatsoma & Aigbe, 2010).

This study examined/explored the level of utilization of ITNs and associated factors in the Sunyani West District.

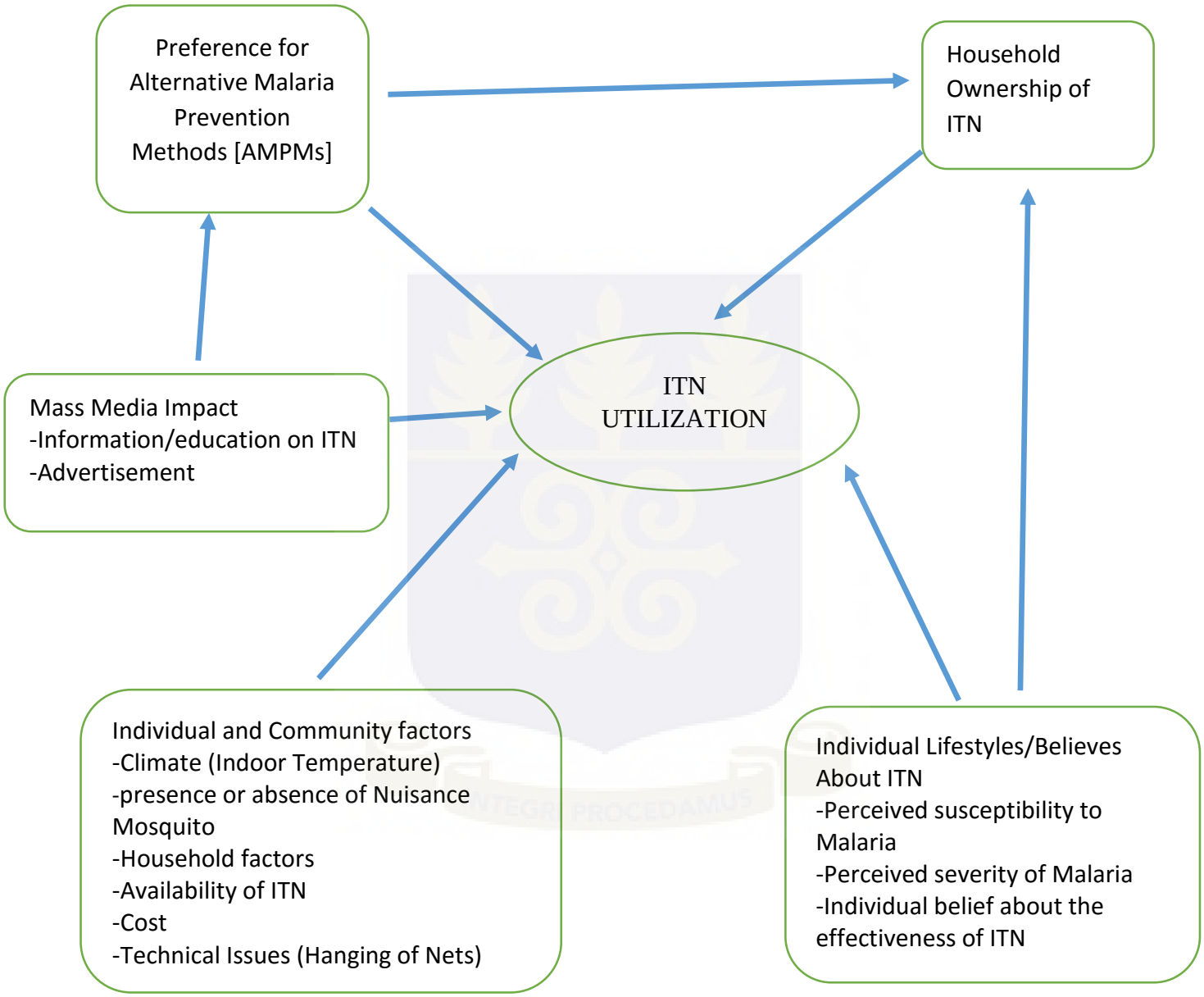
1.3 General Objective

To determine factors associated with ownership and utilization of ITN in the Sunyani West District

1.4 Specific Objectives

1. To determine the level of household ownership of Insecticide Treated Nets in the district.
2. To determine the proportion of children < 5 and pregnant women who sleep under ITNs in the district
3. To identify other malaria prevention methods used by people of the district
4. To identify individual and community factors that influence usage of ITNs

1.5 Conceptual Framework for Factors Influencing the Utilization of ITN



ITNs have turned out to be a dominant means for malaria prevention because they offer protection for individuals and community as a whole through their repulsive and insecticidal properties. Several factors have been identified to influence its usage by individuals and households. Household ownership of ITNs is one of the key determinants of it utilization. In communities where ITN coverages are high, individuals/households use of ITNs are not hindered by its lack. Community ITN coverage is high where the health system has policy and programmes that churn out bed nets into the population. Example, through mass ITN distribution. Other factors that affects availability is the price of the commodity. In situations where ITNs are available, other factors influence its utilization. These factors include: individual and community factors including individual perception about. Some individuals perceived themselves to have low susceptibility to malaria and also perceived malaria as normal disease. Others think ITNs are not effective. Community factors that influence ITN use include indoor temperature, cost of ITN, availability of ITN, household factors and the presence or absence of nuisance mosquito. Aside ITNs, numerous malaria prevention methods have been developed over the years, some these methods are indoor residual spray (IRS), wall paints that repels mosquitoes (Inesfly), body lotions/creams and mosquito coils. Preference for these alternative malaria prevention methods is based on their cost, availability and their perceived effectiveness over ITN due mass media advertisement can potentially influence the use of ITNs.

1.6 Justification of the Study

Although several means are being used to deploy ITNs into households, there are not enough systems put in place to determine the level of household ownership (Atieli et al., 2011). Lack of information on the level of household ownership poses a huge challenge to

implement interventions; either ITNs will continue to be pushed to households that do not need them or on the other hand, low household ownership of ITNs will affect it usage and malaria will continue to be prevalent. Children under five and pregnant women have been identified to be at high risk of malaria, it is therefore recommended that they sleep under ITNs every night (Ordinioha, 2012). In view of this, the Ghana Health Services (GHS) and the National Malaria Control Programme (NMCP) policy demands issuance of ITNs to pregnant women at Antenatal care registration (ANC) and children at 18months. Although mass distribution campaigns have been regularly carried out to increase household ownership levels, malaria presents the greater proportion of all hospital morbidity cases in the Sunyani West district. The high prevalence of malaria could be due to low household ownership levels, low usage of ITNs or usage of other methods that may not be effective.

This study is therefore necessary to determine the household ownership, usage levels of ITNs and also identify individual and community factors that are associated with ITN usage.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Numerous factors theoretically influenced the current health progress in African, but there is considerable indication that accomplishing high malaria control intervention coverage, particularly with ITNs and targeted IRS, has been the principal contributor to reduced child death (Steketee & Campbell, 2010). Insecticide-treated bed nets (ITNs) are amongst the key and cost-effective intervention methods against malaria. ITN effectiveness relies on three main mechanisms: 1) LLINs forms a physical barricade and prevent mosquito from getting access to individuals who use nets; 2) the chemicals added or used to treat the net deters mosquitoes thereby increasing safety being offered; and 3) in case where the mosquitoes are not repelled, they come in contact with the net and rest on it. This provide the chance for it to be killed by the insecticides in the nets (Birget & Koella, 2015).

For these reasons, several strategies have been devised to increase the availability and accessibility to ITNs and also promote its usage. Ghana's approach to attain universal coverage of ITNs is through complementary net sharing channels: mass campaigns, through primary schools, antenatal care (ANC) clinics, and immunization programs offered through Child Welfare Clinics (CWC) (USAID, 2013). During the period 2011- 2012, the National Malaria Control Programme using the house to house long lasting insecticide nets (LLIN) hang up campaign plan, disbursed and hanged 12,481,336 LLINs to reach a total of 21,716,830 people who wrote their names. The LLINs coverage reached 98%. Continuous distribution of LLIN were also implemented to maintain universal coverage (Malaria & Programme, 2013). But a study in Kenya reported that despite ITN possession

reaching more than 71%, usage was low at 56.3% (Atieli et al., 2011). A survey in Ghana also showed a high ownership (73.0%) of ITNs but usage was 52.3 among children under five and 50.0% among pregnant women (GMIS, 2017).

2.2 Malaria Burden

Malaria transmission occurs in all six WHO regions. It was estimated that 3.2 billion persons were at risk of being infected with malaria and among this, 1.2 billion are at greater risk of malaria (WHO, 2014). In 2013, the world recorded over 190 million cases of malaria out of which 58400 died (WHO, 2014).

Roughly, only 10% of global malaria occurs outside Africa. Majority of infections occur in Africa and are normally caused by plasmodium falciparum, the most dangerous of all four (4) human malaria parasites. An estimated one million people in Africa die from malaria each year, and most of these are children under 5 years old. In all malaria prevalent countries in Africa, malaria forms 25-40% of all outpatient care (Roll Back Malaria, 2010).

In Ghana, malaria is prevalent throughout the country and transmission is perennial. Although malaria transmission rates are lower in the urban areas, infections take place throughout the year with slight periodic disparities during the raining period from April to July (Garcia, 2011). The prevalence rates model for Ghana shows the highest malaria prevalence for the Northern and Upper West regions and also parts of the Brong-Ahafo, Ashanti and Eastern regions while Southern regions are lower endemic areas (Garcia, 2011). Over 3 million cases of malaria are diagnosed in health facilities each year (Usaid, 2013). Malaria formed about for 38% of all outpatient illness, 34.9% of all admissions and 19.5% of all mortalities in 2010 (GHS, 2011).

2.3 Insecticide Treated Nets

ITN use is one of the options to control malaria. There is enough evidence to support the association between net use and malaria infection. There is a general substantial decrease in the risk of malaria infection and ITN use (Okoyo et al., 2015).

One of the objective of the National Malaria Control Strategic Plan 2008-2015 is to deploy multiple malaria prevention methods. Key strategies have been developed to achieve this aim including scale-up access to long lasting ITNs to achieve universal coverage. Specifically, National Malaria Control Programme (NMCP) aimed at 100% of households own at least one ITN by the end 2015. 80% of the general population sleep under ITNs and upsurge the number of under-five and pregnant women sleeping under ITN from present levels to 85% (USAID, 2013). During the last quarter of the year 2014 and throughout 2015, the Ghana Health Service (GHS), National Malaria Control Programme (NMCP) and other stakeholders conducted mass LLIN campaigns in all regions except in the Upper West which is covered by Indoor Residual Spraying (IRS) to change LLINS that were distributed in 2011 and 2012. In all, the NMCP distributed 1.3 million nets in the Eastern and Volta regions. In the Brong Ahafo and Western regions, a total of 2.8 million nets were distributed.

Mass distribution campaigns and continuous distribution of ITN are being use to increase household ownership to reach the set target but ineffective ITN use still remains a challenge to malaria control efforts. It is therefore recommended that distribution campaigns of insecticide treated net should be followed by thorough behavior change communication (BCC) to improve the use of bed nets. Good attitude to nets usage is positively related to media messages. Providing information to communities through varied media sources is

associated with improved net use culture especially among vulnerable groups (Kilian et al., 2016).

2.4 Household Ownership of ITNs

The World Health Organization in 2014 estimated the percentage of the population to have access to nets in their households to more than 50% in 11 African countries with Ghana included (WHO, 2015). However, the Global fund evaluation of malaria programmes from 2003 to 2010 in Ghana indicated that there was no significant changes of the disease burden over the ten-year evaluation period possibly attributable to interventions such as ITN not reaching enough of the population (Garcia, 2011). In Nigeria, the supply of free ITNs has given rise to in majority of households owning nets, but only few people use them. A study by Ordinioha revealed that, all family units have possession of at least one net. Averagely, every household had 1.7 nets with 75.3% of the family units owning two (2) or more than three nets. Among households that were given nets a mass campaign, 71.8% hanged the nets but only 27.5% of those who have hanged the nets slept under them the night before the survey, mainly under-five children (Ordinioha, 2012).

The 2014 Ghana Demographic and Health Survey showed that 69.6% of households own at least one mosquito net, out of which 46.3% own more than one net. Brong Ahafo Region (BAR) had the highest (81.7%) of ITN possession while the Greater Accra Region (GAR) had the least (53.9%) ITN ownership. ITN ownership was highest among the poorest households and rural households were found to have relatively better coverage than urban households. The NMCP and their partners as part of the Integrated Vector Management (IVM) for the control of malaria during the period 2011-2012, using house to house Long Lasting Insecticide Nets (LLIN) hang up campaign strategy dispersed 12,481,336 LLINs

to cover a listed people of 21,716,380 yielding an administrative coverage of 98% (GMPR, 2013). This hang up campaign was followed by the continuous distribution through Antenatal Care and Child Welfare Clinics (ANC/CWC). The Sunyani West district also carried out mass distribution of ITNs in May 2015 to increase household ownership. In Uganda, Wanzira, Katamba, & Rubahika, (2016) reported that 3361 (62%) household of 5345 achieved universal coverage. The study also found out that 80% individual in households with ITNs slept under it a night before the study. Children between the 6 and 14 years were suggestively less expected to use ITN as compared to those under five. Considerably, households with more than three members compared to those with one members are less likely to use a net. Disparity in LLIN ownership can mostly be associated with differences in housing condition, household size and access to mass media (Hailu et al., 2016).

2.5 ITN Use in Children Under 5 and Pregnant Women

Although all Ghanaians are at risk of malaria infection, children under five of age and pregnant women are at greater risk of severe illness due to their depressed immunity (USAID, 2013). Pregnant women and their unborn children are most at risk of malaria. Malaria infection during pregnancy leads to low birth weight and maternal anaemia. Low birth weight is the single highest risk element for death during the first month of life (UNICEF, 2007). Inspite of this, some African countries have low coverage and use of ITN. In Sudan, ITN coverage among pregnant women is 58.7% and utilization is only 11.5% (Yassin, Rosnah, & Osman, 2010).

Malaria is a significant cause of adverse pregnancy outcomes (Mosha & Philemon, 2010). The existing malaria interventions in pregnancy have been designed to accomplish

complete protection in pregnant women by both intermittent preventive treatments in pregnancy (IPTp) and ITNs to get the most out of their benefits. Intensification in ITN usage will reduce malaria in pregnancy and improve birth-weight outcomes. Likely, these effects can further be reduced by improving IPTp coverage and adherence improved. In 2015, approximately 1501 pregnant women tested positive to malaria (SWDHA, 2015).

Malaria in children under 5 and pregnant women is effectively controlled by the use of ITN (Nwagha TU et al, 2014). A study in Madagascar have shown that bed nets distribution and usage is strongly associated with overall decline in child mortality, ITN possession was also related with a 22% decrease in all cause child deaths in Madagascar (Meekers & Yukich, 2016). Evaluation of the 2011 mass LLIN distribution campaign in Kenya showed more than half (50%) of the people who used their LLINs were either household heads or their spouses. The proportion of children under five who slept under LLIN the previous night was only 25%. Disparity was also found between nets use among children in different setting. There was higher use among rural areas (23.0%) compared to 15% in urban setting (Kenya Pulic Health Services, 2011). Several factors influences the usage of ITN among pregnant women and children under five. There is high willingness to use ITNs among pregnant women who owns them. This may be the basis for issuance of ITNs at ANC registration to pregnant women. The level of education also greatly influence daily use of ITN among pregnant women. Research in Nigeria has also shown that greater proportionof married women than unmarried women sleeps under bed nets daily (Wagbatsoma & Aigbe, 2010). Other factors influencing ITN use among pregnant women include age of women, financial income, number of previous pregnancies (gravidity), number of children, abortion, number of family members, sleeping under ITN during last pregnancy, previous

history of malaria, usage of ITNs by other family members and availability to ITNs were considerably linked with current usage of ITNs (Yassin et al., 2010).

Factors for non-use of ITN among children include households with more than five members, employed mother and lower household altitude. Children are more likely to use ITNs when households have more than three nets, mother attended ANC during pregnancy, married or living with partners, mothers with any education level and that the child is in a household with higher community wealth (Ruyange et al., 2016).

2.6 Use of Other Malaria Prevention Methods

ITNs use has proven to be the most effective and safest means to malaria prevention. Studies have provided additional evidence for bed nets being safe in children and even newborns. Regular and effective use of ITN has shown high impact on malaria prevalence in endemic regions than any other malaria prevention method (Lu et al., 2015).

Aside ITNs that are being promoted by the NMCP and GHS, there are other methods of preventing malaria. Preference for this alternative methods for malaria prevention has a great potential to reduce the utilization of ITNs. Results of a study conducted in Ethiopia revealed that although respondents have a good knowledge (96.6%) on the cause of malaria, they hold different views on the most effective way to prevent malaria. On the subject of knowledge on malaria prevention, 85%, 68.9%, 56.6% and 47.9% of the respondents in that order mentioned ITN use, environmental sanitation, insecticide spray and taking anti-malaria medications respectively (Aleme, Girma, & Fentahun, 2014). ITN is cost effective method of malaria prevention. However some households chose to spend more on other malaria prevention methods. The more a household spends on other forms

of malaria prevention, the less likely they are to use a bed net (Wiseman, Scott, McElroy, Conteh, & Stevens, 2007). In situations where households could not use bed nets due its insufficiency for the whole households or dislike for reasons such as discomfort, alternative methods that are used include screening of windows and ventilators, removing mosquito breeding sites and closing of doors early in the evening (Musoke, Karani, Ndejjo, Okui, & Musoke, 2016). Mosquito reduction methods used in rural communities in Kenya in order of preference are environmental management, mosquito repellent and smoke, insecticide canister sprays and window and door screens (Okech et al., 2008). In the Indian state of Orissa, 58% of household's uses bed nets but the rest use methods such as coils, vaporing mats and liquid vaporizers or sprays. Others uses traditional methods such as smoking out mosquitoes by burning of dried dung or vegetation (Babu, Mishra, Mishra, & Swain, 2007). In some communities of Bagamoyo district of Tanzania, plants such as Aadirachta indica, citrus spp, annona spp and ocimum spp are used to manage insects including mosquitoes (Innocent et al., 2014).

According Watodjo (2015), LLIN use is a very effective means to reduce the malaria burden and that there is the need to pursue its application and usage in the context of malaria elimination.

2.7 Individual and Community Factors

ITN use is the main strategy for malaria prevention among populations in Ghana. Compliance with this intervention is reliant on its suitability and also on the socio-cultural setting of the population (Atkinson et al., 2009). Factors related to individual and community may influence how ITNs are used for malaria control. A study in the Solomon Islands showed that mosquito annoyance and apparent risk of malaria influenced bed net

use. Even though the respondents had knowledge on malaria and means to prevent, they were not enough reasons for them to comply with LLIN use (Sena, Deressa, & Ali, 2013). Other factors such as climate, work and evening social activities affects the use of ITNs, particularly in men (Atkinson et al., 2009). In Kenya, despite ITN ownership reaching more than 71%, compliance was low at 56.3%. Compliance rates are significantly higher during rainy compared with the dry season. Some reasons cited to influence net use include household head's educational level, presence of significant high numbers of nuisance mosquitoes and low indoor temperatures (Atieli et al., 2011). In another survey, it was found out that, of 574 households interviewed, 72.6% of the respondents had ITNs and 80% of these had been slept under the net the night before the survey. Reasons for the absence ITNs in the household include the belief that ITNs were old and damaged beyond maintenance and also the misuse (households use ITNs for other activities other than their envisioned use), which is used at night (Berkessa et al., 2015).

LLIN utilization can also be affected by lack of nets and most prominently by behavioral determined gaps which includes low risk perception, keeping the bed nets for future use, awareness and negligence, and perception of low efficacy of LLINs (Birhanu et al., 2015). Watanabe studied the determinants of ITN usage using the health belief model. The findings indicate that, 99% of respondents use ITNs for the fear of malaria, 55% because of the severity of malaria and 79% of the respondents use ITN because of the malaria prevention benefits (Watanabe et al., 2014). Factors associated with ITN use from the same study include periodic difference in perceived risk, thermal discomfort, cost of changing nets when they are spoilt, lack of financial resource, a lack of nets, nets in poor state and the difficulties of hanging had undesirable influences. Free mass distribution, awareness

campaigns, and the malaria-prevention benefits had positive influences on ITN use (Watanabe et al., 2014).

2.8 Conclusion of Review

The review of literature brought forth that insecticide-treated bed nets (ITNs) are among the most important and cost-effective intervention measures against malaria. Mass distribution campaigns and continuous distribution of ITN are being used to increase household ownership to reach the set target but ineffective ITN use still remains a challenge to malaria control efforts. Aside ITNs that are being promoted by the NMCP and GHS, there are other methods to preventing malaria. Preference for this alternative methods for malaria prevention has a great potential to reduce the utilization of ITNs but not enough studies have been carried out to determine magnitude, efficacy and/or effects of this methods on it users. Also, much of this information was from previous studies conducted outside the Sunyani West District. The present study will therefore fill the literature gap and provide data pertaining to the study area and will ascertain magnitude of the use of other methods.

With methodological issues and best practices, previous studies determined the usage and factors affecting usage of ITNs among pregnant women from household heads. The current study present separate data collection tool for pregnant women. In addition, the study is not limited to a few selected sub districts within Sunyani West but samples were be drawn from every sub district (geographical stratification)

CHAPTER THREE

METHODS

3.1 Study Design

A cross sectional descriptive study involving household heads and pregnant women in five selected communities, one from each sub district within the Sunyani West District was conducted. Data on ITN ownership and usage were collected from the household heads or their representatives (18 years or older) and pregnant women during the study. A structured questionnaire with questions on LLIN ownership, usage and factors likely to influence usage was used for the data collection. The Sunyani West district has five (5) sub districts, and these served as the strata from which one community each was selected. After five communities have been selected from the sub districts, the predetermined sample was shared proportionately per the population of the communities as registered in the 2015 mass LLIN distribution campaign among the selected communities. The snow ball sampling approach was used to reach the pregnant women in the communities.

3.2 Study Area

The Sunyani West District is one of the twenty-seven Districts of the Brong Ahafo Region of Ghana. Sunyani West District has its major vegetation types as grassland, broken forest and forest reserves, mostly moist-semi deciduous forest (DHA Annual Report, 2016). The main occupation is farming in food crop and cash crops. However, there are quite a number of public and civil servants employed in various institutions (DHA Annual Report, 2016).

Table 1: Demographic characteristics of the Sunyani West District Population by Sub Districts

SD	Total Pop	Expected Preg. 4%	WIFA 24.8%	CHN 0-11 Months 4%	CHN 12 – 23 Months 4%	CHN 24–59 Months 12%
Bofourkrom	10,157	406	2,519	406	406	1,219
Chiraa	22,538	902	5,589	902	902	2,705
Fiapre	15,134	605	3,753	605	605	1,816
Odumase	20,408	817	5,061	8017	817	2,449
Nsoatre	27,304	1,092	6,771	1,092	1,092	3,753
Total	95,541	3,822	23,694	3,822	3,822	11,465

Source: ***Sunyani West DHA, 2016***

3.3 Health Administration and Infrastructure

The District Health Directorate (DHD) is responsible for the health administration and coordination of activities of all health providers within the district. Table 2 below shows health facilities and the number of communities they serve.

Table 2: Sub-District Health Facilities and Number of Communities They Serve

No.	Sub-district	Institution	No. of communities
1	Bofourkrom	Bofourkrom health Centre	13
2	Chiraa	Chiraa Health Centre, Mercy Maternity Home, Holy Daniel Clinic Kobedi CHPS Asuakwa CHPS Tanom CHPS, Jamesbert Clinic	21
3	Fiapre	Fiapre Health Centre Notre dame School Dumasua CHPS Fiapre Zongo CHPS Mantukwa CHPS	10
4	Odumase/ Kwatire	Kwatire Health Centre Odumase RCH Hannah Maternity Home ICAM Clinic Addoe CHPS Obiri Yeboah CHPS Gubre CHPS Yoyooso CHPS Adantia CHPS	20
5	Nsoatre	Nsoatre Health Centre Amponsah Maternity Home Kwabenakuma CHPS Adounya CHPS Ayakomaso CHPS Boreso CHPS	21

Source: ***Sunyani West DHA, 2016***

3.4 Causes of Morbidity

Malaria has been the leading cause of illness in the district. Upper respiratory tract infections (URTI), skin and diarrhea diseases are also very common. Table 3 below is the summary of the top ten cause disease.

Table 3: Top Ten Causes of OPD Morbidity in Sunyani West District (2013-2015)

2013		**2014**		**2015**	
DISEASE	CASES	DISEASE	CASES	DISEASE	CASES
Malaria	65,380	Malaria	64,129	Malaria	51,055
URTI	19,265	URTI	26,150	URTI	25,888
Skin Diseases and Ulcers	9,059	Diarrhoea Diseases	12,037	Diarrhoea Diseases	11,985
Diarrhoea	8,416	Skin Diseases	11,717	Rheumatism & joint pains	10,209
Rheumatism & joint pains	8,257	Rheumatism & joint pains	11,575	Skin Diseases	8,216
Intestinal Worms	5,382	Intestinal Worms	8,427	Intestinal Worms	6,177
Acute Urinary Tract Infections	2,601	Anaemia	3,413	Anaemia	3,741
Anemia	2,315	Acute Urinary Tract Infections	2,773	Acute Urinary Tract Infections	2,709
Home Accidents & Injuries	2,095	Pneumonia	2,239	Pneumonia	2,570
Anemia	1,843	Acute Eye Infection	2,037	Acute Eye Infection	1,746

Source: ***Sunyani West DHA, 2016***

3.5 Study Variables

The dependent variables of the study were utilization of ITN and proportion of children under five and pregnant women who slept under ITN the night before the day of data collection. The independent variable include household ownership of ITN, usage of other malaria prevention methods and individual and community factors that influence ITN usage as independent variables.

Table 4: Variables and their scales of measurement

Variable	Scale of measurement
Household membership characteristics	Ratio
Socio-Demographic Characteristics	Nominal
Number of ITN per Household	Ratio
Household with at least one ITN	Nominal
Children under five and pregnant women that slept under ITN a night before	Nominal
Reasons for not using ITN	Nominal
Usage of other malaria prevention methods	Nominal
Individual/community factors affecting the use of ITN	Nominal

3.6 Sample Size

Formula Used: $N = (z^2pq)/d^2$

Where p: estimated proportion of ITN usage (44.95%) = 0.4495

q: 1-p

d: margin of error = 5% (0.05)

z: confidence interval of 95% which is equivalent to 1.96

$N = (1.96^2 \times 0.4495 \times [1 - 0.4495])/ 0.05^2$

$N = 0.950602959/0.0025$

N = 380.24

N = 380

Non and Incomplete Response (10%)

10/100 x 380

38

Sample size to be used = 380 + 38 = 418

Assumptions

It is assumed that the rate of utilization of ITN in the Sunyani West District is 44.95% (Demographic and Health Survey, 2014).

3.7 Sample Size for Pregnant Women

$N = (z^2pq)/d^2$

Where p: estimated proportion of ITN usage (35.00%) = 0.35

q: 1-p

d: margin of error = 5% (0.05)

z: confidence interval of 95% which is equivalent to 1.96

$N = (1.96^2 \times 0.35 \times [1 - 0.35])/ 0.05^2$

N = 0.873964/0.0025

N = 349.58

N = 350

Non and Incomplete Response (10%)

10/100 x 350

35

Sample size to be used = 350 + 35 = 385

Assumptions

It is assumed that the rate of utilization of ITN among pregnant women in the Sunyani West District is 35.00% (Ricotta, Koenker, & Kilian, 2014).

3.8 Sampling Method

The Sunyani West district has five sub districts namely: Odumase-Kwatire, Chiraa, Nsoatre, Fiapre and Bofourkrom. These sub districts served as the strata. In every sub district, all the communities were numbered and random number generator used to select one community each. Adantia (Odumase-Kwatire), Attakrom (Chira), Amanfuso (Nsoatre), Dumesua (Fiapre) and Bofourkrom were selected. After these five communities had been selected from the sub districts, the sample size was shared proportionately per the population of the community using the formula:

Population of Community / Total population of Communities x estimated sample size

Table 5: Household Sample Size per Communities

Community	Population	Sample Size (no. of households)
Adantia	2321	146
Attakrom	668	41
Amanfuso	812	51
Dumesua	1804	113
Bofourkrom	1046	66
Total	6651	417

In each community, the community household registers developed between February-April were used as the sampling frame. The total number of households in the register were divided by their share of the sample size. Systematic method was then used to select households for the study. The first household was selected using random number generator to pick a household within the first sampling interval of the systematic selection. In the communities, selected households were identified by the help of a community based surveillance volunteer or an opinion leader. In situation where selected household had no one temporary available to be interviewed, a re-visit is scheduled. Households that have permanently moved are replaced.

In the case of pregnant women in the selected five communities, the sample size of pregnant women in every community was obtain by the formula:

Population of Community / Total population of Communities x Sample Size for pregnant women.

Table 6: Pregnant Women Sample Size per Communities

Community	Population	Sample Size (Pregnant Women)
Adantia	2321	134
Attakrom	668	39
Amanfuso	812	47
Dumesua	1804	104
Bofourkrom	1046	61
Total	6651	385

Respondents were selected using the snowball approach by locating one pregnant woman and after data collection from her she gave direction for the location of another pregnant woman.

3.9 Inclusion Criteria

1. Household heads and pregnant women in the Sunyani West District.

3.10 Exclusion Criteria

1. Household heads and pregnant women who are not permanent residents of the Sunyani West district.

3.11 Data Collection

Data collectors moved from house to house within selected communities. Home visits were not prearranged. After getting approval from the participants through informed consent, data collectors administer questionnaires directly (face to face) in preferred language

(English, Twi, Bono) and record responses on demographic characteristics, household ownership and use of ITN and factors influencing the utilization of ITNs. Data were collected from household heads but in their absence, mothers of children under five were the preferred respondents. Re-visits are scheduled when respondents were not present to be interviewed. Interviews lasted for about 25 to 30 minutes per participant.

3.12 Data Collection Tool

The tool used for the data collection was a structured questionnaire with questions on household ownership of nets, usage and factors influencing utilization (Appendix B). The questionnaires had seven sections. The first section was on identification (sub district name, community, respondent's number and date). The second section was on household membership characteristics (household size and number of children under five). The third section looked at the demographic characteristics of respondents (sex, age, marital status, educational level, occupation and religion). The next section considered household ownership of nets (household with at least one net, total number of nets, number of net hanged, net source and reason why respondents own no net). The section that followed was on ITN use among children under five and prevent. To assess the proportion those who slept under ITN the night before questioning. Section six was on individual and community factors associated with net use. The individual factors assessed were hypersensitivity/burning sensation, perceived insusceptibility to mosquito bite/malaria and receipt of free nets. The community factors assessed were media exposure to malaria and ITN related messages, mass distribution, access to healthcare and community classification (rural/periurban). The last section of the tool assessed the use of other malaria prevention methods among respondents and the reasons for using other methods.

3.13 Data Processing and Analysis

Data were entered into Excel 2013. It was cleaned (ensuring that codes do not exceed their limit for each variable) and checked for accuracy and completeness and then imported to STATA 14 software for analysis.

Table 7: Pregnant Women Sample Size per Communities

Analysis	Test
Level of household ownership of ITN (House with at least one ITN)	Frequency Distribution & Confident Interval
Proportions of children under 5 and pregnant who sleep under ITNs	Frequency Distribution & Confident Interval
Proportion of households that uses other malaria presentation methods	Frequency Distribution & Confident Interval
Association between house ITN ownership and usage of other methods	Cross Tabulation (Chi square)
Association between Individual/ Community factors and ITN use	Cross Tabulation Multiple Logistic Regression

Data was collected using a questionnaire, and then entered using the codes provided using Excel 2013. The data were cleaned and checked for accuracy and completeness and then imported to STATA (STATA 14) for analysis. Household ownership (Households with at least one ITN), proportion of children, pregnant women who used ITNs and respondents who used other methods were determined using frequency distribution (%) with corresponding confidence intervals. Associations between the dependent variable (ITN Use, Slept under ITN last night) and the independent variables (Individual/Community factors) were assessed using chi-square tests and logistic regressions. Among household respondents, the individual factors used for the regression model are hypersensitivity/burning sensation, perceived insusceptibility to mosquito bite/malaria, receipt of free nets and the use of alternative methods. For pregnant women, the individual factors regressed hypersensitivity/burning sensation, perceived insusceptibility to

mosquito bite/malaria, the use of alternative methods and partner influence. The community factors modeled include media exposure (respondents who have seen or heard a message about malaria in the past 6 months), access to health facility (community has a health facility), mass distribution and classification of the community, whether rural or periurban.

3.14 Quality Control

Five data Collection Assistants were trained on how to effectively conduct interviews and also how to handle ethical issues such inform consenting during fieldwork. The questionnaire was pre-tested in Yawhima, a community in the Sunyani Municipality. The questionnaire was reviewed after the pretesting based on problems identified during the exercise.

3.15 Ethical Consideration

The study proposal was submitted to the Ghana Health Service's (GHS) Ethical Review committee for review and clearance before commencement of data collection. Ethical Review Number: GHS-ERC: 65/02/17

3.16.1 Study Area Approval

An introductory letter from the University of Ghana, School of Public Health was presented for permission to undertake the study in the district. In selected communities, verbal permission was sought from community leaders such as Assembly Men, Chiefs and Opinion Leaders.

3.16.2 Subjects Involved in the Study

The study involved household heads, mothers and pregnant women in the Sunyani West district.

3.16.3 Potential Risks/Benefits of the Study

There were no known potential risk in participating in the study except that it took part of the precious time of respondents and the need of participants to provide some personal informations such age, number of persons in household, marital status and number of previous pregnancies. The benefit of the study is that it identified factors influencing ITN usage which will enable the National Malaria Control Programme (NMCP) and Sunyani West District Health to device appropriate strategies to fight the high prevalence of malaria.

3.16.4 Consenting

The Principal Investigator and Data Collection Assistants read and explain information on the consent form to the participant. This was done individually prior to the interview. The nature, purpose, risk and benefits of the study were explained to each respondent. Participants signed their signatures or thumb printed the consent form before they were interviewed.

CHAPTER FOUR

RESULTS

4.1 Household Characteristics of Respondents

A total of 413 household heads or their representatives and 377 pregnant women participated in the study. The 413 households had a total of 2,359 individuals' resident in the various households. Out of this number, 556 (23.6%) were children under five years of age. The mean household size was 5.7 (SD: 3.48). The mean household size for pregnant women was 4.9 (SD: 2.12) as shown in Table 8 below.

Table 8: Household Characteristics of Respondents

Population	No. of Respondents	Household Size	Mean	SD
Household Respondent	413	2359	5.71	3.48
Pregnant Women	377	1845	4.89	2.21

4.2 Socio-Demographic Characteristics of Respondents

From Table 9 and 10, 86.20% (367/413) of household respondents were females. Majority, 44.07% were between 33 to 47 years. About 71.19% (294/413) were married, 22.03% were single, 3.63% divorced and 3.15% were widows. Most of the respondents, 41.89% (173/417) had primary and JSS education and 61.50% (254/413) were self-employed. Most household respondents were Christians (84.99%). For pregnant women, majority (53.05%) were within 24 to 33 years. About 77.45% were married, 28.65% had no formal education, but 13% have attained tertiary education. Most pregnant women were self-employed (55.32%) and Christians (79.05%)

Table 9: Socio-Demographic Characteristics of Household Respondents and Pregnant Women in the Sunyani West District, June 2017.

Characteristic	Households (N=413)		Pregnant Women (N=377)	
	Frequency/Mean*	Percentage(%)/SD*	Frequency/Mean*	Percentage (%)/SD*
Sex				
Male	57	13.80	0	0.00
Female	367	86.20	377	100.00
Age	38.10*	12.08*	27.90*	6.08*
Marital Status				
Married	294	71.19	292	77.45
Single	91	22.03	79	20.95
Divorced	15	3.63	4	1.06
Widowed	13	3.15	2	0.53
Educational Level				
No formal Education	90	21.79	108	28.65
Primary/JSS	173	41.89	127	33.69
Secondary/Vocational	90	21.79	93	24.67
Tertiary	60	14.53	49	13.00

Table 10: Spouse Educational Level, Occupation and Religion of Household Respondents and Pregnant Women in the Sunyani West District, June 2017.

Characteristic	Households(N=413) Frequency	Percentage (%)	Pregnant Women (N=377) Frequency	Percentage (%)
Educational Level of Spouse				
No formal Education			94	24.93
Primary/JSS			105	27.83
Secondary/Vocational			106	28.12
Tertiary			72	19.10
Occupation				
Public	79	19.13	78	20.69
Private	52	12.59	74	19.63
Self Employed	254	61.50	201	53.32
Unemployed	28	6.78	24	6.37
Religion				
Christian	351	84.99	298	79.05
Moslem	51	12.35	51	13.53
Traditionalist	8	1.94	28	7.43
Others	3	0.73	0	0

4.3 Household Ownership of ITN

Household ownership of at least one ITN was high in the Sunyani West District with 78.93% (362/417) of household and 86.74 (327/377) of pregnant women having at least one net that can be used while sleeping. Net density (average net per person) was 0.35 in households. Among those with nets in households, 238 (73.91%) had the nets through free mass distribution campaigns but the majority, 171 (53.61%) of the pregnant women got their nets through antenatal care visits. For those who did not have nets, 87 (21.06%) of household respondents, 40.23% said that they prefer to use other methods, 35. 63% do not have enough money to buy, 19.54% were of the view that mosquito nets are not easily available to buy (Table 11). In pregnant women, 50 (13.26%) did not have net(s). Similarly, as among household, majority 28 (56.00%) prefers to use other methods of malaria prevention. Table 11 shows household ownership of ITN.

Table 11: Household Ownership of Insecticide Treated Nets among Household and Pregnant Women in the Sunyani West District, June 2017.

Item	Frequency	Percentage (%)
Household Respondents	(N=413)	
Household with at least one (1) net	326	78.93
Total Nets	817	-
Net Hanged	606	74.17
Reason for Not Owning a Net	**(n=87)**	
Do not need one	4	4.60
Not enough money to buy	31	35.63
Net not easily available to buy	17	19.84
Prefer to use other methods	35	40.23
Pregnant Women	(N=377)	
Pregnant Women with at least one (1) net	327	86.74
Pregnant Women with Net Hanged	235	62.33
Reason for Not Owning a Net	**(n=50)**	
Do not need one	3	6.00
Not enough money to buy	15	30.00
Net not easily available to buy	4	8.00
Prefer to use other methods	28	56.00

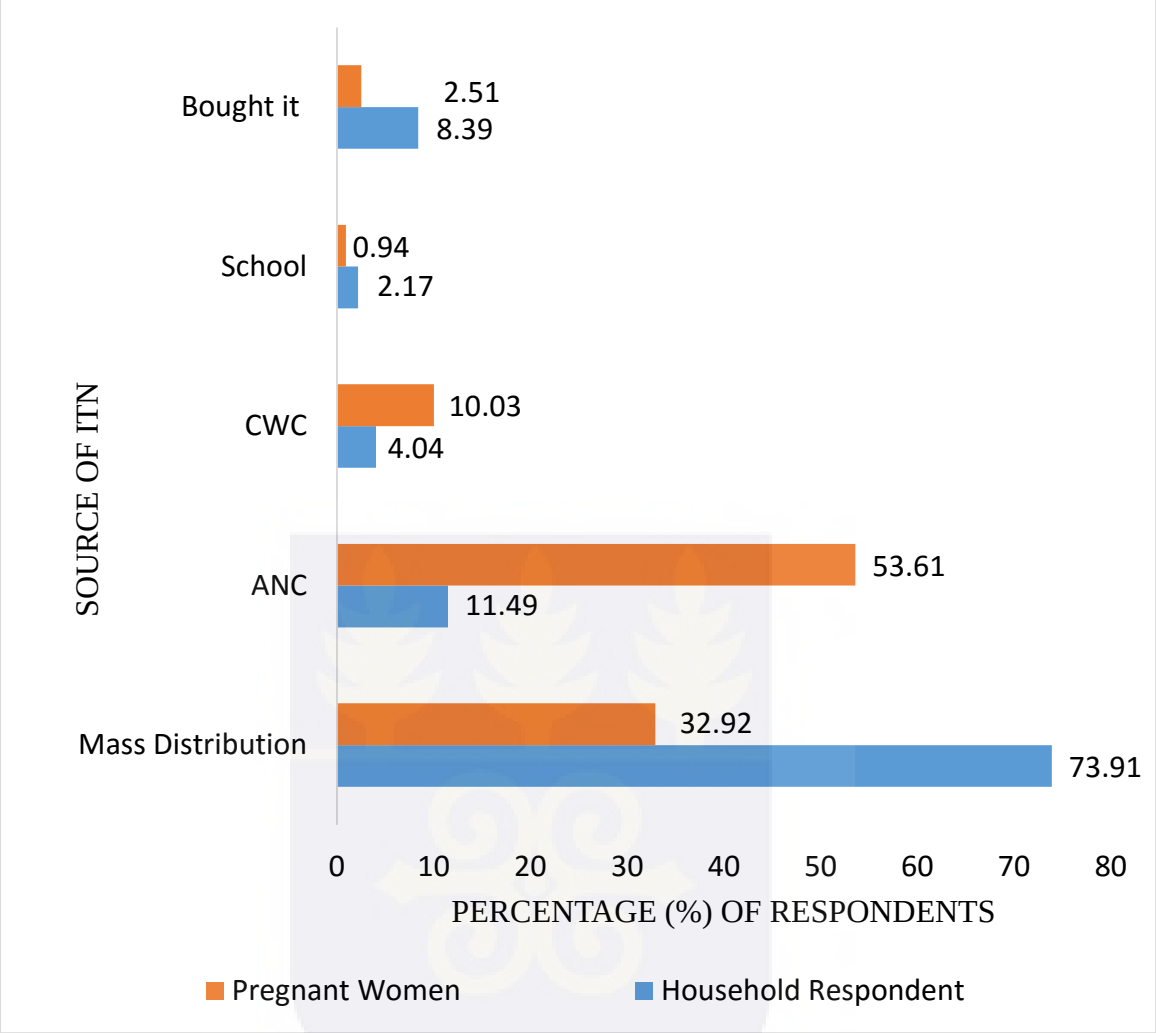


Figure 1: Clustered Bar Chart showing Sources of Insecticide Treated Nets among Household and Pregnant Women in the Sunyani West District, June 2017.

4.4 Insecticide Treated Use

Only 183 (48.54%, CI: 43.39-53.71) of pregnant women used insecticide treated nets the night before data collection. Majority, of them (61.20%) said they used the ITNs as protection against mosquito bites and nuisance. Two hundred and thirty-one (55.93%, CI: 50.99-60.79) of the household respondents also slept under ITN the night before the study. Among pregnant women who use ITN, only 57 (31.15%) used ITNs in order to prevent malaria. In children five years and below, 384 (69.06%, CI: 65.03-72.89) out of a total of

556 slept under ITN the night before the study. When stratified by age, those 4 years and older used ITN most (78.31%). A Pearson chi-square test showed an association between a child's sex and ITN use ($p < 0.001$). More males 222/284 (78.17%) used ITNs compared to females 162/272 (59.56%).

Table 12: ITN Use among Pregnant Women and Household Respondents in the Sunyani West District, June 2017.

	Household		Pregnant Women	
	Frequency (N=413)	Percentage (%)	Frequency (N=377)	Percentage (%)
ITN Use				
Slept Under ITN	231	55.93	183	48.54
Did not Sleep Under ITN	182	44.07	194	51.46
Reason for Using ITN	n = 231		n = 183	
To get warmth	21	9.09	14	7.65
Protection against mosquito bite and nuisance	151	65.37	112	61.20
Avoid Malaria	59	25.54	57	31.15

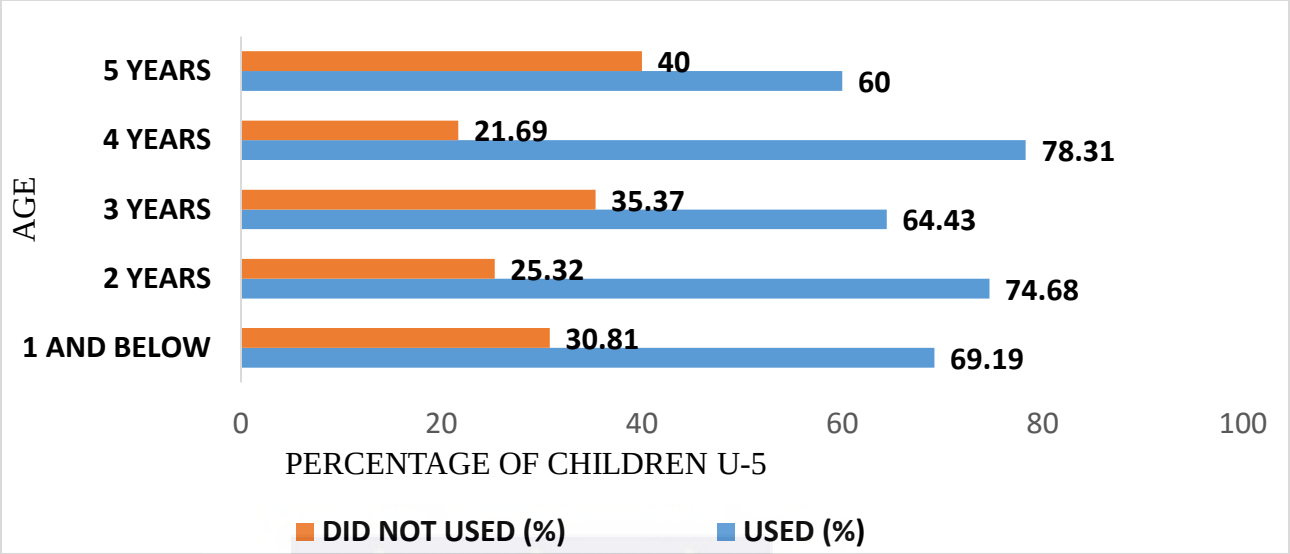


Figure 2: A Stacked Bar Chart Showing the Percentage of Children Five (5) years and Below who Slept under ITN in the Sunyani West District, June 2017.

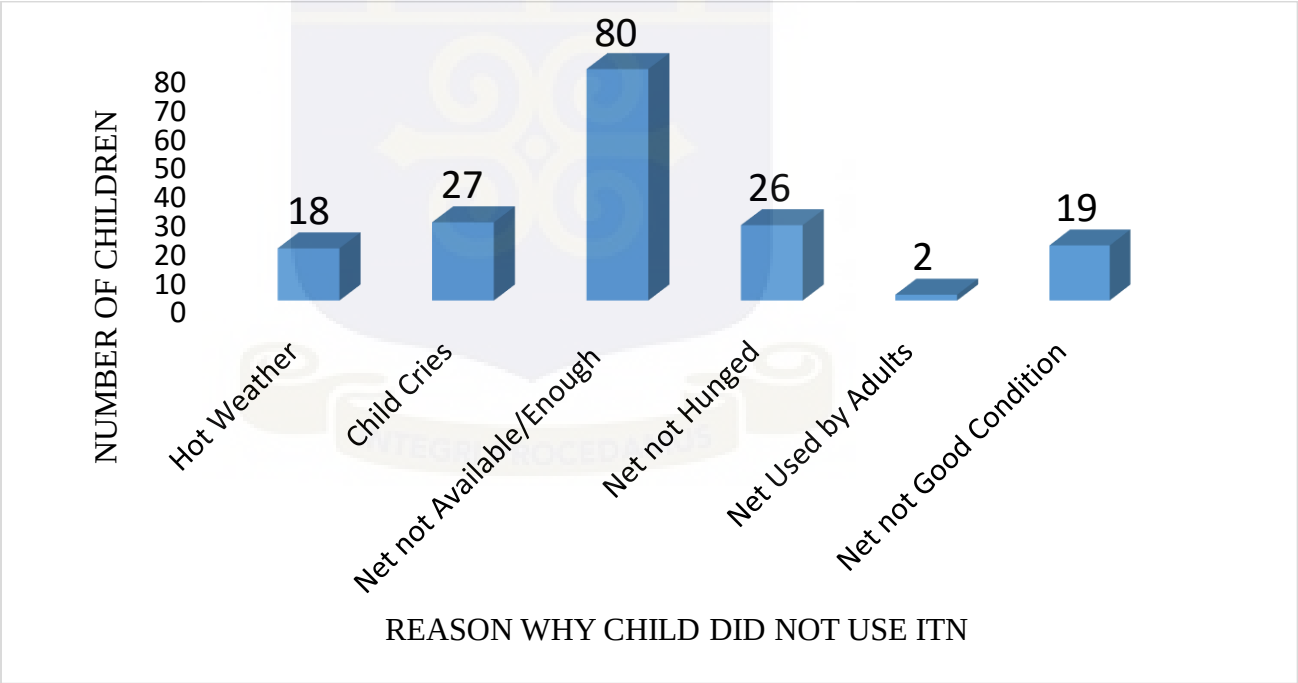


Figure 3: A Bar Graph Showing the Various Reasons why Children Five (5) years and Below Did not sleep under ITN in the Sunyani West District, June 2017.4.4

4.5 Use of Other Malaria/Mosquito Bite Prevention Methods

About 30% of the study participants use other malaria prevention methods instead of bed nets to protect themselves against malaria. This practice was higher in peri-urban area as compared to the rural communities. From the study, the odds of alternative methods use in rural communities was 0.33 the odds of ITN Use in peri-urban communities (95%CI, 0.205-0.517). The altenative methods mostly used included insecticide spray (44.96) and burning of mosquito coil (41.09%). Only 6 (4.65%) used mosquito repellents. Majority, 47 (36.43%) of alternative method users were of the view that the methods used were easy to apply as compared to ITN. Another reason was that, those methods were less costly (21.17 %) and also readily available (20.16%)

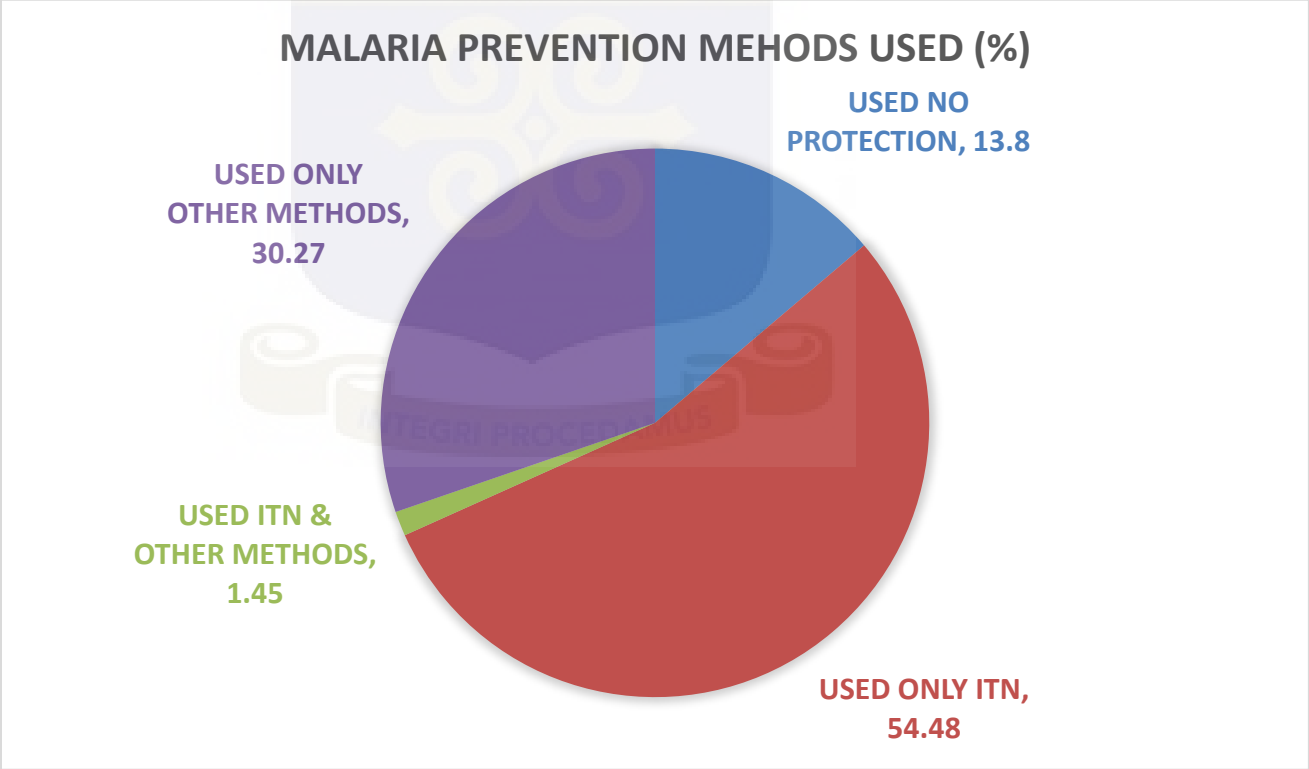


Figure 4: A Pie Chart Showing Methods Used as Protection against Malaria among Household Respondents in the Sunyani West, June 2017

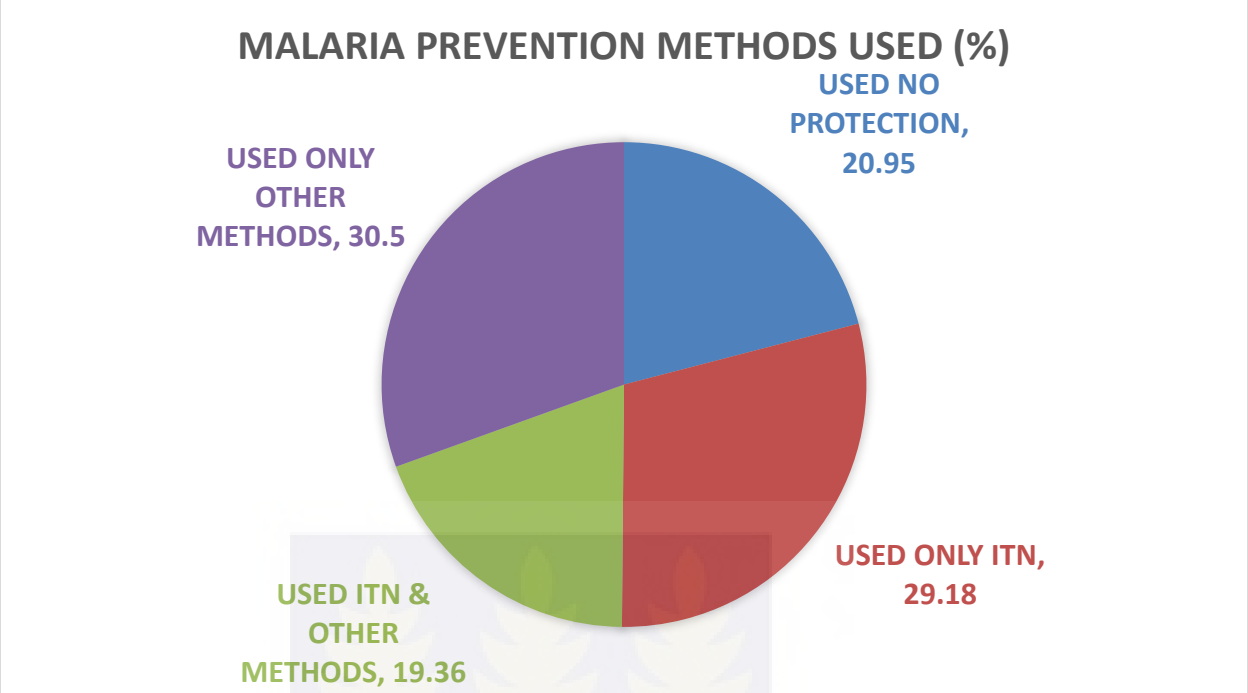


Figure 5: A Pie Chart Showing Methods Used as Protection against Malaria among Pregnant Women in the Sunyani West, June 2017

Individual and Community Factors that Influence the Usage of ITNS

4.6 Demographic Characteristics Associated with ITN Use

Among household respondents, sex was significantly associated with ITN use. Male were more likely to use ITN as compared to females ($p<0.001$). In addition to that, occupation ($p=0.007$) and one's religion ($p=0.001$) were associated with ITN use. Marital status and educational level were not associated with ITN use. Among the pregnant women, only age ($p=0.001$) was associated with ITN use. Women aged 24-33 were more likely to use ITN comparing to women age 14-23 and 34-43. These are shown in Tables 13 and 14.

Table 13: Demographic factors associated with ITN use among Household Respondents in the Sunyani West District, June 2017

	ITN Use			
Variable	**Yes**	**No**	**Chi-square**	**P-value**
Sex				
Male	43 (75.44%)	14 (25.56%)	10.21	0.001
Female	188 (52.81%)	168 (47.19%)		
Marital Status				
Married	161 (54.76%)	133 (45.24%)		0.097*
Single	53 (58.24%)	38 (41.76%)		
Divorced	6 (40.00%)	9 (60.00%)		
Widowed	11 (84.64%)	2 (15.38%)		
Education				
No Formal Education	57 (63.33%)	33 (36.67%)	3.65	0.301
Primary/JSS	97 (56.07%)	76 (43.93%)		
Secondary/Vocational	48 (53.33%)	42 (46.67%)		
Tertiary	29 (48.33%)	31 (51.67%)		
Occupation				
Public	41 (51.90)	38 (48.01%)	12. 23	0.007
Private	40 (76.92%)	12 (23.08%)		
Self Employed	132 (51.97%)	122 (48.03)		
Unemployed	18 (64.29%)	10 (35.71%)		
Religion				
Christian	186 (52.99%)	165 (47.01%)		0.001*
Moslem	37 (72.55%)	14 (27.42%)		
Traditionalist	8 (100.00%)	0 (0.00%)		
Others	0 (0.00)	3 (100.00)		

(*) = Fishers exact test

Table 14: Demographic factors associated with ITN use among Pregnant Women in the Sunyani West District, June 2017

	ITN Use			
Variable	**Yes**	**No**	**Chi-square**	**P-value**
Age				
14-23	46 (47.42%)	51 (52.58%)	23.13	0.001
24-33	116 (58.00%)	84 (42.00%)		
34-43	21 (26.26%)	59 (73.75%)		
Marital Status				
Married	145 (49.66%)	147 (50.34%)	7.23	0.065
Single	34 (43.04%)	45 (56.96)		
Divorced	4 (100.00%)	0 (0.00%)		
Widowed	0 (0.00%)	2 (100.00%)		
Education				
No Formal Education	52 (48.15%)	56 (51.85%)	1.59	0.663
Primary/JSS	63 (49.61%)	64 (50.39)		
Secondary/Vocational	48 (51. 61%)	45 (48.39%)		
Tertiary	20 (40.82%)	29 (59.18%)		
Spouse Educational Level				
No Formal Education	55(58.51%)	39 (41.49%)	6.21	0.101
Primary/JSS	43 (40.95%)	62 (59.05%)		
Secondary/Vocational	51 (48.11%)	55 (51.89%)		
Tertiary	34 (47.22%)	38 (52.78%)		
Occupation				
Public	42 (53.85%)	36 (46.15%)	7.06	0.070
Private	33 (44.59%)	41 (55.41%)		
Self Employed	102 (50.72%)	99 (49.25%)		
Unemployed	6 (25.00%)	18 (75.00%)		
Religion				
Christian	144 (48.32%)	154 (51.68%)	0.177	0.915
Moslem	26 (50.98%)	25 (49.02%)		
Traditionalist	13 (46.43%)	15 (53.57%)		

4.7 Individual Factors that Influence ITN Use

Pearson chi-square test showed a statistically significant association between ITN Use and hypersensitivity ($p<0.001$), perceived insusceptibility to mosquito bite/malaria ($p<0.001$) and mode of acquisition of nets ($p<0.001$). In the unadjusted models, Hypersensitivity/Burning Sensation [OR = 0.35, 95%CI (0.222-0.536)], Perceived insusceptibility to mosquito bite/malaria [OR = 0.31, 95%CI (0.99-0.491)], and Use of other methods [OR = 0.012, 95%CI (0.005-0.029)] reduced the odds that an individual will use ITN significantly. Receiving free net through mass distribution increases ITN Use by 4.47 times (95%CI, 2.876-6.944). However, when hypersensitivity/burning sensation, perceived insusceptibility to mosquito bite/malaria, use of other methods and receipt of free nets were adjusted, only receipt of free nets [AOR = 4.83, 95%CI (2.585-9.035)] and use of other methods [AOR = 0.009, 95%CI (0.003-0.026)] were statistically significant.

Among pregnant women, Pearson chi-square test of association showed that Hypersensitivity/Burning sensation, perceived insusceptibility to mosquito bite/malaria, Partner influence and use of other methods influenced the use of ITNs at night. Cultural and receipt of free nets had no significant association with ITN use. Their unadjusted effects reduced the chances of a pregnant women using ITN. These associations were statistically significant. When their influences were adjusted, the effect the Use of other methods [AOR = 0.68, 95%CI (0.428-1.067)] became insignificant but the effects of Perceived insusceptibility [AOR = 0.38, 95% (0.225-0.627)] and Partner influence [AOR = 0.68, 95%CI (0.140-0.359)] remained significant.

Table 15: Individual factors associated with ITN Use among Household Respondent and Pregnant Women in the Sunyani West District, June 2017.

	Household Respondent		Pregnant	
Individual Factors	**Chi-square**	**p-value**	**Chi-square**	**p-value**
Hypersensitivity/Burning Sensation	23.32	< 0.001	12.00	< 0.001
Perceived Insusceptibility to Mosquito Bite/Malaria	26.61	< 0.001	23.90	< 0.001
Receipt of Free Nets	47.18	< 0.001	1.01	0.315
Use of Alternative Method	206.26	< 0.001	14.16	< 0.001
Partner Influence			44.24	< 0.001
Cultural Reasons for Non-Use			0.251	0.616

Table 16: Logistic Regression of Individual Factors Associated with ITN Use among Household Respondents and Pregnant Women in the Sunyani West District, June 2017.

Individual Factor (Ref = No)	Crude Odds Ratio (OR)	95% Confident Interval	Adjusted Odds Ratio (AOR)	95% Confident Interval
Household respondents				
Hypersensitivity/ Burning Sensation	0.35	0.222-0.536 (p=0.001)	1.48	0.694-3.161 (p=0.310)
Perceived Insusceptibility	0.31	0.199-0.491 (p=0.001)	0.55	0.278-1.084 (p=0.084)
Receipt of Free Nets	4.47	2.876-6.944 (p=0.001)	4.83	2.585-9.035 (p=0.001)
Use of Alternative Method	0.012	0.005-0.029 (p=0.001)	0.009	0.003-0.026 (p=0.001)
Pregnant Women				
Hypersensitivity/ Burning Sensation	0.45	0.292-0.700 (p=0.001)	0.57	0.343-0.947 (p=0.030)
Perceived Insusceptibility	0.33	0.2133-0.522 (p=0.001)	0.38	0.225-0.627 (p=0.001)
Partner Influence	0.24	0.151-0.364 (p=0.001)	0.22	0.140-0.359 (p=0.001)
Use of Alternative Method	0.46	0.302-0.688 (p=0.001)	0.68	0.428-1.067 (0.093)

4.8 Community Factors that Influenced ITN Use

In households, Media exposure (p=0.002), Health access (p=0.017) and Mass distribution of ITN (p<0.001) were associated with ITN Use. A Simple Logistic Regression showed that Mass distribution promotes ITN use significantly [OR = 3.10, 95%CI (1.603-5.981)] likewise Media exposure [OR = 1.97, 95%CI (1.267-3.063)]. However, Access to healthcare reduced the odds of using a net and also individuals in rural communities were more likely to sleep under ITNs, although the difference was not statistically significant. In a Multiple Logistic Regression model, the odds of Media exposure to malaria messages [AOR = 2.18, 95%CI (1.320-3.588)], Access to healthcare [AOR = 0.33, 95%CI (0.180-0.622)] and Mass distribution [AOR = 2.9, 95%CI (1,438-5.923)] were significant.

Among pregnant women, a Chi-square test showed that Media exposure (p=0.150), Access to healthcare (p=0.258) and community classification (p=0.186) had no significant association with ITN Use. Adjusting for Media Exposure, Access to healthcare and Community classification, Mass distribution increased the odds of ITN use by 5.43 times. (95%CI, 1.918-17.217).

Table 17: Community factors associated with ITN Use among Household Respondent and Pregnant Women in the Sunyani West District, June 2017

	Household Respondent		Pregnant Women	
Community Factors	**Chi-square**	**p-value**	**Chi-square**	**p-value**
Media Exposure to Malaria Messages	9.10	0.002	3.80	0.150
Mass Distribution	17.84	< 0.001	11.35	0.001
Access to Healthcare	5.72	0.017	2.71	0.258
Community Classification	4.17	0.014	1.75	0.186

Table 18: Logistic Regression of Community Factors Associated with ITN Use among Household Respondents and Pregnant Women in the Sunyani West District, June 2017.

Community Factor (Ref = No)	Crude Odds Ratio (OR)	95% Confident Interval	Adjusted Odds Ratio (AOR)	95% Confident Interval
Household Respondents				
Media Exposure	1.97	1.267-3.063 (p=0.003)	2.18	1.320-3.588 (p=0.002)
Access to Healthcare	0.52	0.299-0.893 (p=0.018)	0.33	0.180-0.622 (p=0.001)
Mass Distribution	3.10	0.299-0.893 (p=0.001)	2.9	1.438-5.923 (p=0.003)
Community Classification	1.53	1.016-2.308 (p=0.042)	1.26	0.821-1.947 (p=0.286)
Pregnant Women				
Media Exposure	0.73	0.444-1.226 (p=0.240)	0.71	0.423-1.189 (p=0.192)
Access to Healthcare	0.81	0.494-1.333 (p=0.406)	0.90	0.545-1.492 (p=0.688)
Mass Distribution	5.43	1.827-16.148 (p=0.002)	5.75	1.918-17.217 (p=0.002)
Community Classification	0.76	0.507-1.141 (p=0.187)	0.71	0.471-1.081 (p=0.112)

CHAPTER FIVE

5.1 DISCUSSION

The study was carried out in the Sunyani West District. In all, a total 413 household respondents and 377 pregnant women were interviewed. The primary target for the household survey were mothers since they were in a better position to provide information on ITN ownership and usage especially on children under five. Samples were drawn from five communities (Bofourkrom, Adantia, Dumesua, Attakrom and Amanfuso); one each from the five sub districts.

5.2 Household Ownership of Nets

Households with at least one ITN among the study population was high, with 79% of households and 87% of pregnant women having nets that could be used while sleeping. Despite the ownership being high, the district is yet to attain the NMCP's target of 100% of households owning at least one ITN (USAID, 2013). Household ownership of ITN have seen much increase compared to the coverage in the 2014 Ghana Demographic and Health Survey of 69.6% household ownership of at least one net. The high ownership of net in the district may be due to the mass distribution campaign carried out in 2015. In addition to the mass distribution, there are other distribution out-lets such as Child Welfare Clinics (CWC) and Antenatal Care (ANC). Several studies have reported such high ITN ownership in other malaria endemic communities. A study by (Ernst et al., 2017) in Mozambique showed a similar high ownership of nets (78%). In another study by Moon et al. (2016) that surveyed 3916 households in 2010 and 3906 households in 2014, 64.3 % of the respondents were in possession nets. Kateera et al., (2015) studied long - lasting

insecticidal net sources, ownership and use in the context of universal coverage of household in eastern Rwanda and reported an overall ownership of at least one net to be 92 %. ITN ownership was found to be equally high in Benin (84.8%) through a similar study by(Tokponnon et al., 2015). Other studies have however reported much lower levels of household owners in Eastern as well as West Africa. According to Kimbi et al, (2014) net ownership in Cameroon was only 47%, whilst (Woyessa, Deressa, Ali, & Lindtjørn, 2014) found ownership in Ethiopia to be 23.1%. From the current study, net density (average net per person) was 0.35 in the sampled households. This is below the target of the National Malaria Control Programme of achieving a universal coverage (one net per two persons). The World Health Organization defines universal coverage as one LLIN for every two persons at risk of malaria (WHO, 2014). This means that net density should be at least 0.5. There is therefore a significant difference in the existing net density and the expected density. The current findings support the report of the Global fund that evaluated the malaria programmes in Ghana from 2003 to 2010 and revealed that there was no significant change in the malaria disease burden over the ten-year evaluation period. The lack of improvement was attributed to interventions such ITN not reaching enough of the population (Garcia, 2011). A similar situation was observed in Central Uganda, where the percentage of households with LLINs per two people was found to be low (51%) (Wanzira et al., 2014) and in Nigeria, a study identified an intra-household possession gap (not enough for every family member) as 66% (Kilian et al., 2013).

Another issue of concern was unhanged nets, although majority of respondents (74 %) received their nets through free mass distributions and they are supposed to be hang up campaigns, some of the nets still remain unhanged. From the current study, some pregnant

women (38%) and 26% of household respondents did not have a net hanged. An individual is very unlikely to use a net once the net is not in place.

Among those who did not own any net, 40% said they prefer to use other methods, 36% do not have enough money to buy, 20% was of the reason that mosquito nets are not easily available to buy, 2% either do not need a net or used to have a net but it was torn and could not be used. In the case of the pregnant women, 136%) do not have any net. Similarly, as among households, majority (56%) preferred to use other methods. It therefore appears that preference for the use of other malaria prevention methods influence one's decision to own or not to own a net.

5.3 ITN Use among Children under Five and Pregnant Women

In this study, ownership (pregnant women with at least a net) of nets among pregnant women did not translate into its usage. Only 49% of the pregnant women used insecticide treated nets the night before the study. Although ITN usage was found to be low in the current study, it was much higher than the situation in Sudan, where ITN coverage among pregnant women is 59% but usage was only 11.5% according to (Yassin et al., 2010). Also, in a study in South-West Nigeria, only 8.8% of women who had nets slept regularly under them. The target of the National Malaria Control Programme plan of action that ended in 2015, was to increase the number of under-five and pregnant women sleeping under ITN from previous lower levels to 85% (USAID, 2013). ITN usage among pregnant women in the Sunyani West District was far below the national target. In children five years and below, 69% slept under ITN. When stratified by age, four years old children used ITN most (78.31%). One would expect that ITN usage should be highest among children below 1 year but only 69% of them slept under ITN. A possible explanation may be that, most of

them share sleeping places with their mothers, and hence poor ITN usage among mothers is likely to affect ITN usage by the children. A significant association was found between a child's sex and ITN use with more males (78.17%) using ITNs compared to the females 59.56%. Although net use among children was not at a desirable rate, it was much higher than that reported for Central Uganda [51%] (Wanzira et al., 2014) and Senegal [45.6%] (Thwing et al., 2011). Net unavailability or net not being enough was the reason why most children under five did not use ITN. It was observed that children mostly under two years slept under a kind of designed nets for children but they were not impregnated with insecticide, as such, some children might not have the full benefit of sleeping under ITNs.

5.4 Individual and Community Factors that Influence ITN Use

A statistically significant association was also found between ITN use and receipt of free nets and the use of alternative malaria prevention methods. Also, reasons given in the current study for non-ownership and usage of ITN were similar to those reported by Ezeigbo, Ejike, & Nwachukwu (2016) in a similar study in the Abia State of Nigeria which included 'having door and window netting', 'use of other malaria prevention methods' and 'fear of side-effects' . Individuals who received free nets through mass distribution were 4.47 times more likely to use the nets compared to those who did not receive any nets.

Among pregnant women, hypersensitivity/burning sensation, perceived insusceptibility to mosquito bite/malaria, partner influence and use of other methods influence the use ITNs at night. All the above factors potentially reduced ITN use. Burning sensation is normally caused by individuals coming in contact with insecticide net whilst sleeping under it. It is therefore necessary, to avoid the effect of burning sensation. Pregnant women must have the required knowledge for rinsing and air drying the net under shade before the first use.

Most of the pregnant women were married and presumably share sleeping place with partners. Partner influence was an important factor in determining the usage of ITN by pregnant women. This finding of the study was similar to that reported by Ernst et al. (2017). They reported that the proportion of pregnant women sharing sleeping place with their partners adversely influenced net use and proposed the need to do a thorough study of the role social networks play in influencing uptake of preventive strategies since the role of social influence on bed net ownership has not been well explored. From this, one can deduce that interventions aiming at promoting ITN use among pregnant women must include their partners for it to be effective. The study also assessed the presence of cultural barriers to ITN use in the district but no cultural reasons were given by pregnant for non-use of ITN. The pregnant women were also found using other malaria preventive methods which significantly reduced the use of ITN.

With the community factors, media exposure to malaria messages, access to healthcare and mass distribution influenced ITN use. Access to healthcare would have been predicted to increase net use just as it increases health care utilization but on the contrary, this reduced net usage in communities that have health facilities. It could be that, the presence of health facility indirectly assures community members of availability of treatment/care for malaria, so less efforts are put in to prevention. From the current study, media exposure promoted net usage. The results on the valuable role of media messages is in conformity with the results of Adjah & Panayiotou (2014). Explanation for mass distribution increasing ITN use may be because it increased household ownership and availability of net. Also mass distribution campaigns are associated with education on ITN use which also promotes ITN

use. A study in Benin showed positive impact of mosquito net distribution on household ownership and usage (Tokponnon et al., 2015).

5.5 The Use Alternative or Other Methods in Malaria Prevention

About 30% of the study population used only other malaria prevention methods to protect themselves against malaria. This finding is similar to the finding (44.5%) of Ozims & Eberendu (2014) in Imo State, Nigeria. The methods mostly used from the study included insecticide spray (45%) and burning of mosquito coil (41). Only 5% used mosquito repellents. This practice was higher in periurban as compared rural communities. Some individuals use alternative methods for the lack of mosquito nets but other reasons given were that the alternative methods used were easy to apply as compared to ITN, less costly and also readily available. The proportion of other malaria prevention methods users was quite substantial but the Ghana Health Service and National Malaria control do not recognize or recommend these methods against malaria prevention. If these methods really are the appropriate and applicable means to its users, then it is time for the authorities to do the necessary studies so to establish a firm stand on those methods. If insecticide spraying and mosquito coil burning are found through studies to be effective and safe, it could add up to already existing tried and tested strategies such as ITN use and Indoor Residual Spraying and help diversify means of protection against mosquitoes. A few studies are already against the use of other methods with reasons that they inflict some economic burden on households with no resultant decrease in the risk of developing malaria (Onwujekwe, Etiaba, Uguru, Uzochukwu, & Adjagba, 2014). However, more must be done to establish the facts for or against the use of other matters. A study in Southern Nigeria reported substantially high levels of use of other malaria preventive gears such as

window and door nets, indoor spray, aerosol spray and cleaning the environment (Onwujekwe et al., 2014). Clearly, this study has shown that aside ITNs that are being promoted by the NMCP and GHS, several other means to prevent malaria exist. Preference for this alternative methods for malaria prevention has a great potential to reduce the utilization of ITNs.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study sought to determine the level of household ownership and utilization of ITNs and associated factors in the Sunyani West District. A total of 413 household heads or their representatives and 377 pregnant women participated in the study. The 413 households had a total of 2,359 individuals resident in the various households. Out of this number, 556 (23.6%) were children under five years of age.

Household Ownership and Usage of ITN

Households with at least one ITN among the study population was high, with 79% of households and 87% of pregnant women having nets that could be used while sleeping. About 49% of the pregnant women used insecticide treated nets the night before the study. In children five years and below, 69% slept under ITN.

Individual Factors that Influence ITN Use

A statistically significant association was also found between ITN use and receipt of free nets and the use of alternative malaria prevention methods among household respondent. Among pregnant women, ITN use is significantly associated with perceived insusceptibility to mosquito bite/malaria, hypersensitivity/burning sensation and partner influence

Community Factors that Influence ITN Use

With the community factors, media exposure to malaria messages, access to healthcare and mass distribution influenced ITN use among household respondents. Access to healthcare

would have been predicted to increase net use but on the contrary, this reduced net usage in communities that have health facilities. The only community factor statistically associated with ITN use among pregnant women is mass distribution.

Use of Alternative Methods

About 30% of the study population used other malaria prevention methods to protect themselves against malaria. The methods mostly used from the study included insecticide spray (45%) and burning of mosquito coil (41). Only 5% used mosquito repellents. This practice was higher in periurban as compared rural communities. Some individuals used other method for the lack of net but other reasons given were that it was easy to apply as compared to ITN, less costly and also readily available.

Conclusion Remarks

Mass distribution campaigns and continuous distribution of ITN have increased household ownership but Net density/Average net per household is lower than WHO's recommendation (Universal Coverage). Ineffective ITN use remains a challenge to malaria control efforts in the Sunyani West District due to alternative malaria prevention methods use among household respondent and perceived insusceptibility to mosquito bite/malaria, hypersensitivity/burning sensation and partner influence in the case of pregnant women. Some community factors such as Media Exposure and Mass Distribution promotes ITN use. Aside ITNs that were being promoted by the NMCP and GHS, several other means to prevent malaria are being used. The use of these alternative methods has a great potential to reduce the utilization of ITNs but not enough studies have been carried out to determine magnitude, efficacy and/or effects of these methods on it users.

6.2 Recommendations

National Malaria Control Programme & Partners

- Modification and Redesign LLINs to make it easy to apply (movable/foldable) including the production of Kid's Kit.
- Design and Implement studies on the effects & effectiveness of popular alternative methods (insecticide spray and burning of mosquito coils) being used by the populace.
- Efforts must be made to diversify Malaria Control methods to give individuals options as in the case of Family Planning (FP)

Sunyani District Health Directorate

- Train Community Health Extension Worker and Community Health Officers with well-tailored information/knowledge on Behaviour Change Communication to address the needs of non-users
- Intensify health education on ITN use. The messages must address individual challenges related perceived insusceptibility to mosquito bite/malaria, burning sensation and partner influence in the case of pregnant women
- The District Health Directorate and District Assembly should mobilize resource to implement mass distribution in order to increase household ownership, net availability and achieve universal coverage.

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APPENDIX A: INFORMED CONSENT

FACTOR INFLUENCING THE USAGE OF INSECTICIDE TREATED BED NET IN THE SUNYANI WEST DISTRICT

My name is Emmanuel Angmorteh Mensah and I am a graduate student from the School of Public health, University of Ghana, Legon, Accra. I am undertaking a research study on the topic **'Factor influencing the usage of Insecticide Treated Bed Net in the Sunyani West district'.** The purpose of the study is to identify factors affecting utilization of long lasting insecticide nets as a preventive measure for malaria in the general population and especially among children under five and pregnant women. This informed consent is to ensure that you understand the purpose and your responsibilities in the research before you decide if you want to be part or not.

Study procedure

This is a research study that would involve answering questions to an interviewer using a questionnaire. The interview will involve answering questions about ownership and usage of ITN, the use of alternative malaria prevention method and factor affect the use of ITNs. The whole study will last for about one month but your participation will be only for today and will take about 30 minutes.

Voluntary participation

You have the right not to participate in the study or to withdraw from the study at any time without any consequences to you. Should you choose to withdraw, the information you provide will not be used in the study. You are entitled to ask questions at any point in the study for clarification. Any aspect of the questions that is not well understood will be clarified by the interviewer.

Risk and benefit

We do not for see any potential risk in participating in the study except that it will take part of your precious time and the need to provide to us some personal information of yours. Benefits in this the study will be identifying factors influencing ITN usage which will enable the National Malaria Control Programme (NMCP) and Sunyani West District Health to device appropriate strategies to fight the high prevalence of malaria.

Compensation

No payment will be made for your time.

Confidentiality

We will protect all information you give us in this research to the best of our ability. We will not discuss your participation with anyone outside the research team. All responses will be treated as confidential as no names will be placed on the questionnaires.

This research has been reviewed and approved by Ghana Health Service Ethical Review Board. If you have any questions about this study, you may contact:

Emmanuel Angmorteh Mensah (Principal Investigator): 0274560893, E-mail: ea.mensah@yahoo.com

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Participant's Consent Form

I have read through the foregoing information/the foregoing information has been read and interpreted to me and I fully understand all that has been explained to me about the objectives, benefits, risks and my rights to withdraw from the study at any time without any consequences to me. I have been given opportunity to ask questions and have been answered satisfactorily. I therefore agree to participate in this study.

Please confirm your participation by signing below.

Signature/Thumbprint of participant Date

…… …….

P.I/Research Assistants name…….

Signature …… Date……

APPENDIX B: QUESTIONNAIRE

Households Questionnaire

My name is Emmanuel Angmorteh Mensah and I am a graduate student from the School of Public Health, University of Ghana, Legon, Accra. I am undertaking a study on the topic 'Factors influencing the usage of Insecticide Treated Bed Net in the Sunyani West district'. I therefore seek your consent and support in carrying out this research by kindly spending few minutes of your time in responding to some questions related to malaria and bednet use. Thank You

Sub District……	sub	Community……	comm
Respondents Number……	id	Date ……	

Household Membership Characteristics

1	How many people normally live in your household?	____ ____	hhsize
2	How many children less than 5 years are in your household?	____ ____	chninhh

Demographic Characteristics of Respondents

3	Sex of respondent	1. Male 2. Female	sexhh
4	Age of respondent	____ ____	agehh
5	Marital status	1. Married 2. Single 3. Divorced 4. Widowed	mstatus
6	Educational level of the respondent	1. No Formal education 2. Primary/JSS 3. Secondary / Vocational 4. Tertiary	educlevel
7	Occupation of respondent	1. Public 2. Private 3. Own business(farming/Trading) 4. Unemployed	ocuhh

8	Religion	1. Christian 2. Moslem 3. Traditionalist 4. Others (specify)……..	relig

Household Ownership of Nets

9	Does your household have any mosquito net(s) that can be used while sleeping?	1. Yes 0. No	hhownership
10	If yes, how many nets does your household have?	____ ___	numnethh
11	How many is hanged?	____ ____	nethanged
12	Where are the sources of this nets?	1. Free Mass distribution 2. ANC 3. CWC 4. School 5. Bought it from a store 6. Others (specify) ……	netsource
13	If no to question 9, what is your reason for not owning a net?	1. Do not need one 2. Not enough money to buy 3. Net not easily available to buy 4. Prefer to use other methods 5. Others (specify) ……	reasonnonet

ITN Use among children under five

		Child 1	Child 2	Child 3	
14	Age of children under five?	____ ____	____ ____	____ ____	chdage
15	Sex of children under five?	1. Male 2. Female	1. Male 2. Female	1. Male 2. Female	chnsex
16	Did child under five sleep under	1. Yes 0. No	1. Yes 0. No	1. Yes 0. No	chnitnuse

	net last night?				
17	If no, why did child not sleep under net?	1. Hot weather 2. Child cries 3. Not enough nets 4. Net not hung up 5. Used by adults 6. Nets not in good condition 7. Others (specify)……	1. Hot weather 2. Child cries 3. Not enough nets 4. Net not hung up 5. Used by adults 6. Nets not in good condition 7. Others (specify)……	1. Hot weather 2. Child cries 3. Not enough nets 4. Net not hung up 5. Used by adults 6. Nets not in good condition 7. Others (specify)……	reasonchn

Factor influencing ITN use

18	Did you sleep under ITN last night?	1. Yes 0. No	itnuse
19	If yes, why did you use ITN?	1. To get warmth 2. Protect me from mosquito bite and nuisance 3. Not to get malaria 4. Others (specify)……	reasonuse
20	Asses the following factors:		
Individual Factors			
Hypersensitivity/Burning sensation		2. Yes 1. No	hyperbs
Perceived insusceptibility to mosquito bite/malaria		2. Yes 1. No	perinsus
Received Free Net (Mass Distribution)		2. Yes 1. No	modeacquire
Community Factors			
Media exposure to malaria messages (Respondents who have seen or heard a message about malaria in the past 6 months)		2. Yes 1. No	Mediaexpo

Specific source of media of exposures to malaria messages?	1. Radio 2. TV 3. Poster/Billboard 4. Community health worker 5. Community Event 6. 6. Social Media	Sourceexpo
Access to healthcare (community has a health facility)	2. Yes 1. No	Healthacess
Community where there has been Mass distribution in past three years (Respondent is a beneficiary of freely distributed nets?)	2. Yes 1. No	Massdist
Classification of community of residence of respondent? Periurban (Buildings dominated by sand blocks with iron sheet roofing) Rural (Community predominately made of mud houses with straw roofing)	1. Periurban 2. Rural	commclass

Use of Other malaria prevention methods

20	Did you use any other means to protect yourself against mosquito bite last night?	1. Yes 0. No	usealt
21	How many persons used this method?	____ ____	nuusealt
23	What was the method used?	1. Mosquito coils 2. Insecticide spray 3. Net gauze on windows and doors 4. Physical killing 5. Fan (Ceiling/standing) 6. Mosquito repellent 7. Indoor Residual Spray 8. Others (specify)……	Altmethoduse

24	What are your reasons for using the method above	1. Less costly 2. Readily available 3. Easy to apply 4. Effective than net use 5. Does not produce health 6. Does not occupy space 7. Others (specify)……	reasonalt

Pregnant Women Questionnaire

My name is Emmanuel Angmorteh Mensah and I am a graduate student from the School of Public health, University of Ghana, Legon, Accra. I am undertaking a study on the topic 'Factor influencing the usage of Insecticide Treated Bed Net in the Sunyani West district'. I therefore seek your consent and support in carrying out this research by kindly spending few minutes of your time in responding to some questions related to malaria and bednet use. Thank You

Sub District……	sub	Community……	comm
Respondents Number……	pwid	Date ……	

Household Membership Characteristics

1	How many people normally live in your household?	____ ____	hhsize

Demographic Characteristics of Pregnant Woman

3	Number of previous pregnancy (ies)	____ ____	prevpregs
4	Age Pregnant Woman	_____ ____	pwage
5	Marital status	1. Married 2. Single 3. Divorced 4. Widowed	pwmstatus
6	Educational level of the pregnant woman	1. No Formal education 2. Primary/JSS 3. Secondary / Vocational 4. Tertiary	pweduclevel

8	Educational level of the spouse	1.No Formal education 2.Primary/JSS 3.Secondary / Vocational 4. Tertiary	spousedulvl
8	Occupation	1. Public 2. Private 3. Own business(farming/Trading) 4. Unemployed	pwocuhh
9	Religion	1. Christian 2. Moslem 3. Traditionalist 4. Others (specify)……..	pwrelig

Ownership of Nets among Pregnant Women

10	Does your household have any mosquito net(s) that can be used while sleeping?	1. Yes 0. No	pwownership
11	Is the net hanged?	1. Yes 0. No	
12	If yes, where are the sources of this nets?	1. Free Mass distribution 2. ANC 3. CWC 4. School 5. Bought it from a store 6. Others (specify) ……	pwsoursnet
13	If no, what is your reason for not owning a net?	1. Do not need one 2. Not enough money to buy 3. Net not easily available to buy 4. Prefer to use other methods 5. Others (specify) ……	pwreasonnonet

Factor influencing ITN use among Pregnant Women

14	Did you sleep under ITN last night?	1. Yes 0. No	pwitnuse
15	If yes, why did you use ITN?	1. To get warmth 2. Protect me from mosquito bite and nuisance 3. Not to get malaria 4. Others (specify)……	pwreasonitnuse
16	Asses the following factor:		
Individual Factors			
Hypersensitivity/Burning sensation		2. Yes 1. No	pwhyperbs
Perceived insusceptibility to mosquito bite/malaria		2. Yes 1. No	pwperinsus
Received Free Nets (Mass Distribution)		2. Yes 1. No	pwmodeacquire
Cultural reasons (beliefs and norms)		2. Yes 1. No	cultreas
Partner Influence (Pregnant woman did not sleep under ITN last because of the partner)		2. Yes 1. No	partinflu
Community Factors			
Media exposure to malaria messages (Respondents who have seen or heard a message about malaria in the past 6 months)		2. Yes 1. No	pwmediaexpo
Specific source of media of exposures to malaria messages?		1. Radio 2. TV 3. Poster/Billboard 4. Community health worker 5. Community Event 6. 6. Social Media	pwsourceexpo

Access to healthcare including ANC services (verify from ANC book)	2. Yes 1. No	pwhealthacess
Community where there has been Mass distribution in past three years (Respondent is a beneficiary of freely distributed nets?)	2. Yes 1. No	pwmassdist
Classification of community of residence of respondent? Periurban (Buildings dominated by sand blocks with iron sheet roofing) Rural (Community predominately made of mud houses with straw roofing)	1. Periurban 2. Rural	pwcommclass

Use of Other malaria prevention methods by Pregnant Women

18	Did you use any other means to protect yourself against mosquito bite last night?	2. Yes 1. No	pwusealt
19	What was the method used?	1.Mosquito coils 3. Insecticide spray 4. Net gauze on windows and doors 5. Physical killing 6. Fan (Ceiling/standing) 7. Mosquito repellent 8. Indoor Residual Spray 9. Others (specify)……	pwaltmethod
20	What are your reasons for using the method above	1. Less costly 2. Readily available 3. Easy to apply 4. Effective than net use 5. Does not produce health 6. Does not occupy space 7. Others (specify)……	pwreasonalt