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# Factors affecting the use of malaria prevention methods among pregnant women in Kenya.

**Choonara, Shakira**

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# Factors Affecting the Use of Malaria Prevention Methods among Pregnant women in Kenya.

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**University of the Witwatersrand, Faculty of Humanities,**

**School of Social Sciences, Johannesburg.**

**Author: Shakira Choonara**

**Person Number: 305359**

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**Research report submitted to the Faculty of Humanities, University of the Witwatersrand, in partial fulfilment of the requirements for degree of Masters of Arts in the field of Demography and Population Studies.**

**2012**

**Supervisor: Professor Clifford Odimegwu**

**Declaration**

I, Shakira Choonara declare that this research report is my own original work. It is being submitted to the School of Social Sciences, Faculty of Humanities, University of the Witwatersrand, Johannesburg. It is submitted in partial fulfilment of the requirement for the degree of Master of Arts in the field of Demography and Population Studies. I declare that to the best of my knowledge it has not been submitted before in part or in full for any degree or examination at this or any other university.



Miss Shakira Choonara

08/07/2013

**Dedication**

I dedicate this work to my parents; Cassim Choonara whose courage, daily struggles, critical questions and support motivated the completion of this research and Ayesha Choonara for her patience and encouragement.

**Acknowledgements**

I would like to thank my supervisor Professor Clifford Odimegwu for his constant guidance and advice throughout the research process. A special thank you to my mentors; Miss Ziphozonke Bridget Dube, Dr Latifat Ibisomi and Bob Charlestein Elangwe. I am deeply indebted to the remarkable staff and students at the University of the Witwatersrand's Disability Unit, who have supported my university career from the onset.

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**List of Abbreviations**

| | |
|---|---|
| **KDHS** | Kenya Demographic and Health Survey |
| **KNBS** | Kenya National Bureau of Statistics |
| **ITN** | Insecticide Treated Nets |
| **IPTp** | Intermittent Preventative Therapy during Pregnancy |
| **MIS** | Malaria Indicator Survey |
| **SP** | Sulphadoxine-Pyrimethamine |
| **WHO** | World Health Organisation |

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**Abstract**

**Background**

In sub-Saharan Africa, malaria is the leading cause of morbidity and mortality. An estimated 15 million malaria cases and 40 000 malaria deaths were reported in Kenya. Malaria during pregnancy is associated with adverse health outcomes for both the mother as well as her foetus. The purpose of this study was to examine the relationship between socioeconomic correlates and the uptake of malaria prevention methods during pregnancy.

**Methodology**

Data was drawn from the 2008-2009 Kenya Demographic and Health Survey. A total of 8098 women aged 15-49 were analysed. Stata version 12 was used for the management and analysis of data. Univariate, bivariate and multivariate analysis was carried out to meet the objectives of this study.

**Results**

Forty-eight percent of women made use of Insecticide Treated Net (ITNs), 52 percent were administered with Intermittent Preventative Therapy (IPTp) and 36 percent made use of both measures during pregnancy. Multivariate results indicate that urban women were found to display slightly higher odds of ITN usage (1.13) and the combined usage of ITNs and IPTp (1.22) during pregnancy in comparison to rural women. Women with higher levels of education and women from middle income and rich households displayed higher odds of the uptake of these malaria prevention methods during pregnancy.

**Conclusion**

This study has shown that socioeconomic indicators influence the usage of malaria prevention methods during pregnancy. It is therefore imperative that these factors be considered when designing and implementing policies aimed at improving the uptake of these measures during pregnancy.

# Chapter 1 Introduction

## 1.1 Statement of the Problem

### 1.1.1 Burden of Disease

Malaria during pregnancy is estimated to cause between 75 000 and 200 000 infant deaths globally (Miaffo et al., 2004). Malaria is responsible for close to 500 000 women developing severe anaemia and responsible for approximately 350 to 500 million clinical episodes each year (Goesh et al., 2004). Between one and three million deaths may be attributed to malaria, causing it to be classified as one of the most prevalent communicable diseases in the world (Sachs & Melaney, 2011). Malaria is one of the leading contributors to the mortality figures recorded in sub-Saharan Africa (Okpere et al., 2010). On an annual basis, malaria during pregnancy is responsible for 10 000 maternal deaths and 200 000 infant deaths in Africa (Okpere et al., 2010).

Annually, 24 million Kenyans are threatened by malaria (Kenya National Bureau of Statictics & and ICF Macro, 2010).This translates to approximately 70 percent of the Kenyan population being at risk of malaria. In 2010, thirty-four percent of outpatient hospital visits in Kenya were due to malaria (Kenya National Bureau of Statistics & Macro., 2011). During high transmission seasons, malaria was recorded as being as high as ninety-five percent among children under the age of five in the Bungoma district of Kenya (Hamel et al., 2001). Malaria was found to be largely responsible for the high mortality rate in this district.

Pregnant women and children under the age of five are considered to be at greatest risk of malaria (Goesh et al., 2004). According to Ejik et al. (2005), approximately 30 million women become pregnant in malaria endemic regions of Africa. Malaria during pregnancy is associated with adverse health outcomes, such as maternal anaemia, Intrauterine Growth Retardation (IUGR), spontaneous abortion and the delivery of low birth weight infants (Aina & Ayeni,

2011). The delivery of low birth weight infants is one of the principal causes of infant mortality in sub-Saharan Africa (Kabanywanyi et al., 2008). It has been estimated that close to 6% of infant deaths in the endemic regions of sub-Saharan Africa may be attributed to malaria-associated low birth weight (Guyatt et al., 2004).

### 1.1.2 Preventive Strategies

The World Health Organisation (WHO) recommends the utilisation of Insecticide Treated Nets (ITNs) and Intermittent Preventative Therapy (IPTp) to reduce malaria in pregnancy (Feng et al., 2010). Malaria is transmitted from person to person through the female anopheles mosquito, which requires blood to nurture her eggs (Aina & Ayeni, 2011). ITNs are sprayed with pyrethroids substances to repel these female anopheles mosquitoes (Okpere et al., 2010). ITNs reduce human-vector contact by acting as a barrier to prevent mosquito bites which cause malaria (Enato & Okhamafe, 2005). IPTp refers to the administration of two or more doses of an anti-malarial drug, such as Sulphadoxine-Pyrimethamine (SP), to pregnant women after 16 weeks of gestation (Kenya National Bureau of Statictics & and ICF Macro, 2010). Following the first dosage of SP, subsequent doses need to be administered at least 4 weeks apart during pregnancy. The utilisation of both or either of these strategies is found to be effective in reducing malaria in pregnancy (Yusuf et al., 2008).

A meeting between various African heads of states in Abuja in 2000 concluded that at least 60 percent of pregnant women should benefit from malaria prevention strategies by the year 2005 (Beer et al., 2010). The Abuja targets were later revised to ensure that at least 80 percent of pregnant women who reside in malaria endemic regions should benefit from preventative measures such as ITNs and IPTp by the year 2005 (Beer et al., 2010). An estimated 16 million ITNs were distributed in Kenya by the end of 2008 (Kenya National Bureau of Statictics & and ICF Macro, 2010). The distribution of these nets was accompanied with advocacy messages

targeting pregnant women. However, according to the 2008-09 Kenya Demographic and Health survey, only 49 percent of pregnant women in Kenya made use of an ITN, while only 14 percent of pregnant women were administered with IPTp at antenatal clinics in Kenya in 2008. These results indicate that the uptake of ITNs and IPTp among pregnant women in Kenya remains well below the Abuja target.

### 1.1.3 Prior Research

Studies in sub-Saharan Africa are primarily concerned with establishing the effectiveness of the usage of ITNs and the administration of IPTp during pregnancy. For instance, the administration of IPTp was found to be effective in reducing malaria transmission among pregnant women in Malawi (Feng et al., 2010). In Nigeria, higher rates of malaria infection were recorded among pregnant women who did not make use of an ITN (Houmsou et al., 2010). Namusoke et al. (2010) established the highly protective effect of ITNs against malaria in Uganda. In addition, lower rates of placental malaria were observed among pregnant women who received IPTp treatment in an area of intense malaria transmission in Western Kenya (Parise et al., 1998). The protective efficacy of ITN usage and IPTp administration during pregnancy has been well established in sub-Saharan Africa. According to Mcintyre et al. (2006), there is a need for studies to focus on factors associated with the uptake of malaria prevention strategies. This study aims to examine the association between socioeconomic factors and the uptake of malaria prevention methods during pregnancy in Kenya.

## 1.2 Research Question

What are the socioeconomic factors associated with the usage of malaria prevention methods among pregnant women in Kenya?

### 1.3 Objectives

1. To determine the prevalence of malaria prevention methods during pregnancy.
2. To examine the association between socioeconomic determinants and the uptake of malaria prevention methods during pregnancy.

### 1.4 Justification

In the year 2000 the United Nations (UN) formulated the Millennium Development Goals (MDGs) in order to ensure the overall development of nations by the year 2015 (World Health Organisation, 2007). MDG 6 is aimed at combating HIV/AIDS, malaria and other diseases (Haslegrave & Bernstein, 2005). The burden of malaria in sub-Saharan Africa poses severe demographic consequences to the continent. In 2006 an estimated 15 million cases and 40 000 malaria deaths were reported in Kenya (World Malaria Report, 2009). Malaria in pregnancy is considered to be the foremost public health concern in Kenya (Kenya National Bureau of Statistics & Macro., 2011). In Africa malaria during pregnancy is responsible for 10 000 maternal deaths and 200 000 infant deaths annually (Okpere et al., 2010). Pregnant women are considered to be far more vulnerable to malaria than other adults. In particular, pregnant women are four times more likely to contract malaria and twice more likely to die from malaria than other adults (Malaria Consortium , 2012). Malaria during pregnancy is associated with maternal anaemia and the delivery of low birth weight babies (Steketee, et al., 1996). Low birth weight < 2500 grams is often found to be the single greatest risk factor for infant mortality in sub-Saharan Africa (Kabanywanyi et al., 2008). Indirectly, malaria during pregnancy hampers the achievement of MDG 4 (reducing child mortality) and MDG 5 (improving maternal health).

Since 1998, the WHO recommends the use of ITNs and the administration of IPTp to prevent malaria infections during pregnancy (Mens et al., 2011). The National Malaria Strategy

(NMS) and the National Health Sector Strategic Plan, guides malaria prevention and control strategies in Kenya (Kenya National Bureau of Statistics & Macro., 2011). One of the major goals of the NMS is to reduce malaria morbidity and mortality by two-thirds by 2017. One of the core aims of the NMS is to ensure that at least 80 percent of people living in malaria endemic regions benefit from malaria preventative measures. According to the 2008-09 Kenya Demographic and Health Survey, 49 percent of pregnant women made use of an ITN and 14 percent of women were administered with IPTp at antenatal clinics during pregnancy.

The use of both ITNs and the administration of IPTp have been found to be associated with a reduction in malaria and improved health outcomes among pregnant women (Yusuf et al., 2008). The administration of IPTp is considered to be effective in reducing malarial transmission during the later stages of pregnancy. On the other hand, the usage of ITNs is considered to be effective during all stages of pregnancy (Briand et al., 2007). It is therefore evident that the combined uptake of both these measures is required to provide the complete protection of pregnant women and their foetuses against malaria infections. This study was concerned with identifying factors associated with the uptake of both these preventive measures during pregnancy.

Relatively few studies in sub-Saharan Africa focus on the uptake of both these measures during pregnancy. For example, Sangare et al. (2010) focus on determinants associated with the administration of IPTp among pregnant women in Uganda and Ejik et al. (2005) focus on the administration of IPTp among pregnant women who reside in the rural areas of Western Kenya. Belay et al. (2008) focus on the use of ITNs among pregnant women in the rural regions of Ethiopia. In contrast to earlier studies, this study was aimed at investigating socioeconomic determinants associated with usage of ITNs, the administration of IPTp and the combined uptake of both these measures during pregnancy.

## 1.5 Definition of concepts

Malaria prevention methods in this study refer to:

*Insecticide Treated Nets (ITNs):*

ITNs: Mosquito nets which are treated with insecticide prior to use.

*Intermittent Preventative Therapy (IPTp):*

IPTp: The administration of two or more doses of the anti-malarial drug Sulphadoxine-Pyrimethamine (SP) during pregnancy.

*Combined Uptake:*

It is the simultaneous use of ITNs and IPTp during pregnancy.

## Chapter 2 Literature Review

### 2.1 Review of the relevant Literature

#### 2.1.1 Health Seeking Behaviour

Existing literature on health seeking behaviour in sub-Saharan Africa illustrates that the availability of health services and drugs does not guarantee the usage of these services (Beiersmann, et al., 2010). In Kenya, the uptake of malaria prevention measures, such as ITNs and IPTp, remains low despite distribution and free access to these measures (Kenya National Bureau of Statictics & and ICF Macro, 2010). According to Beiersman et al. (2010), factors such as household socioeconomic status, and religion tends to influence health seeking behaviour. In Burkina Faso, poverty was found to be an important factor influencing health seeking behaviour (Beiersmann, et al., 2010), whereas, fear of being tested for the Human Immunodeficiency Virus (HIV) at antenatal clinics was associated with the low uptake of IPTp administration during pregnancy in Western Kenya (Hafu et al., 2010).

#### 2.1.2 Malaria Prevention Strategies

Earlier research with regards to the uptake of malaria prevention tools either focus on the usage of ITNs or the administration of IPTp during pregnancy. Relatively few studies are directed towards examining determinants associated with the combined uptake of these measures during pregnancy. In addition, research directed towards the usage of ITNs and the administration of IPTp among pregnant women is not investigated on a national level within any country in sub-Saharan Africa. Belay and Deressa (2008) attempted to investigate factors associated with the usage of ITNs among pregnant women in the Northern region of Ethiopia. They made use of a community-based cross sectional study of 815 pregnant women. The study found that the type of residence and the educational attainment of respondents were significantly associated with the usage of ITNs. An association was also

established between household ownership of a radio and ITN usage among pregnant women. The age of respondents, marital status, parity and the size of households were not considered to be significant predictors of ITN usage among pregnant women in Ethiopia.

Atieli et al. (2011) focus on the determinants associated with the ownership and usage of ITNs among households in the Western Highlands of Kenya. Approximately 600 households were surveyed during this cross-sectional study. Chi-square tests were employed in order to determine the differences between ownership and the actual usage of ITNs. Despite 71 percent of households owning an ITN, only 56 percent of households made use of an ITN. Atieli et al. (2011) concluded that the level of education of a household is significantly associated with the usage of ITNs among households in the Western highlands of Kenya.

Sangare et al. (2010) examined the determinants associated with the administration of IPTp during pregnancy in Uganda. Five hundred (500) pregnant women residing in the Jinja district of Uganda were included in the study (Sangare, et al., 2010). Sangare et al. (2010) made use of relative risk regression in order to determine the association between exposures such as marital status and type of place of residence with a full course of IPTp administration in Uganda. Significant associations were found between women with a primary level of education, religion, married women and IPTp administration. Interestingly, women who reside in the rural areas of Jinja and who are considered to be from least poor households displayed the highest relative risk of receiving a full course of IPTp administration (Sangare, et al., 2010). One of the shortfalls of Sangare et al. (2010) is that no explanation is given for significant associations established in the study.

A considerable amount of prior research focuses on the effectiveness of ITNs and IPTp. Nankabirwa et al. (2011) included the use of mosquito nets in multivariable regression analysis to determine the risk factors of perinatal death in Eastern Uganda. The study found that all perinatal deaths occurred among women who did not sleep under mosquito nets (Nankabirwa et al., 2011). Another study in urban Malawi, evaluated the impact of a social marketing programme on malaria infection among children (Mathanga et al., 2006). The use of ITNs was associated with a 52 percent protective efficacy against malaria infections among children.

A study conducted by Parise et al. (1998) was limited to determining the effectiveness of IPTp administration in preventing placental malaria in Western Kenya. All women who enrolled at two of the largest government antenatal hospitals in the Kisumu district of Western Kenya were included in the study. Two of the largest government hospitals in the Kisumu district include the New Nyanza Provincial General Hospital and the Kisumu District Hospital. Logistic regression analysis was employed in the study to investigate the multiple risk factors associated with the presence or absence of anaemia (Parise, et al., 1998). According to Parise et al. (1998), higher doses of IPTp administration with SP treatment are more effective in preventing placental malaria among pregnant women in this region of Kenya.

Most studies which focus on the uptake of both ITNs and IPTp were primarily concerned with the effectiveness of these measures with regards to reducing malaria infection among pregnant women. Feng et al. (2010) attempted to examine the relationship between the use of ITNs and the administration of IPTp in reducing malaria infections among pregnant women in Malawi. Eight thousand one hundred and thirty one (8131) women were included in the

study over a period of nine years. The study found ITN usage to be significantly associated with a decrease of placental malaria and the low birth weight of infants. In addition, the level of placental malaria and the low birth weight of infants were further reduced among women who made use of both ITNs and who received two or more doses of IPTp (Feng et al., 2010).

Nganda et al. (2004) investigated the uptake of ITNs and IPTp among pregnant women in Tanzania. Two hundred and ninety-three (293) women who recently delivered at the Kibaha District Hospital on the East African Coast of Tanzania were selected for the study. Nganda et al. (2004) employed multivariate logistic regression techniques to assess the uptake of ITNs and IPTp during pregnancy. Nganda et al. (2004) found maternal health education to be associated with IPTp administration among pregnant women. High knowledge of malaria among pregnant women was found to be associated with the use of ITNs. In addition, this study also attempted to investigate the association between the uptake of ITN, IPTp and the incidence of anaemia among pregnant women in Tanzania. The use of ITNs and the administration of IPTp among pregnant women significantly decreased the onset of maternal anaemia.

The effectiveness of ITN usage and IPTp administration to reduce malaria during pregnancy is well established (Sangare, et al., 2010). Relatively few studies in sub-Saharan Africa focus on the uptake of both these preventive measures during pregnancy. To ensure the effective prevention of malaria, actual use indicators associated with ITNs and IPTp need to be taken into consideration (Atieli, et al., 2011). This study therefore attempted to examine the association between socioeconomic determinants and the uptake of these malaria prevention methods during pregnancy.

## 2.2 Hypothesis

The following hypothesis was tested in this study:

$H_0$: There is no difference in socioeconomic factors affecting the utilisation of malaria prevention methods during pregnancy.

$H_A$: There are differences in socioeconomic factors affecting the utilisation of malaria prevention methods during pregnancy.

## Chapter 3 Methodology

### 3.1 Data Source

This was a secondary data analysis using data from the 2008-09 Kenya Demographic and Health Survey (KDHS). The 2008-09 KDHS aimed to provide information for the planning of population and health programmes in Kenya. The 2008-09 KDHS collected information pertaining to fertility, marriage, maternal health, malaria and the use of mosquito nets (Kenya National Bureau of Statictics & and ICF Macro, 2010).

### 3.2 Study Population

The study population comprised of 8098 postpartum women aged 15-49 who had given birth two years prior to the survey. The 2008-09 KDHS measures IPTp administration as the proportion of women who had a live birth in the two years preceding the survey and who received two or more doses of the anti-malarial drug (Sulphadoxine-Pyrimethamine) during pregnancy. The inclusion criteria for this study were women who have given birth two years prior to the 2008-09 KDHS.

### 3.3 Sampling Design

The 2008-09 KDHS was a household based survey, which consisted of a sample drawn from people residing in households across the country. It was a nationally representative survey of 8444 women aged 15-49 years. The survey was based on a two-stage sampling design. The first stage involved selecting a sample from the national master sampling frame and the second stage involved the systematic sampling of households (Kenya National Bureau of Statictics & and ICF Macro, 2010). The survey commenced from 13$^{th}$ November 2008 and was completed around late February 2009.

### 3.4 Survey Questionnaires

The women's questionnaire developed as part of the 2008-09 KDHS was relevant to this study. It attempted to collect information on all women of reproductive ages (15-49 years) on topics such as education, residential history, use of mosquito nets as well as the administration of IPTp during pregnancy. From the households interviewed during the 2008-09 KDHS, 8767 women were found to be eligible, although only 8444 women were interviewed. This yielded a 96 percent response rate for women aged 15-49 in the 2008-09 KDHS.

### 3.5 Variable Definitions

#### 3.5.1 Response Variables

Three main outcome variables were included in the study. The first outcome variable is ITN usage. In the 2008-09 KDHS, women of reproductive ages were asked if they had slept under a mosquito net the night before the survey. This was the only question on ITN usage recorded in the survey. A study conducted by Ejik et al. (2005) in Western Kenya found that close to 91 percent of women who made use of an ITN during pregnancy still made use of an ITN at the time of being interviewed. Due to this limitation, the present usage of ITNs among respondents was assumed to be the usage of ITNs during pregnancy. The initial variable of ITN usage in the 2008-09 KDHS consisted of four categories: 'no bed net'; 'only a treated net'; 'treated and untreated nets'; and 'only untreated nets'. Treated bed nets refer to ITNs, which are mosquito nets treated with insecticide prior to usage. A new variable for ITN usage was created, limiting the categories to 'no bed net' and 'only treated bed nets' which was re-coded as 'no' and 'yes'.

The second response variable of the study was IPTp administration. In the 2008-09 KDHS, women of reproductive ages were asked if they were administered with two or more doses of IPTp during pregnancy. The responses to this question was categorised as, 'yes'; 'no' and

'don't know'. The category 'don't know' was dropped from analysis. ITNs and IPTp were coded as binary variables 'no' and 'yes'.

The third outcome variable of the study was the combined uptake of ITNs and IPTp during pregnancy. No question in the 2008-09 KDHS is asked on the combined uptake of these measures. This variable was aimed at capturing women who make use of both these measures during pregnancy. A binary variable was generated to measure the combined uptake of ITNs and IPTp. The 'no' categories for ITN usage and IPTp administration variables were merged to generate the number of women who did not make use of either measures during pregnancy, whereas, the 'yes' categories of the ITN usage and IPTp administration were merged to generate the number of women who made use of both these measures during pregnancy.

### 3.5.2 Predictor Variables

***Socioeconomic Variables***

Four main explanatory variables were considered in the study. Socioeconomic indicators, such as poverty and parental education are listed in existing literature as important predictors of health seeking behaviour (Beiersmann, et al., 2010). Furthermore, Nuwaha (2001) argues that indicators of socioeconomic status are not well developed in middle and low income countries. Proxy measures, such as level of education, occupation and place of residence are considered to be good indicators of socioeconomic status (Nuwaha, 2001).

The purpose of this study was to investigate which factors were associated with the uptake of malaria prevention methods during pregnancy. In line with existing literature, socioeconomic factors, such as the type of place of residence, level of education, wealth index and the occupation of respondents were tested for an association with the use of malaria prevention

measures during pregnancy. Table 1 presents the numerous categories for each of these variables.

***Background Variables***

In addition to socioeconomic variables, relevant background variables were also included. A study in Uganda established an association between marital status, religion and IPTp administration (Sangare, et al., 2010). Therefore, demographic variables, such as age, marital status, region of residence and religion of respondents were included as controls in the study. With regards to the region of residence, the 2010 Malaria indicator survey profiles provinces in Kenya according to malaria risk (Kenya National Bureau of Statistics & Macro., 2011).

Areas where the risk of malaria is equal to or greater than 20 percent is classified as an endemic region. In endemic areas malaria transmission is intense throughout the year. Rainfall, high temperatures and humidity are responsible for the high levels of malaria throughout the year (Kenya National Bureau of Statistics & Macro., 2011). Endemic areas in this study include the Western and Nyanza provinces in Kenya.

Seasonal risk areas experience short periods of intense malaria transmission. Rainy seasons in these areas coupled with high temperatures provide a breeding ground for malaria vectors. Seasonal transmission areas have a risk of malaria, which is less than five percent and low risk areas have a 0.1 percent risk of malaria. Low risk areas generally have low temperatures, which do not allow for the breeding of vectors and thus have lower levels of malaria transmission (Kenya National Bureau of Statistics & Macro., 2011). The North Eastern, Eastern and Rift Valley provinces are categorised as seasonal risk areas. Low risk areas include Nairobi and Central.

**Table 1 Variable(s) and variable Definitions:**

| **Variable** | **Definition & Categories:** |
|---|---|
| **Outcome Measure/s:** | |
| • ITN Usage | • Respondent slept under a treated net during pregnancy.<br>• (0) No, (1) Yes. |
| • IPTp Administration | • The administration of two or more doses of Sulphadoxine-Pyrimethamine (SP) during pregnancy.<br>• (0) No, (1) Yes. |
| • Combined Uptake of ITNs and IPTp | • The combined uptake of ITNs usage by the respondent and administration of two or more doses of SP during pregnancy.<br>• (0) No, (1) Yes. |
| **Demographic Determinants** | |
| • Age | • Current age in 5 year groups.<br>• (1) 15-24, (2) 25-34, (3) 35+. |
| • Region | • De Facto region of residence disaggregated in accordance to level of Malaria Transmission.<br>• (1) Endemic.<br>Areas with 20 percent or higher risk of malaria.<br>Western & Nyanza province.<br>• (2) Seasonal Risk.<br>Areas with a malaria risk of less than five percent.<br>North Eastern, Rift Valley and Eastern province.<br>• (3) Low Risk.<br>Areas with a malaria risk of 0.1 percent or less.<br>Nairobi and Central province. |
| • Religion | • Religion of respondent.<br>• (1) Christian, (2) Muslim, (3) Other. |
| **Demographic Determinants** | |

| **Variable** | **Definition & Categories:** |
|---|---|
| • Marital Status | • Current marital status.<br>• (0)Never Married, (1) Currently Married, (2) Previously Married. |
| **Socioeconomic Determinants** | |
| • Residence | • Type of place of residence.<br>• (1) Rural, (2) Urban. |
| • Education | • Highest educational level.<br>• (0) No education, (1) Primary, (2) Secondary, (3) Tertiary. |
| • Type of Occupation | • Occupation of respondent.<br>• (1) Unemployed, (2) Professional, (3) Agricultural, (4) Other. |
| • Wealth Index | • Wealth Index of households.<br>• (1) Poor, (2) Middle, (3) Rich. |
| • **Other Determinants** | |
| • Healthcare Decisions | • Final say on healthcare decisions.<br>• (1) Respondent alone, (2) Respondent and husband/partner, (3) Husband/partner alone. |

### 3.6 Statistical Package

Stata version 12 was utilised for the analysis and management of data.

### 3.7 Statistical Analysis

Three levels of statistical analysis were required to meet the objectives of the study.

Univariate analysis through the use of percentage distributions was carried out to meet the first objective, which was to determine the prevalence of malaria prevention methods during pregnancy in Kenya.

The second and third level of analysis involved the use of bivariate and multivariate logistic regression. These techniques were appropriate as all three outcome measures of the study were binary. These two levels of analysis were carried out at a five percent level of

significance. Bivariate analysis was done to assess factors associated with the outcomes of this study. Significant factors were further analysed in a multivariate regression model using forward selection methods.

Three multivariate logistic regression models were created during the final level of analysis. The hypothesis tested was that there was no difference in socioeconomic determinants affecting the use of malaria prevention measures during pregnancy. The multivariate logistic regression technique was suitable as the three outcome measures of the study were binary. The multivariate logistic regression technique yielded odds ratios, which were useful in testing the association between predictor variables and each of the outcome variables. Backward elimination methods were employed in order to generate the best multivariate models. Variables not significant at the five percent level were excluded from the final models. Furthermore, the Hosmer and Lemeshow method was used to test the overall goodness of fit of all multivariate logistic regression models.

The logistic regression equation used in this study is:

$$y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i$$

$y_i$ = Outcome Variable

$\alpha$ = Constant

$\beta_i$ = Co-effecients

$X_i$ = Predictor Variables

### 3.8 Ethical Considerations

This study used data from the 2008-09 Kenya DHS. Permission to make use of this data was granted through the Measure DHS website. Due to the study making use of secondary data analysis, there were no ethical issues of concern. Ethical issues, such as confidentiality and informed consent were addressed by the implementing organisations of the 2008-09 Kenya DHS (Kenya National Bureau of Statictics & and ICF Macro, 2010).

## Chapter 4 Results

### 4.1 Introduction

The following section presents the results of this study. An outline of the characteristics of the population, bivariate and multivariate results as well as a concise summary of the results from the final models of the study is presented in this chapter.

### 4.2 Prevalence of Malaria Prevention Methods

**Table 2 Percentage Distribution of the uptake of Malaria Prevention Methods among Pregnant Women in Kenya DHS 2008-09**

| Malaria Prevention Methods | Percentage (%): |
|---|---|
| ITN Usage % | 48.0 |
| IPTp Administration % | 38.5 |
| Combined Uptake (ITN and IPTp) % | 36.2 |

The first objective of the study was concerned with establishing the prevalence of the uptake of malaria prevention methods during pregnancy in Kenya. Table 2 shows that 48 percent of women were found to have made use of an ITN during pregnancy. Thirty-eight percent of women reported being administered with IPTp during pregnancy. With regards to the usage of both these measures about one-third reported the uptake of ITNs and IPTp.

### 4.3 Characteristics of Study Population

**Table 3 Percentage Distributions of Respondents Use of Malaria Prevention Methods by Socioeconomic and Demographic Characteristics Kenya DHS 2008-09**

| Variable (s): | Percentage ITN Usage | | Percentage IPTp Administration | | Percentage Combined Uptake (ITNs & IPTp) | |
|---|---|---|---|---|---|---|
| | Frequency (n) | % | Frequency (n) | % | Frequency (n) | % |
| **Demographic Variables:** | | | | | | |
| ***Age:*** | | | | | | |
| 15-24 | 1449 | 37.3 | 457 | 32.8 | 1156 | 37.8 |
| 25-34 | 1346 | 34.7 | 686 | 49.2 | 955 | 31.3 |
| 35+ | 1088 | 28.0 | 252 | 18.1 | 944 | 30.9 |
| Total | 3883 | 100 | 1395 | 100 | 3055 | 100 |
| ***Region of Residence:*** | | | | | | |
| Endemic | 1998 | 51.5 | 649 | 46.5 | 1499 | 49.1 |
| Seasonal Risk | 1203 | 31.0 | 543 | 38.9 | 946 | 31.0 |
| Low Risk | 682 | 17.6 | 203 | 14.6 | 610 | 20.0 |
| Total | 3883 | 100 | 1395 | 100 | 3055 | 100 |
| ***Marital Status:*** | | | | | | |
| Never Married | 976 | 25.1 | 173 | 12.4 | 969 | 31.7 |
| Currently Married | 2688 | 69.2 | 1179 | 84.5 | 1893 | 61.9 |
| Formerly Married | 219 | 5.6 | 43 | 3.1 | 193 | 6.4 |
| Total | 3883 | 100 | 1395 | 100 | 3055 | 100 |
| ***Religion:*** | | | | | | |
| Christian | 3075 | 79.6 | 1107 | 79.5 | 2466 | 81.1 |
| Muslim | 719 | 18.6 | 261 | 18.8 | 540 | 17.8 |
| Other | 67 | 1.7 | 24 | 1.8 | 36 | 1.2 |
| Total | 3861 | 100 | 1392 | 100 | 3042 | 100 |
| **Socioeconomic Variables:** | | | | | | |
| ***Type of Place of Residence:*** | | | | | | |
| Rural | 2475 | 63.7 | 1034 | 74.1 | 1866 | 61.1 |
| Urban | 1408 | 36.3 | 361 | 25.9 | 1189 | 38.9 |
| Total | 3883 | 100 | 1395 | 100 | 3055 | 100 |
| ***Level of Education:*** | | | | | | |
| No Education | 541 | 13.9 | 203 | 14.6 | 354 | 11.6 |
| Primary | 1946 | 50.1 | 785 | 56.3 | 1467 | 48.0 |
| Secondary | 1022 | 26.3 | 319 | 22.9 | 886 | 29.0 |
| Tertiary | 374 | 9.6 | 88 | 6.3 | 348 | 11.4 |
| Total | 3883 | 100 | 1395 | 100 | 3055 | 100 |
| ***Occupation:*** | | | | | | |

| Variable (s): | Percentage ITN Usage | | Percentage IPTp Administration | | Percentage Combined Uptake (ITNs & IPTp) | |
|---|---|---|---|---|---|---|
| | Frequency (n) | % | Frequency (n) | % | Frequency (n) | % |
| Unemployed | 1602 | 41.4 | 571 | 41.0 | 1255 | 41.2 |
| Professional | 1218 | 31.5 | 410 | 29.5 | 997 | 32.8 |
| Agricultural | 711 | 18.4 | 292 | 21.00 | 530 | 17.4 |
| Other | 339 | 8.8 | 119 | 8.6 | 262 | 8.6 |
| Total | 3870 | 100 | 1392 | 100 | 3044 | 100 |
| ***Wealth Index:*** | | | | | | |
| Poor | 1213 | 31.2 | 521 | 37.4 | 815 | 26.7 |
| Middle | 1390 | 35.8 | 557 | 39.9 | 1134 | 37.1 |
| Rich | 1280 | 33.0 | 317 | 22.7 | 1106 | 36.2 |
| Total | 3883 | 100 | 1395 | 100 | 3055 | 100 |
| **Other Determinants:** | | | | | | |
| ***Healthcare Decisions:*** | | | | | | |
| Respondent Alone | 457 | 32.8 | 299 | 25.4 | 494 | 26.1 |
| Respondent and Husband/ Partner | 686 | 49.2 | 533 | 45.3 | 888 | 47.0 |
| Husband / Partner Alone | 252 | 18.1 | 345 | 29.3 | 508 | 26.9 |
| Total | 1395 | 100 | 1177 | 100 | 1890 | 100 |

In terms of the usage of ITNs, 37.3 percent of women were aged 15-24 years, whereas 49.2 percent of women aged 25-34 years recieved IPTp. With regards to the combined uptake of these measures during pregnancy, 37.8 percent of respondents were aged 15-24 years. Fifty-one percent of women who resided in these endemic areas made use of ITNs. Forty-six percent of respondents administered with IPTp resided in endemic areas and 49.1 percent of women in endemic areas reported the combined uptake of these measures during pregnancy.

Sixty-nine percent of currently married women make use of ITNs, IPTp was administered to 84.5 percent of currently married women and the combined usage of ITNs and IPTp was reported among 61.9 percent of currently married women. Seventy-nine percent of Christian women reported the use of ITNs. IPTp was administered to approximately 79.5 percent of

Christians and the combined usage of both measures during pregnancy was reported by 81.1 percent of Christian women.

Socioeconomic characteristics indicate that most of the respondents in the study reside in the rural areas of Kenya. To begin with, 63.7 percent of respondents in rural areas reported the use of ITNs. IPTp was administered to approximately 74.1 percent of rural respondents and 61.0 percent of rural women were found to make use of both measures during pregnancy. In terms of ITN usage, 20.1 percent of women have received a primary level of education and 41.40 percent are unemployed. IPTp was administered to 52.2 percent of women with primary education and 41.4 percent of unemployed women. Forty-eight percent of women with a primary education and 41.2 percent of unemployed women reported the usage of both these measures during pregnancy. Table 3 shows that 35.8 percent of women from middle income households made use of ITNs during pregnancy. Similarly, a high percentage (39.9) of women from middle income households were administered with IPTp and 91.1 percent of respondents reported the combined uptake of measures during pregnancy.

Lastly, the majority of healthcare decisions were made jointly by the respondents and their husbands/partners, and 49.2 percent of women jointly made decisions with their husbands/ partners with regards to ITN usage. During pregnancy, 47 percent of IPTp decisions were made jointly by the respondents and their husbands/partners. Additionally, 47 percent of healthcare decisions on the combined usage of ITNs and IPTp were made by both the respondents and their husbands/partners.

### 4.4 Correlates of Use of Malaria Prevention Methods

The primary aim of this study was to determine which socioeconomic factors affect the uptake of malaria prevention methods during pregnancy. Bivariate and multivariate logistic regression results are presented in this section. These two levels of analysis assisted in identifying socioeconomic predictors of ITN usage, IPTp administration and the combined uptake of both these measures during pregnancy.

### 4.4.1 Bivariate Analysis

**Table 4 Analysis of factors showing the association between Socioeconomic Factors and the Uptake of Malaria Prevention Methods among Pregnant women in Kenya DHS 2008-09.**

| Variable(s): | ITN Usage | | | IPTp Administration | | | Combined Uptake (ITNs & IPTp) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) |
| **Demographic Variables:** | | | | | | | | | |
| ***Age:*** | | | | | | | | | |
| 15-24 (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| 25-34 | 1.56* | 0.000 | (1.41-1.73) | 1.20* | 0.021 | (1.03-1.39) | 1.18* | 0.002 | (1.06-1.31) |
| 35+ | 1.27* | 0.000 | (1.13-1.41) | 0.86 | 0.112 | (0.71-1.04) | 1.39* | 0.000 | (1.24-1.55) |
| ***Region of Residence:*** | | | | | | | | | |
| Endemic (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Seasonal Risk | 0.48* | 0.000 | (0.44-0.53) | 0.96 | 0.571 | (0.83-1.11) | 0.61* | 0.000 | (0.55-0.68) |
| Low Risk | 0.41* | 0.000 | (0.36-0.46) | 0.73* | 0.001 | (0.60-0.88) | 0.62* | 0.000 | (0.55-0.70) |
| ***Marital Status:*** | | | | | | | | | |
| Never Married (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Currently Married | 2.35* | 0.000 | (2.13-2.58) | 1.19 | 0.082 | (0.98-1.46) | 1.11* | 0.000 | (1.11-1.34) |
| Formerly Married | 1.78* | 0.000 | (1.46-2.18) | 0.78 | 0.208 | (0.52-1.15) | 1.42* | 0.001 | (1.16-1.73) |
| ***Religion:*** | | | | | | | | | |
| Christian (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Muslim | 1.36* | 0.000 | (1.21-1.53) | 1.06 | 0.501 | (0.89-1.26) | 1.17* | 0.010 | (1.04-1.32) |
| Other | 0.67* | 0.012 | (0.50-0.92) | 0.43* | 0.012 | (0.27-0.68) | 0.43* | 0.000 | (0.30-0.63) |
| **Socioeconomic Variables:** | | | | | | | | | |
| ***Type of Place of Residence:*** | | | | | | | | | |
| Rural (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |

| Variable(s): | ITN Usage | | | IPTp Administration | | | Combined Uptake (ITNs & IPTp) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) |
| Urban | 1.71* | 0.000 | (1.55-1.88) | 0.95 | 0.472 | (0.81-1.10) | 1.77* | 0.000 | (1.61-1.95) |
| ***Level of Education:*** | | | | | | | | | |
| No Education (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Primary | 1.05 | 0.432 | (0.93-1.20) | 1.55* | 0.000 | (1.29-1.87) | 1.25* | 0.001 | (1.09-1.44) |
| Secondary | 1.30* | 0.000 | (1.12-1.50) | 2.06* | 0.000 | (1.65-2.57) | 1.86* | 0.000 | (1.60-2.16) |
| Tertiary | 1.65* | 0.000 | (1.36-2.00) | 1.51* | 0.010 | (1.10-2.06) | 2.39* | 0.000 | (2.00-2.89) |
| ***Occupation:*** | | | | | | | | | |
| Unemployed (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Professional | 1.69* | 0.000 | (1.52-1.88) | 1.15* | 0.085 | (0.98-1.36) | 1.58* | 0.000 | (1.42-1.76) |
| Agricultural | 0.99 | 0.857 | (0.88-1.11) | 0.98 | 0.789 | (0.82-1.17) | 0.93 | 0.261 | (0.82-1.05) |
| Other | 1.01 | 0.845 | (0.87-1.19) | 0.93 | 0.577 | (0.73-1.19) | 0.99 | 0.900 | (0.84-1.16) |
| ***Wealth Index:*** | | | | | | | | | |
| Poor (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Middle | 1.23* | 0.000 | (1.11-1.36) | 1.66* | 0.000 | (1.42-1.93) | 1.56* | 0.000 | (1.40-1.74) |
| Rich | 1.88* | 0.000 | (1.68-2.10) | 1.18 | 0.067 | (0.99-1.40) | 2.29* | 0.000 | (2.05-2.57) |
| **Other Determinants:** | | | | | | | | | |
| ***Healthcare Decisions:*** | | | | | | | | | |
| Respondent Alone (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Respondent and Husband/ Partner | 1.17* | 0.026 | (1.02-1.35) | 1.01 | 0.951 | (0.84-1.21) | 1.08 | 0.259 | (0.94-1.25) |
| Husband / Partner Alone | 1.10 | 0.212 | (0.95-1.29) | 0.92 | 0.429 | (0.76-1.13) | 0.93 | 0.353 | (0.80-1.09) |

R.C-Reference Category

* Significant on the 5 percent level

Women aged 25-34 years and 35 years and above were 1.56 and 1.27 times more likely to make use of ITNs than women aged 15-24 years. With regards to IPTp administration women aged 25-34 years displayed an odds of 1.20 in comparison to women aged 15-24 years. Bivariate Analysis

Table 4 shows that women aged 25-34 years and 35 years and above were 1.39 times more likely than women aged 15-24 years to make use of both measures during pregnancy.

In comparison to pregnant women who resided in endemic areas, women in seasonal risk areas and low risk areas were 52 percent and 51 percent less likely to make use of ITNs. Women who resided in low risk areas were 27 percent less likely than women who resided in endemic areas to be administered with IPTp during pregnancy. Focusing on the combined uptake of ITNs and IPTp women in seasonal risk areas and low risk areas were 0.61 and 0.62 times less likely than women in endemic areas to make use of both measures.

In terms of the marital status of respondents, significant odds of ITN usage were established for currently married (2.35) and formerly married women (1.78). Currently married women and formerly married women were 1.11 and 1.42 times more likely to make use of both measures during pregnancy than women who were never married. Interestingly, Muslim women displayed higher odds of ITN usage and IPTp administration compared to Christian women. Muslim women were 1.36 times more likely than Christian women to make use of ITNs and 1.17 times more likely to make use of both measures during pregnancy. Women who followed other religions were found to be 23 percent less likely than Christians to make use of ITNs.

Odds ratios yielded for the type of place of residence shows that urban women were 1.71 times more likely to make use of ITNs than rural women. Additionally, women in urban areas were 1.77 times more likely to make use of both ITNs and IPTp during pregnancy than women who resided in rural areas. Women with primary and tertiary levels of education were 1.30 and 1.65 times more likely to make use of ITNs during pregnancy. Similarly, significant odds were associated between women with a primary (1.55), secondary (2.06) and tertiary (1.51) level of education and IPTp administration. Increasing odds of the uptake of both measures were also established with women who have a primary (1.25), secondary (1.86) and tertiary (2.39) level of education.

Bivariate Analysis

Table 4 shows that only professional women displayed significant odds of the uptake of malaria prevention methods during pregnancy. Professional women were 1.69 times more likely than unemployed women to make use of ITNs. Professional women were 1.15 and 1.58 times more likely to be administered with IPTp as well as make use of both measures during pregnancy. Compared to women from poor households, women from middle income and rich households were 1.23 and 1.88 times more likely to make use of ITNs. Women from middle income households were also found to be 1.66 times more likely than women from poor households to be administered with IPTp during pregnancy. Women from middle income and poor categories were 1.56 times and 2.29 times more likely than poorer women to use both ITNs and IPTp during pregnancy. With regards to healthcare decisions only respondents who jointly made decisions with their husbands/partners were 1.17 times more likely to make use of ITNs in comparison to respondents who made healthcare decisions alone.

### 4.4.2 Hypothesis Testing (Multivariate Analysis)

The null hypothesis tested in this study argues that there is no difference in socioeconomic factors affecting the utilisation of malaria prevention methods during pregnancy. The assumption of the hypothesis was that all four socioeconomic factors exert an influence on the usage of ITNs, IPTp administration and the uptake of both measures during pregnancy. Multivariate logistic regression assisted in identifying which socioeconomic factors were associated with the uptake of these malaria prevention methods. Odds ratios indicate which women were more or less likely to make use of each method in terms of their socioeconomic characteristics. The P>[z] values yielded during multivariate analysis indicated the significance or non-significance of the odds ratios based on a 5 percent level of significance.

The following section provides the multivariate results of the study.

**Table 5 Independent Factors associated with the Uptake of Malaria Prevention Methods among pregnant women in Kenya DHS 2008-09.**

| Variable(s): | ITN Usage | | | IPTp Administration | | | Combined Uptake (ITNs & IPTp) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) |
| **Demographic Variables:** | | | | | | | | | |
| ***Age:*** | | | | | | | | | |
| 15-24 (R.C) | - | - | - | 1.00 | - | - | 1.00 | - | - |
| 25-34 | - | - | - | 1.20* | 0.028 | (1.02-1.40) | 1.10 | 0.122 | (0.97-1.24) |
| 35+ | - | - | - | 0.91 | 0.358 | (0.74-1.11) | 1.42* | 0.000 | (1.25-1.62) |
| ***Region of Residence:*** | | | | | | | | | |
| Endemic (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Seasonal Risk | 0.51* | 0.000 | (0.46-0.58) | 1.09 | 0.294 | (0.93-1.28) | 0.68* | 0.000 | (0.61-0.76) |
| Low Risk | 0.27* | 0.000 | (0.23-0.31) | 0.67* | 0.000 | (0.54-0.82) | 0.41* | 0.000 | (0.35-0.46) |
| ***Marital Status:*** | | | | | | | | | |
| Never Married (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Currently Married | 2.73* | 0.000 | (2.46-3.04) | 1.25* | 0.036 | (1.01-1.54) | 1.24* | 0.000 | (1.11-1.39) |
| Formerly Married | 2.02* | 0.000 | (1.63-2.50) | 0.86 | 0.480 | (0.57-1.31) | 1.41* | 0.003 | (1.13-1.77) |
| ***Religion:*** | | | | | | | | | |
| Christian (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Muslim | 1.48* | 0.000 | (1.27-1.72) | 1.50* | 0.000 | (1.21-1.85) | 1.50* | 0.000 | (1.11-1.39) |
| Other | 0.70 | 0.080 | (0.50-0.97) | 0.68 | 0.110 | (0.42-1.09) | 0.60* | 0.010 | (1.13-1.77) |
| **Socioeconomic Variables:** | | | | | | | | | |
| ***Type of Place of Residence:*** | | | | | | | | | |
| Rural (R.C) | 1.00 | - | - | - | - | - | 1.00 | - | - |

| Variable(s): | ITN Usage | | | IPTp Administration | | | Combined Uptake (ITNs & IPTp) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) | Odds Ratio (OR) | P>[z] | Confidence Interval (CI) |
| Urban | 1.22* | 0.011 | (1.05-1.43) | - | - | - | 1.13* | 0.004 | (0.97-1.31) |
| ***Level of Education:*** | | | | | | | | | |
| No Education (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Primary | 1.15 | 0.082 | (0.98-1.37) | 1.79* | 0.000 | (1.41-2.28) | 1.29* | 0.003 | (1.09-1.53) |
| Secondary | 1.58* | 0.000 | (1.30-1.92) | 2.49* | 0.000 | (1.87-3.31) | 1.86* | 0.000 | (1.53-2.27) |
| Tertiary | 1.91* | 0.000 | (1.48-2.45) | 2.22* | 0.000 | (1.50-3.26) | 2.27* | 0.000 | (1.78-2.89) |
| ***Wealth Index:*** | | | | | | | | | |
| Poor (R.C) | 1.00 | - | - | 1.00 | - | - | 1.00 | - | - |
| Middle | 1.38* | 0.000 | (1.22-1.55) | 1.52* | 0.000 | (1.29-1.80) | 1.56* | 0.000 | (1.38-1.76) |
| Rich | 2.37* | 0.000 | (1.95-2.87) | 1.11 | 0.342 | (0.90-1.37) | 2.32* | 0.000 | (1.93-2.80) |

R.C-Reference Category.

* Significant on the 5 percent level.

With regards to the administration of IPTp during pregnancy women aged 25-34 years displayed odds of 1.20, whereas, women aged 35 years and above were 1.42 times more likely to make use of both measures during pregnancy compared to women aged 15-24 years. Lower odds of ITN usage was established among women who resided in seasonal risk (0.51) and low risk (0.27) areas. Women who resided in low risk areas were 0.67 times less likely to be administered with IPTp. In comparison to women in endemic areas, women in seasonal risk and low risk areas were 0.68 and 0.41 times less likely to use both measures during pregnancy.

Table 5 shows that currently married women display the highest odds of ITN usage, IPTp administration and the uptake of both measures during pregnancy. Women who are currently married and who are formerly married were 2.73 and twice more likely to make use of ITNs in comparison to women who were never married. Women who are currently married were 1.25 times more likely to be administered with IPTp than women who were never married. In comparison to women who were never married, currently married women and formerly married women displayed odds of 1.24 and 1.41. Muslim women were 1.48 times more likely to use ITNs and 1.50 times more likely to be administered with IPTp during pregnancy than Christian women. Muslim women displayed odds of 1.50 for the uptake of both these measures during pregnancy. Urban women were 1.22 and 1.33 times more likely to make use of ITNs and the combined uptake of both measures in comparison to rural women.

In terms of the level of education of respondents, women with secondary and tertiary levels of education were 1.58 and 1.91 times more likely to make use of ITNs during pregnancy than women with no education. Significant odds were established between the level of education of respondents and IPTp administration. Women with primary levels of education displayed odds of 1.79, women with secondary levels displayed odds of 2.49 and women

with tertiary education displayed odds of 2.22. Increased odds of the combined uptake of ITNs and IPTp were associated with increased education. Women with primary, secondary and tertiary levels of education displayed odds of 1.29, 1.86 and 2.27. Significant associations were established between the wealth index of respondents and the usage of ITNs during pregnancy. Women from middle income and rich households were 1.38 and 2.37 times more likely than women from poorer households to make use of ITNs. Women from middle income households were 1.52 times more likely to be administered with IPTp than women from poorer households. Lastly, respondents from middle income and rich households displayed odds of 1.56 and 2.32 in terms of the combined usage of both these measures during pregnancy.

In terms of the hypothesis tested, it is clear that there are differences in the socioeconomic factors exerting an influence on the uptake of malaria prevention methods during pregnancy. Multivariate findings indicate that there is no association between the type of place of residence and IPTp administration. However, significant associations were established between the type of place of residence, ITN usage and the combined uptake of measures. Furthermore, women with a primary level of education did not display a significant association with ITN usage during pregnancy. Finally, women from rich households did not display significant odds of IPTp administration. In comparison to women from poor households, women from rich households displayed significantly higher odds of ITN usage and the combined uptake of measures during pregnancy. Based on these findings, the null hypothesis is rejected in favour of the alternative hypothesis.

## Chapter 5 Discussion

In sub-Saharan Africa the effectiveness of ITNs and IPTp administration during pregnancy is well established. For instance, Sirmia et al. (2006) found that an increased dose of IPTp during pregnancy was associated with a reduced risk of low birth weight of infants in Burkina Faso. The utilisation of ITNs among pregnant women in Malawi was associated with a decrease in placental malaria and the low birth weight of infants (Feng et al., 2010). It has been argued in previous literature that there is a need to understand factors which influence the use of ITNs and IPTp (Nuwaha, 2001). The primary objective of this study was to examine the relationship between socioeconomic factors and the uptake of malaria prevention methods during pregnancy.

This study showed that the type of place of residence predicts ITN usage and the combined uptake of these measures during pregnancy. Urban women were found to display slightly higher odds of ITN usage (1.13) and the combined usage of ITNs and IPTp (1.22) during pregnancy in comparison to rural women. It is, however, interesting to note that no association was established between the type of place of residence and IPTp administration during pregnancy. These findings are similar to a study by Belay and Deressa (2008) who found an association between the type of place of residence and ITN usage among pregnant women in Ethiopia. In Nigeria, the unavailability of IPTp drugs in rural facilities and the perceived side-effects associated with the drugs were cited as low reasons for the uptake of IPTp during pregnancy (Amoran et al., 2012).

In Kenya, poor access to ITNs may be responsible for rural women reporting lower usage of ITNs during pregnancy in comparison to urban women. Rural women may also not have access to well-equipped antenatal clinics to receive IPTp, which possibly explains no association being established between IPTp administration and the type of place of residence.

Professional or skilled workers were found to make use of ITNs in Mbarara, Uganda (Nuwaha, 2001). The occupation of respondents in this study was found to have no effect on the uptake of malaria prevention methods during pregnancy.

In terms of other socioeconomic determinants, women with secondary and tertiary levels of education were 1.58 and 1.91 times more likely to make use of ITNs during pregnancy in comparison to women with no education. With regards to the administration of IPTp women with primary, secondary and tertiary levels of education displayed odds of 1.79, 2.49 and 2.22. Increased likelihood of the usage of these preventive measures during pregnancy were associated with higher levels of education. Women with primary secondary and tertiary levels of education were 1.29, 1.86 and 2.27 times more likely to make use of both ITNs and IPTp during pregnancy compared to women with no education.

With regards to ITN usage during pregnancy, Njoroge et al. (2009) established an association between the level of knowledge of malaria and education in Kenya. Napoleon et al. (2011) argue that educated women tend to have more knowledge on malaria prevention. In comparison to less educated women, it is clear that more educated women in Kenya report higher levels of the uptake of malaria prevention methods during pregnancy due to their increased knowledge of malaria. These results are similar to Sagare et al. (2010) who established significant associations between women with a primary level of education and IPTp administration in Uganda. Atieli et al. (2011) also found the level of education significantly associated with ITN usage among households in Western Kenya.

Lastly, respondents from middle income and rich households displayed odds of 1.38 and 2.37 in terms of ITN usage during pregnancy. Women from middle income households were found to be 1.52 times more likely than women from poor households to be administered

with IPTp during pregnancy. Women in the middle income (1.56) and rich categories (2.32) also displayed significant odds for the combined usage of ITNs and IPTp during pregnancy. As established by previous findings, Mbonye et al. (2005) argues that inhibitory factors of ITN use during pregnancy include the high costs of ITNs. Sangare et al. (2010) found that richer women were administered with a full course of IPTp during pregnancy.

A possible explanation for the low usage of ITNs and IPTp among women from poorer households is the high cost associated with these measures. In the Kilifi district in Kenya, close to 85 percent of women cited the lack of money as the main reason for the non-usage of ITNs during pregnancy (Njoroge et al., 2011). Women from poorer households may be faced with long queues at antenatal clinics, limited resources of IPTp drugs at these facilities as well as transport costs to the clinics which may hinder the administration of IPTp during pregnancy.

In addition to socioeconomic factors, multivariate results indicate that demographic factors influence ITN usage, IPTp administration and the combined uptake of these measures during pregnancy. Belay and Deressa (2008) established non-significant associations between age, marital status, parity and ITN use among pregnant women in Northern Ethiopia. In line with the findings of this study, multivariate results indicate that no association was established between the age of respondents and ITN usage during pregnancy in Kenya. However, significant odds were recorded for women aged 25-34 years (1.20) in terms of IPTp administration and women aged 35 years and above (1.42) with regards to the combined uptake of both these measures. It can be assumed that older respondents in the study have more knowledge and experience with regards to the risk of malaria and therefore display higher odds of usage of these measures during pregnancy.

In contrast to Belay and Deressa (2008) currently married women and formerly married women were 2.73 and 2.02 times more likely to make use of ITNs during pregnancy in comparison to women who were never married. Currently married women were also found to be 1.25 times more likely than never married women to be administered with IPTp. Currently married women displayed an odds of 1.24 for the combined uptake of ITNs and IPTp during pregnancy in Kenya. Married women tend to have better financial support structures in place, which enables them to purchase and make use of these malaria prevention methods during pregnancy. Formerly married women may still be receiving financial support from the former spouses, which would allow them access to ITNs and IPTp during pregnancy. These findings are consistent with Sangare et al. (2010) who established a significant association between marital status and IPTp administration in Uganda.

In Nigeria, traditional beliefs and religion influenced the use of ITNs and IPTp (Homousou et al., 2010). Similarly, Muslim women were 1.48 times more likely than Christian women to make use of ITNs and 1.50 times more likely to be administered with IPTp and make use of both measures during pregnancy. This could be due to the differing levels of knowledge, perceptions of the risk of malaria during pregnancy and advocacy for the uptake of these measures among religious communities.

Women who resided in seasonal risk (0.51) and low risk (0.27) areas of Kenya displayed lower odds of ITN usage when compared to women in endemic areas. Women in low risk areas were 0.67 times less likely than women in endemic areas to be administered with IPTp during pregnancy. In terms of the combined uptake of these measures during pregnancy, respondents in seasonal and low risk areas displayed odds of 0.68 and 0.41. These findings are in line with Cruz et al. (2006), which study established an association between the region of residence and ITN usage in Ghana. Qualitative findings in Ethiopia indicate that when the

risk of malaria is perceived to be low, malaria recedes as a critical problem in the minds of individuals (Baume et al., 2009). This results in the lower uptake of prevention measures. Seasonal transmission areas in Kenya have a risk of malaria, which is less than five percent and low risk areas have a 0.1 percent risk of malaria. It is evident that the lower the risk of malaria the lower the uptake of malaria prevention methods during pregnancy.

## Chapter 6 Conclusions and Recommendations

### 6.1 Conclusions

This study found that 48 percent of women used ITNs, 52 percent received IPTp and 36 percent made use of both these measures during pregnancy. This indicates that the usage of these measures are well below the Abuja targets of ensuring that 80 percent of women in endemic areas should benefit from ITNs and IPTp by the year 2005. Nuwaha (2001) argues that an understanding of factors influencing the use of malaria prevention tools is necessary for designing strategies to improve the uptake of these measures. The primary aim of this study was to examine the association between socioeconomic factors and the uptake of malaria prevention methods during pregnancy in Kenya.

In terms of socioeconomic indicators, the educational level, type of place of residence and wealth index of respondents influenced the use of ITNs and the combined uptake of both measures during pregnancy. The level of education of and the wealth index of respondents were associated with IPTp administration. Multivariate findings indicate an association between marital status, region of residence, religion and ITN usage. In addition to these demographic factors, the age of respondents was associated with IPTp administration and the combined uptake of these measures during pregnancy. This study has shown that both socioeconomic and demographic indicators determine the uptake of ITNs, IPTp and the combined uptake of these measures during pregnancy. It is therefore imperative that these factors be considered when designing and implementing policies aimed at improving the usage of malaria prevention measures during pregnancy. Malaria policies in Kenya need to be particularly cognisant of and directed towards women in this study who display low usage of these measures in order to reach the Abuja targets. Furthermore, ensuring increased uptake of

these measures would reduce the high morbidity and mortality associated with malaria during pregnancy for both the mother and the foetus.

### 6.2 Limitations

A major limitation of this study was the difference in the timing of the measurement of IPTp and ITNs in the 2008-09 Kenya Demographic and Health Survey (KDHS). The only variable for ITN usage in the 2008-09 KDHS deals with the respondent making use of an ITN the night before the survey; whereas, IPTp administration was measured as the proportion of women who had a live birth in the two years preceding the survey and who received two or more doses of Sulphadoxine-Pyrimethamine (SP) during pregnancy. A study conducted by Ejik et al. (2005), found that close to 91 percent of women who made use of an ITN during pregnancy, still made use of an ITN at the time of being interviewed. This study assumed the present usage of ITNs among respondents to be equal to the usage of ITNs during pregnancy. Additionally, there is no measurement of the combined usage of both ITNs and IPTp in the 2008-09 KDHS. This variable was generated by combining responses from the ITN and IPTp variables.

An estimated 16 million ITNs were distributed in Kenya by the end of 2008 (Kenya National Bureau of Statictics & and ICF Macro, 2010). The administration of IPTp is also administered freely to women making use of public sector services in Kenya. The association between the wealth index and ITN usage or IPTp administration in the study may be diluted.

Levels of ITN usage and IPTp administration are found to be higher during peak malaria transmission seasons (Kenya National Bureau of Statistics & Macro., 2011). The peak malaria period in Kenya is between June and August. The 2008-09 KDHS data collection period spanned from November to February (Kenya National Bureau of Statictics & and ICF

Macro, 2010). Due to the data collection of the 2008-09 KDHS not being conducted during the peak malaria transmission seasons in Kenya, lower levels of ITN and IPTp usage may have been recorded in the study.

The study may have been subject to recall bias. Data from the study is based on individual responses from women which may have resulted in incorrect information being given by respondents thus resulting in recall bias.

### 6.3 Recommendations

In order to reduce the morbidity and mortality associated with malaria during pregnancy, existing and future policies need to be directed towards women who display low usage of malaria prevention measures during pregnancy. In particular, malaria policies in Kenya need to be directed towards poor women, women who reside in the rural areas of Kenya and who have no education. Particular attention needs to be paid towards increasing the uptake of these measures among Christian women and women who were never married. This study found that these women have displayed the lowest odds of the usage of these preventive measures and are thus at greatest risk of contracting malaria during pregnancy.

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