

**DETERMINANTS OF INSECTICIDE TREATED BED-NETS USE BY
WOMEN FOR MALARIA CONTROL: A COMPARISON OF NDAVAYA
AND KINANGO DIVISIONS, KINANGO DISTRICT, KENYA**

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DECLARATION

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DEDICATION

To my family for their immortal love, encouragement and support during the entire period of the study

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ACRONYMS

ACT	Artemisinin Combination Therapy
AIDS	Acquired Immune Deficiency Syndrome
AL	Artemether-Lumefantrine
ANC	Antenatal Care
BC	Before Christ
CHW	Community Health Worker
CBO	Community Based Organizations
CBS	Central Bureau of Statistics
CDC	Centers for Disease Control
DDT	Dichlorodiphenyltrichloroethane
DHC	Dispensary Health Committee
DOMC	Division of Malaria Control
DPHO	District Public Health Officer
EMRO	Eastern Mediterranean Regional Office
FBO	Faith Based Organization
FGD	Focused Group Discussion
GoK	Government of Kenya
HMIS	Health Management Information System
HIV	Human Immunodeficiency Virus
IEC	Information Education and Communication
IPT	Intermittent Presumptive Treatment
ITNs	Insecticide Treated Nets
KEPI	Kenya Expanded Programme on Immunization
MCH	Maternal and Child Health

MDGs	Millennium Development Goals
MOH	Ministry of Health
NGO	Non-Governmental Organization
NID	National Immunization Days
NMS	National Malaria Strategy
PHO	Public Health Officer
PHT	Public Health Technician
PLWHAs	People Living With HIV/AIDS
PSI	Population Services International
SHP	School Health Programme
SP	Sulphadoxine Pyrimethamine (Fansidar)
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
ToT	Trainer of Trainers
UNICEF	United Nations Children Education Fund
WHO	World Health Organization

ABSTRACT

Globally malaria results in 300 to 500 million clinical episodes and one million deaths annually. Malaria is caused by a protozoa of the genus *Plasmodium*. The disease is transmitted by the bite of an infected female *Anopheles* mosquito. In Kenya the disease leads to morbidity and mortality contributing to 30% of outpatient cases, 20% of admissions and 15 to 35% of hospital deaths. Kinango District records over 41% outpatient morbidity due to malaria. Malaria control measures include environmental hygiene practices, application of insecticides, intermittent presumptive treatment and prompt and effective case management. Use of Insecticide Treated Bed-Nets (ITNs) protects against mosquito bites including *Anopheles gambiae* and *An. Funestus* that harbour and spread the protozoa. The aim of the study was to investigate and compare the factors that influenced use of ITNs by women for malaria control in Ndavaya and Kinango Divisions of Kinango District. A cross-sectional survey design using systematic sampling was applied to collect data from 204 women selected randomly from the two divisions. Semi structured questionnaires, Key informant Interviews and Focused Group Discussions were used to gather data. Data for variables such as age, education level, incomes and source of nets were summarized in tables and figures. Chi-square test was applied to test whether the deviations (differences between observed and expected) were a result of chance or due to other factors. About 57% of women in Kinango slept under ITNs compared with only 32% in Ndavaya. Use of ITNs was significantly influenced by source ($\chi^2 = 79.01$; $P \leq 0.001$). Over 51% of the respondents who had obtained ITNs from government health facilities did not use them. About 85% and 80% of the respondents in Ndavaya and Kinango respectively earning >Ksh. 12,000 used ITNs. Over 70% of women in both divisions who knew that malaria was transmitted through mosquito bites used ITNs. Kinango had approximately 30% of respondents' husbands supporting use of ITNs compared with only 13% for Ndavaya. More respondents (73%) in Kinango than Ndavaya (61%) who had been trained on use of ITNs indeed used them. Results indicated that the use of ITNs increased with the level of education and income. Shorter distances to health facilities were also associated with use of ITNs. The government should develop a communication package for malaria endemic areas. Community health workers should facilitate massive and systematic awareness creation on malaria transmission and ITNs use. Men should participate in interventions to scale up use of ITNs. Further research is required to establish the factors that influence use of ITNs by men and also determine the efficacy of indigenous malaria control mechanisms.

1.0 CHAPTER I: INTRODUCTION

1.1 Background of the study

Malaria is a disease caused by a protozoa of the genus *Plasmodium*. The infection is transmitted by the bite of an infected female Anopheles mosquito (Sungano *et al.*, 2006). Malaria takes an enormous toll on human health and well being in tropical regions including Sub-Saharan Africa, South and Southeast Asia, Oceania, and parts of America. In many of these regions, the burden has been increasing in recent years. In Africa, malaria kills more than 2,800 children per day (one child every 30 seconds) and contributes to 20% of all deaths in children below the age of five years (WHO, 2005b). Most of Malaria is caused by infection with *Plasmodium falciparum* and *P. vivax*. Besides, malaria indirectly contributes to many deaths in young children through synergy with other infections and illnesses.

The World Health Organization (WHO, 2008) malaria report indicates that diversity in infection results from variations between malaria parasites and mosquito vectors, ecological conditions that affect malaria transmission and socioeconomic factors, such as poverty and access to effective health care and prevention services. In addition to providing immediate health benefits, prevention and treatment of malaria may lessen transient increases in human immunodeficiency virus (HIV) load during malaria episodes and thus, help in limiting its progression.

Kinango District records 41% malaria-related outpatient morbidity (MoH, 2006). The National Malaria Strategy (NMS) 2001-2010 and the National Health Sector Strategic

Plan II (2005-2010) emphasized the need for effective Malaria control interventions (MoH, 2001b). The interventions are aimed at achieving the Abuja targets and the Millennium Development Goals (MDGs) whose main goal is to reduce morbidity and mortality from malaria (MoH, 2006). Majority of infections with *Plasmodium falciparum* in pregnancy remain asymptomatic, undetected and untreated. The major impact of malaria during pregnancy is caused by persistent or recurrent, predominantly low-grade, sometimes sub-patent parasitemia, resulting in maternal anemia and a reduced birth weight (Nganda *et al.*, 2004).

Malaria is a major cause of anaemia in children and pregnant women, low birth weight, premature birth and infant mortality (WHO, 2005a). Current policy options for malaria control include prompt and effective parasite treatment, and vector control through the use of insecticide (permethrin)-treated bed nets (ITNs) (MoH, 2006). In areas of intense perennial malaria transmission like Coastal and Western Kenya, permethrin-treated bed nets has been reported to reduce the adverse effect of malaria during the first four pregnancies for the individual women that were studied (Ter Kuile *et al.*, 2003).

The government of Kenya was a signatory to the Millennium Development Goals and the Abuja Declaration, which set a target of reducing malaria in half by the year 2010. In addition, 80% of pregnant women and children under five are expected to have access to and sleep under insecticide treated nets for malaria prevention. The Ministry of Health developed an ITN strategy paper in 2000, which indicated the government's intentions for scaling up ITN use nationwide (MoH, 2001b). This was incorporated into the National Malaria Strategy (NMS) as a principal pillar of malaria prevention

and control. However the Ministry of Health reported that only 16 % of pregnant women in Kinango were using ITNs (MoH, 2005). Alaii *et al.*, (2003) reported that adherence to ITN use is normally influenced by a range of environmental, social and perceptual factors. Little has been documented regarding these determinants in Ndavaya and Kinango Divisions of Kinango District.

1.2 Statement of the problem

During the past five years the Government of Kenya, DFID, WHO, UNICEF, USAID and numerous NGOs have supported scaling up of ITNs' use in malaria endemic areas including Kinango District. This has involved subsidizing ITN prices for under fives and pregnant mothers besides issuance of free ITNs during National Immunization Days, preceded by intensive awareness campaigns (PSI, 2006).

However, despite commitment of this substantial human and financial capital, the Ministry of Health indicated that only a dismal 16% of women in Kinango District used Insecticide Treated Bed-nets compared with 21% usage at the national level (MoH, 2005). In addition, Kinango Division of Kinango District has benefited from numerous interventions by NGOs and CBOs aimed at increasing ITNs use while little attention has been accorded to Ndavaya Division (MoH, 2006). Malaria affects disproportionately women and children under five years. This is why the focus to scale up ITNs targets the two categories of people (MoH, 2001b).

As Alaii *et al.*, (2003) observed, adherence to ITN use is a function of a range of environmental and perceptual factors. This observation therefore suggests presence of various hitherto undocumented factors that might have hindered the use of ITNs by

women in this area. Pregnant women are most vulnerable to Malaria and are also caregivers of children in the family. Their use of ITNs would reduce malaria infection and promote improved health in Ndavaya and Kinango Divisions. This study thus set to investigate and compare the factors that determine use of ITNs by women for malaria control in Ndavaya and Kinango Divisions of Kinango District.

1.3 Research questions

Various research questions were considered during this study and include:

- What is the relationship between knowledge and perception of malaria transmission and use of ITNs by women?
- What are the socio-cultural and economic determinants to ITNs use by women?
- How does source and availability of ITNs influence their use?
- What environmental factors influence use of ITNs by women?

1.4 Hypotheses

1.4.1 Null hypothesis

Environmental factors, income levels, knowledge and perception of malaria transmission do not determine use of ITNs by women in Kinango District.

1.4.2 Alternative hypothesis

Environmental factors, income levels, knowledge and perception of malaria transmission influence use of ITNs by women in Kinango District.

1.5 Objectives of the study

1.5.1 Broad objective

To investigate and compare the factors that determines the use of Insecticide Treated Bed-Nets by women for malaria control in Ndavaya and Kinango Divisions of Kinango District.

1.5.2 Specific objectives

- (1) To investigate the relationship between knowledge and perception of malaria and use of ITNs by women in Ndavaya and Kinango Divisions.
- (2) To establish the socio-cultural and economic determinants of ITNs use by women in Kinango and Ndavaya Divisions.
- (3) To assess whether source and availability of ITNs affects ITNs use by women in Kinango and Ndavaya Divisions.
- (4) To identify the environmental factors that influence ITNs use by women in Kinango and Ndavaya Divisions.

1.6 Significance of the study

Pregnant women and children below five years of age are at the greatest risk of malaria infection. Women play a double role of protecting the un-born foetus and caring for children (WHO, 2008). Increased use of ITNs by women, as argued by Audrey *et al.*, (2008) is critical in reducing the incidences of malaria and improving the health of communities. Determinants of a community's use of nets provide insight into why net coverage and use remains low even in areas where significant financial investments have been committed. Studies have shown that in most communities, net

use is lowest among the economically and geographically challenged (Nuwaha, 2001).

The role played by socioeconomic circumstances and environmental disposition of women has not been well documented in Kenya (Alaii *et al.*, 2003). Women very often lack the resources and awareness on proper treatment and prevention of malaria. Kinango District has a malaria prevalence of 41% while 56% of the population subsists on less than one US dollar per day (MoH, 2005). This study set to investigate the various factors that influenced use of ITNs for control of malaria amongst women in Kinango District of Coastal Kenya. The results will greatly aid in developing effective interventions to scale up ITN usage in the district and by extension to other parts of the country.

2.0 CHAPTER II: LITERATURE REVIEW

2.1 Historical perspective

Ancient and medieval physicians, including Hippocrates, left descriptions of diseases that might be speculated to be different types of malaria. Strong material evidence of the presence of malaria in pre-dynastic Egypt as early as 3200 BC, was obtained through recovery of *P. falciparum* HRP-2 antigen which was found in mummies belonging to that period (WHO, 2005a). During the first half of the 20th century, malaria started to disappear from the industrialized countries, due to ecological change, better availability of medical care and improvement of the quality of life. At the end of the 2nd World War chloroquine drug and DDT insecticide revolutionized malaria control. The Eighth World Health Assembly endorsed indoor spraying with DDT in 1955 (WHO, 2005a).

2.2 Global malaria situation

At the end of 2004, 107 countries and territories had areas at risk of malaria transmission. Some 3.2 billion people lived in areas at risk of malaria transmission. Globally, malaria results in 300 to 500 million clinical episodes and at least one million deaths annually, 90% of which occur in Africa. Patterns of malaria transmission and disease vary markedly between regions and even within individual countries. Malaria remains a major global problem, exacting an unacceptable toll on the health and economic welfare of the world's poorest communities (WHO, 2005b).

2.3 Malaria in Africa

Sixty percent of all the cases of malaria worldwide, 75% of global falciparum malaria cases and more than 80% of malaria deaths occur in Sub-Saharan Africa. Malaria

causes about 18% of deaths in children under 5 years of age. It also causes anaemia in children and pregnant women and leads to low birth weight, premature birth and infant mortality in Africa (WHO, 2005b). Malaria in pregnancy is the primary cause of up to 10,000 maternal anaemia-related deaths in SSA annually (Guyatt and Snow, 2001). In endemic African countries, malaria accounts for 25–35% of outpatient visits, 20–45% of hospital admissions and 15–35% of hospital deaths (WHO, 2008). In Africa malaria mostly affects populations in the west including Nigeria, Benin, Senegal, Sierra Leone and parts of central Africa such as Democratic Republic of Congo. Most of the East African countries including Uganda, Tanzania, Kenya, and Somalia are affected. Angola and Mozambique are also endemic in the south besides Chad and Sudan in the North.

2.4 Malaria in Kenya

In Kenya, malaria is the leading cause of morbidity and mortality, especially in young children and pregnant women. Approximately 40% of the population has suffered from malaria and 72 children under the age of 5 years die of malaria daily (GoK, 1998). Malaria causes an estimated 34,000 deaths annually. It accounts for 30% of outpatient attendances, nearly 20% of admissions and 15 to 35% of hospital deaths, imposing a great burden on already fragile health-care systems (MoH, 2006; WHO, 2005b).

The level of endemicity of malaria in Kenya varies from region to region and there is a big diversity in risk of malaria infection largely driven by climate and, the effects of altitude (Guyatt *et al.*, 2004). The western parts of Kenya around Lake Victoria, the Rift Valley highlands and coastal areas carry the greatest burden of the disease. In the

coastal region including Kinango District the prevalence of Malaria exceeds 50 percent (MoH, 2006).

2.5 Malaria pathogens

Out of the four plasmodia species that cause human malaria, *Plasmodium falciparum* accounts for the most serious infections and also causes the most acute form of malaria (Toure and Colluzzi, 2000). *Plasmodium vivax*, *P. malariae* and *P. ovale* are usually sporadic and cause less severe forms of malaria. Acute *Plasmodium falciparum* malaria is accompanied by severe life threatening complications such as cerebral malaria, severe anaemic and sometimes death (MoH, 2006).

2.6 Socio-economic burden of malaria

Malaria affects human populations in 103 countries of the world (Remme *et al.*, 1993) with an estimated 2.8 billion people at risk (Agyepong, 1992). The World Health Organization report (WHO, 2008) estimates the annual number of people infected with malaria to be over 247 million. Besides, 90% of the annual global malaria mortality of 1.5 million is in Africa (Snow *et al.*, 1993). In SSA the population at great risk includes pregnant women and children less than five years (White and Cook, 1996). Malaria accounts for 20-30% of deaths in this age bracket (Cattani and Leugeber, 1997).

Over 70% of Kenya's population is at risk of malaria, 75% of which live in rural areas (PSI-Kenya, 2006). In 1991, the number of patients treated in Kenyan hospitals was 16.9 million, out of which 5.7 million were malaria patients (GoK, 1991). Besides death, malaria also contributes to malnutrition and stunted growth in young children;

complications in pregnancy including stillbirths, increased maternal deaths, and labour reduction (GoK, 1991). Further, malaria in pregnant mothers causes infection of the placenta and low birth weight especially, during early pregnancies. This in turn may affect the intellectual development of the fetus (Sauders and Carver, 1995).

2.7 Ecological determinants of malaria

Temperature influences development of mosquitoes while water-related factors ensure availability of breeding places and maintaining the level of humidity sufficient for survival of vectors that require humidity of at least 50% (WHO, 2005a). The *Anopheles* mosquito typically breeds in natural water bodies with clean, slow moving, warm water, with sufficient aquatic vegetation. *An. gambiae* breeds in small pools while *An. stephensi* breeds in semi-closed artificial containers. In tropical and equatorial zones, more than one vector species are prevalent in the same area but occupy different ecological niches. *An. fluviatilis* breeds in running water during the rainy season while *An. culicifacies* breeds in small pools during dry seasons. Together, they can assure continuous transmission in relay and maintain high levels of endemic malaria (WHO, 2005a).

2.8 Population dynamics and malaria

Among the many diseases that plague migrants, malaria plays one of the leading roles. Malaria aggravates the process of movement of populations from high to low endemic areas and vice versa. Such movement leads to a mixing of populations of parasites originating from different areas and exchange of parasites with a hitherto inexperienced antigenic structure (WHO, 2005a). Organized resettlement also has its malaria consequences. Concentrating population in big villages in an attempt to

curtail guerrilla activities in war torn countries might be limiting malaria transmission, but dissolution of such villages was one of the factors responsible for resurgence of malaria after the Gulf War in the North-Eastern Iraq. On the other hand, forced resettlement from non-malaria to malaria areas led to malaria epidemics in places like Ethiopia (WHO, 2005a).

2.9 Malaria control measures

The Ministry of Health recommends four major strategies to combat malaria (MoH, 2006). These include use of insecticide treated bed nets by pregnant women and children under five years, environmental control of mosquitoes, administration of Intermittent Presumptive treatment for mothers in pregnancy and early diagnosis and correct treatment of the disease.

2.9.1 Use of Insecticide Treated Nets (ITNs)

Insecticide-treated bed nets (ITNs) have shown promise in reducing malaria morbidity and mortality (MoH, 2001a). The net protects against vector mosquitoes such as *Anopheles gambiae* and *An. funestus*, which generally bite at night (MoH, 2006). The insecticide, a synthetic pyrethroid such as permethrin acts by killing, irritating and repelling mosquitoes from the net thus improving the barrier when the net drapes directly upon the inhabitant or becomes torn. When used at high coverage and re-treated with insecticide biannually, ITNs confer area-wide effects on the mosquito population, protecting those living in houses lacking nets (WHO, 2008).

A recent study in western Kenya showed that ITNs were associated with reductions of 38% in the incidence of malaria parasitemia and 47% in the incidence of severe malarial anemia during pregnancy. At the time of delivery, the prevalence of placental

or maternal malaria was reduced by 35%, and the prevalence of low birth weight was reduced by 28% (Ter Kuile *et al.*, 2003). A review of results of efficacy trials of ITNs in Sub Sahara Africa reported that their correct use could save up to six lives for every 1,000 protected children less than five years of age. ITNs also improve the health of pregnant women and their newborns in areas with a high burden of malaria and HIV infection (Osero *et al.*, 2005)

According to PSI-Kenya (2006), over 6 million ITNs had been distributed by the end of year 2005, with an additional 5 million targeted for distribution in 2006 - 2007. Due to concerted efforts of the government and other stakeholders, the national mosquito net ownership in 2005 was 44%, while ITN ownership was at 21%. Similarly, rural net ownership was at 37% compared with urban net ownership of 62 percent (PSI-Kenya, 2006). The 2007 Kenya Malaria Indicator Survey shows that 48% of households own at least one ITN while 23% of households own more than one ITN (DOMC, 2009). More so the same survey found that approximately 33% of urban women slept under an ITN compared with 31% in the rural areas.

2.9.2 Use of drugs

The spread of chloroquine resistance and low adherence to anti-malarial prophylaxis during pregnancy led to the reconsideration of the role of anti-malarial chemoprophylaxis in controlling malaria. Intermittent presumptive treatment (IPT) with sulfadoxine-pyrimethamine (SP) has been used in Sub Sahara Africa for the last decade and is currently spelt out in the national policy in Kenya. Due to the resistance observed from use of SP treatment, the Ministry of Health in 2006 rolled out a new policy on treatment of malaria using Artemesinin-Based Combination Therapy

(ACT). This has led to Artemether-Lumefantrine (AL) being adopted as the drug of choice (MoH, 2006).

2.9.3 Multiple control measures

Over the last decade evidence has accumulated supporting the combined use of both Insecticide Treated Nets (ITNs) and Intermittent Presumptive Treatment (IPT) using Sulhadoxine Pyrimethamine (SP) to reduce the adverse effect of malaria during pregnancy (WHO, 2008). In Kenya it is government policy to offer IPT with sulfadoxine-pyrimethamine (SP) for every pregnant woman attending Maternal and Child Health services (MoH, 2006). The use of a combination of ITN and IPT provides additive protection against severe anaemia (Nganda *et al.*, 2004).

Integrated vector management augments other malaria control interventions to reduce transmission of malaria. It is based on the intensity of transmission, vector, human behaviour, the environment and resources available. These methods include Indoor Residual Spraying (IRS) and selective larviciding in specific sites, screening of house inlets with wire mesh to reduce entry of mosquitoes, environmental management for source reduction of vector density, biological control measures and use of repellents and fumigants (MoH, 2006).

3.0 CHAPTER III: MATERIALS AND METHODS

3.1 Research design

A cross-sectional survey design was employed to gather data from women residing in Kinango District of Coast Province in Kenya. Ndavaya Division was purposefully selected due to its low ITN uptake and minimal external efforts towards promoting ITNs use. Conversely, Kinango Division that has recorded high ITNs usage and has had intensive interventions to scale up ITNs use was also purposefully chosen for comparison purposes. This design was considered suitable for the study because it would allow logical description of the current interrelation of variables of interest within the study population. It would also provide an opportunity to document the situation without any manipulation.

3.2 Variables

The independent variables for this study included perception and knowledge of malaria transmission as and their influence on the use of Insecticide Treated Bed-nets (ITNs), control of malaria using various methods, weather patterns and their influence on ITN use, socio-demographic characteristics (including age, family size, levels of education and income, occupation, marital status, and sleeping patterns), policy issues and source of bed nets. Use of insecticide treated bed-nets (ITNs) by women was the key dependent variable.

3.3 Study site

The study was conducted in Kinango and Ndavaya Divisions of Kinango District in Coast Province of Kenya. The District borders Kwale and Msambweni to the East while Kilifi and Taita lie to its North and West respectively. It covers an area of 1,848KM²(CBS, 1999) with three divisions including Kinango, Ndavaya, and

Samburu. It has one government hospital and 6 dispensaries. The area has a warm and sub-humid climate with mean annual temperature and rainfall of 26⁰ C and 500 mm per annum respectively. The area is majorly inhabited by the Duruma, Kamba and Maasai communities. The literacy level is about 15% and 75 per cent of the people subsist on less than 1US\$ per day. In the Coast Province Kinango district registers the lowest (16%) ITN usage by women who are a key target group in reduction of malaria incidences (MoH, 2005).

3.4 Study population

Kinango District has three divisions with a population of 200,599 people. Kinango has 43,764 residents; Ndavaya Divisions has 44,858 while Samburu Division has 111,979 people. The target population for the study were 20,383 women of reproductive age (15-49 years) residing in Ndavaya and Kinango Divisions. Most of them were subsistence farmers, with some practicing pastoralism and trading in livestock, foods and grain. Kinango Division has 12,514, while Ndavaya has 7,869 women within reproductive age.

3.5 Sampling techniques and sample size

3.5.1 Sampling techniques

Purposive sampling was used to select Ndavaya Division that has had minimal interventions to scale up ITN uptake and also Kinango Division which has benefited immensely from NGOs and CBOs promoting ITN use for comparison of variables. The two divisions were allocated an equal number of respondents while the locations in each division provided respondents proportional to their number of households as per the Central Bureau of Statistics (CBS) data. Systematic sampling was then applied to select 204 respondents with every 10th household being visited. A starting

point was randomly identified from a list of households compiled by the Central Bureau of Statistics (Ministry of Finance and Planning, 1999). Further, all households that had participated in the reconnaissance survey were skipped during the actual data collection.

3.5.2 Sample size determination

Epi Info™ version 3.4 Statcalc function (CDC, 2007) was used to determine the appropriate sample size. Epi Info™ was preferred because it is a database and statistical software for epidemiological studies developed by CDC for conducting outbreak investigations, managing databases in public health surveillance and general statistics applications.

Therefore to run Statcalc for the required sample, the parameters employed included:

Size of population – 20,383 (CBS, 1999)

Expected frequency of the factor – 16% (ITN use by women in Kinango District)

Worst acceptable result – 21% (National ITN usage – PSI 2006)

Confidence level – 95%

This gave a sample size of 204 women

3.6 Construction of research instruments

After thorough literature review, incisive consultations with supervisors and discussions with Public Health Officers in the two divisions, the researcher developed zero drafts of the tools for the study. The drafted questionnaires, interview schedules, discussion guides and action plans were shared with supervisors and key stakeholders including the District Public Health Officer (DPHO), divisional PHOs,

CHWs, village elders and colleagues to take account of them. Their contributions were consequently incorporated.

The tools were later pre-tested during a reconnaissance survey and further refined to ensure they captured the envisaged data accurately and consistently. The instruments were framed in such a way that vital information was to be gathered in tandem with the research questions. The information included socio-demographic characteristics, ownership and use of bed-nets, malaria control measures, awareness on malaria transmission and policy issues. In order to address high levels of illiteracy among the target population, the tools were also translated into Kiswahili, Digo and Duruma languages which are widely spoken in the study area. These were thoroughly reviewed by local Research Assistants, elders and Public Health Officers for completeness and clarity. The translated questionnaires, FGD and KII guides were then pre-tested and refined further.

3.7 Pilot study

A reconnaissance survey was conducted to ensure that the tools that were used for the study attained the requisite validity and reliability. Ten respondents were therefore randomly sampled from Kinango and Ndavaya Divisions and questionnaires administered to them. Key Informant Interview schedules and Focussed Group Discussion (FGD) guides were also tested with one group of women in Ndavaya Division. The data collected was cleaned, edited, coded and analyzed using Epi Info™ Version 3.4. This process and the preliminary results obtained immensely helped in improving the draft tools for the study.

3.8 Validity and reliability

3.8.1 Validity

Validity refers to the accuracy and meaningfulness of inferences, which are based on the research results. It is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study (Mugenda and Mugenda, 1999). To ensure tool validity a pre-test was undertaken with ten questionnaires and an FGD was carried out with one women group. Consequently the tools were refined for precision, clarity and inclusiveness. In order to ensure data quality, cross-checking and inspection of the information gathered from the pilot study was done. The study instruments were then adjusted to ensure content, concurrent and face validity. Appropriate corrective measures ensured that the instruments gathered valid information during the study.

All the pre-tested respondents were comfortable with the content information that the researcher wanted to know about them. This included their socio-demographic variables, ownership and use of ITNs, colour and shape preferences, malaria transmission knowledge levels and issues pertaining to policy. This helped to ascertain the content validity of the instruments. Further, research questions framed in view of the study objectives helped increase validity of the study.

3.8.2 Reliability

Reliability is the measure of the degree to which a research instrument yields consistent results or data after repeated trails (Leedy, 2001). This was attained by

allowing colleagues at the Public Health Department, the DPHO, divisional PHOs and CHWs provide valuable critique to the draft tools and afterwards their inputs incorporated. Pre-tested data was also analyzed to check whether the tools were actually answering the study questions. Data was collected in indigenous language, Kiswahili and English depending on the language that a study subject preferred or understood better.

Double checking of the information given was done where necessary while getting response from the study subject in order to further raise the level of reliability on the information provided. Questionnaire, interview and FGD data was also cross-checked for triangulation after being collected. Respondent and situational consistency was observed by ensuring that the trained research assistants collected standard data. Besides, raw data was edited in the field and at the Kinango District Headquarters before entry into the computer.

3.9 Data collection techniques

The principal investigator supervised the collection of data, facilitated interviews and moderated focussed group discussions assisted by three research assistants who were recruited from the study area. Training was undertaken for the 3 research assistants on administration of questionnaires and facilitation of focus group discussions and key informant interviews. Data collection took three weeks and all the 204 sampled study respondents participated. Respondents were contacted at their homes with indigenous dialects including Kiduluma, Kidigo, Kikamba and Kimaasai being employed for effective interaction. Kiswahili and English were also used depending with the preference of the respondent. The procedure mainly involved use of the normal

pleasantries followed by seeking of consent from respondents, taking of socio-demographic data, ownership and use of ITNs, control measures, knowledge of malaria transmission and policy issues.

Key Informants in this study included the District Public Health Officer -Kinango, Public Health Officers in charge of Ndavaya and Kinango Divisions, 4 Community Health Workers (CHWs) drawn equally from the two divisions and 6 traditional (*Kaya*) elders. The officers were consulted at their respective offices while the *Kaya* elders were interviewed at their homes.

A Focussed Group Discussion (FGD) of 13 women was held in Ndavaya while another comprising 11 women was facilitated in Kinango. The higher number of participants in Ndavaya was necessary to represent the expansive division and the various ethnic groups that reside there. The participants were drawn from the 6 locations constituting the two divisions with their ages ranging from 18 to 42 years. Kiswahili was unanimously adopted as the preferred language of FGD deliberations due to the heterogeneity of the participants and ability of all of them to express their opinions in that language. However liberty was allowed for those who wished to share their views in local dialects and translation aptly done by the research assistants to the participants.

3.10 Data analysis and presentation

Several statistical software packages were employed for data management and analysis in order to enhance data quality. These included Epi Info™ version 3.4 an epidemiology data management software and Statistical Package for Social Sciences

(SPSS) version 12. After cross-checking the questionnaires for errors, they were serialized and data coded in a codebook for processing and analysis using Epi Info™ version 3.4. Processed data was again cross-checked for errors and was then classified and tabulated. Data was synthesized using descriptive statistics including frequencies. Variables such as distances to health facilities, income levels and education were analysed through means, median and standard deviation. The data was further imported to SPSS (Statistical Package for Social Sciences) for further analysis. Chi-square was applied to test whether the deviations (differences between observed and expected) were as a result of chance or due to other factors. Findings were finally presented in frequency tables, pie charts and bar graphs.

3.11 Data quality control measures

Cross checking and inspection of the information on the questionnaires was done in order to ensure data quality. Research instruments were thoroughly scrutinized to ensure that the data collected was accurate and unambiguous. This exercise was undertaken concurrently with data collection in order to attain high levels of completeness, consistency and uniformity of the collected data.

Accuracy was realized by ensuring that all study instruments with in-correctable contradictory information were discarded and replaced with others. All questionnaire data was duly entered and verified before being analyzed. This decreased the likelihood of errors because it is unusual for the same entry error to occur twice. Further, the statistical tools (Epi Ifo™ and SPSS) utilized for data entry and analysis contained interval checks which alerted the researcher of any missing variables and so due correction was effected instantly. Besides, thorough investigation for

inconsistencies between information presented in the figures and information discussed in the text was made. Multiple comparisons of various independent variables and the dependent variable also helped to ensure validity of the data.

3.12 Logistical and ethical considerations

A 4x4 vehicle was used to transport the principal researcher and the 3 research assistants to the area targeted during a particular day. The principal researcher oversaw the overall coordination of the exercise. Necessary protocols were obtained from the appropriate authorities including Kenyatta University and Ministry of Science and Technology in Kenya. Notifications for the study were sent and confirmed to participants two weeks prior to carrying out the field research to give them ample time to prepare for the interviews and discussions. Friendly rapport preceded personal interviews with respondents and their voluntary consent to participate was sought by explaining the purpose of the study in a language and manner appropriate to them.

Sensitive questions adopted an induction process to avoid embarrassment while strict confidentiality of the information obtained was observed. Debriefing was done before exit while the findings were shared to participants through the Ministry of Health and respective community health workers.

4.0 CHAPTER IV: RESULTS

A total of 204 women with equal representation for both Ndavaya and Kinango divisions were interviewed during the study. Use of local dialects for communication and indigenous research assistants enabled the process to run smoothly. One FGD each was conducted in each division while Key Informant Interviews were undertaken with community elders and public health officials in the two divisions. Data was collected on the respondent's socio-demographic characteristics, access to health services, use of ITNs and the various determinants of ITN use by women in Kinango and Ndavaya Divisions.

4.1 Socio-demographic characteristics of the respondents

Various socio-demographic characteristics of the respondents were assessed. These included their age, family sizes, ethnic affiliation and occupation. Data was also gathered on the women's level of education, sources of income (and income levels) besides marital status.

4.1.1 Age of the respondents

Majority of the respondents interviewed in both divisions were aged 25-30 years with 31.4% in Kinango and 27.5% in Ndavaya (Figure 4.1). Those below 20 years were equal in both divisions (9%). Between the ages of 20-24 years Kinango had higher with 18% as compared to 15% for Ndavaya. Kinango also had higher number (22%) of respondents aged between 30-34 years compared to 18% in Ndavaya. Ndavaya on the other hand had the highest number of respondents aged 35-39 years (23%) as compared to 12% in Kinango. Those aged 40 years and above were equal in both

Divisions (9%). The age of respondents interviewed in the two divisions did not differ significantly across the age classes (N= 204; $\chi^2 = 4.40$; $P \geq 0.05$).

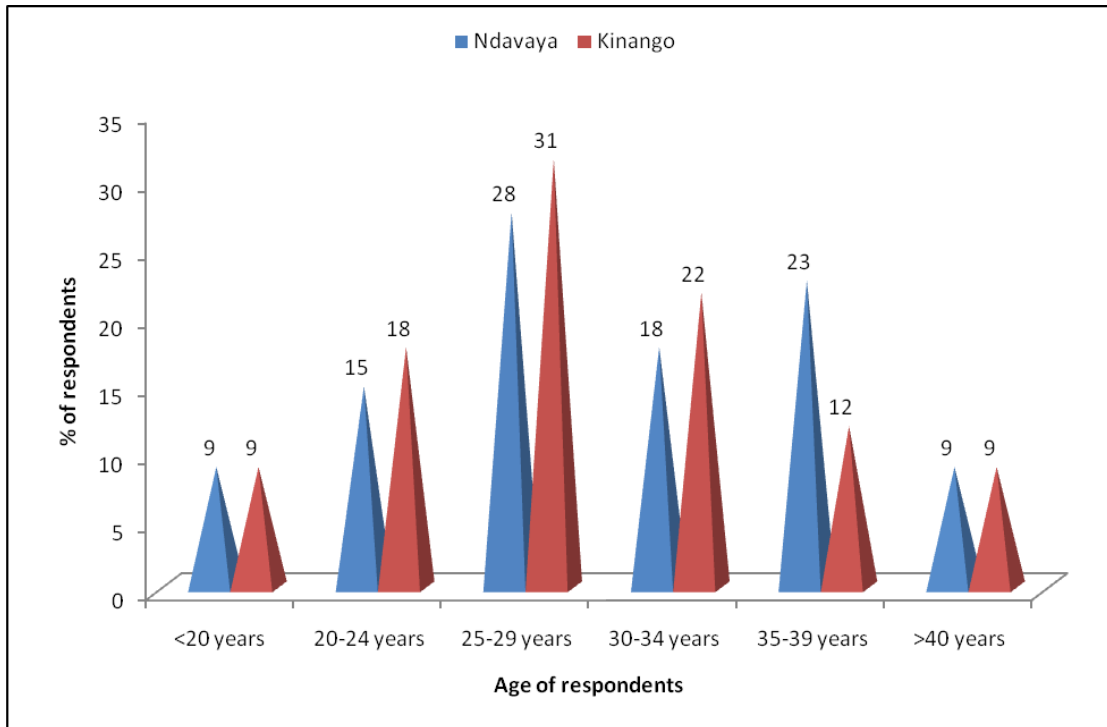


Figure 4.1: Age of respondents in Ndavaya and Kinango

4.1.2 Family sizes in Ndavaya and Kinango

Ndavaya Division was characterized by both very small (1-2) and very large households (9 and above) while Kinango was characterized by medium households of between 3-4 and fairly large 7-8 members. In the bracket of 1-2 family members, 17% of respondents were in Ndavaya and 12% in Kinango. In the bracket of 3-4 family members, Ndavaya had 23% while Kinango Division had 38%. Within 5-6 members, Ndavaya had 32% with Kinango having 19%. Similarly, for family of 7-8 members, Ndavaya had 17% and Kinango 30%. In the category of 9 people and above, 12% were in Ndavaya and 1% in Kinango Division as illustrated in Figure 4.2. The family

sizes of households interviewed in the two divisions differed very significantly (N= 204; $\chi^2 = 22.15$; $P \leq 0.001$).

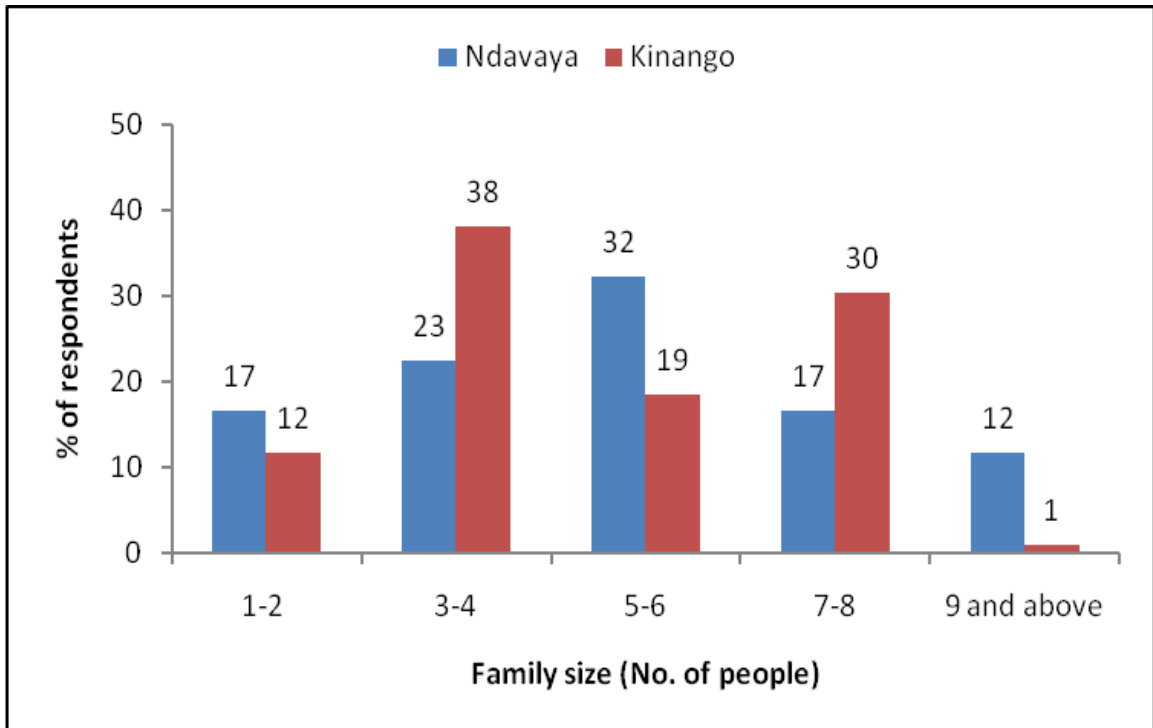


Figure 4.2: Family sizes of households in Ndavaya and Kinango Divisions

4.1.3 Ethnic distribution

The main tribes in Kinango Division in descending order were; Duruma (43.1%), Kamba (33.3%), Maasai (10.8%) and Digo (6.9%) while in Ndavaya they were Duruma (58.8%), Maasai (19.6%), Kamba (13.7%) and Digo (4.9%). Other minor tribes included Sengeju, Kikuyu, Kisii, Taita and Tharaka (Table 4.1). The distribution of ethnic groups in the two divisions of Kinango District differed significantly (N= 204; $\chi^2 = 17.94$; $P \leq 0.05$).

Table 4. 1: Tribes that inhabit Ndavaya and Kinango Divisions

Ethnic group of respondent	% of respondents	
	Division of the respondent	
	Ndavaya	Kinango
Kamba	13.7	33.3
Sengeju	1.0	0
Digo	4.9	6.9
Duruma	58.8	43.1
Maasai	19.6	10.8
Others	2.0	5.9
Total	100	100

4.1.4 Occupation of women in Ndavaya and Kinango

There were more peasant farmers in Ndavaya (82%) than in Kinango Division (72%) as illustrated in figure 4.3 below. More so the number of unemployed women was higher in Ndavaya (14%) than in Kinango Division (2%). There were no business women in Ndavaya division while Kinango had only (6%). Teachers were more in Kinango (20%) as compared 2% of Ndavaya. Those in other occupation were 2% in Ndavaya and 1% in Kinango. The occupations of women in Ndavaya and Kinango Divisions differed very significantly ($N= 204$; $\chi^2 = 30.83$; $P \leq 0.001$).

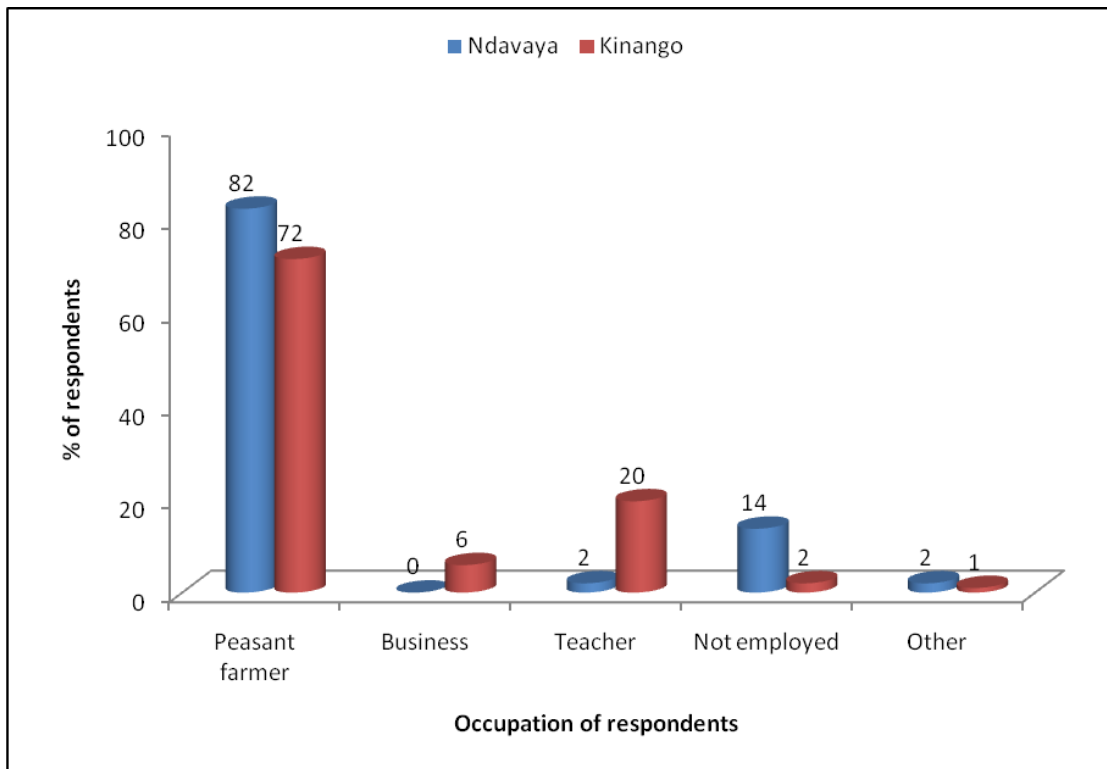


Figure 4.3: Main occupations of respondents in Ndavaya and Kinango

4.1.5 Education level of respondents

There were more women without formal education in Ndavaya (43%) than in Kinango Division (9%) as shown in Figure 4.4. Notably, 56% of women in Kinango had primary education while Ndavaya had 34% with the same. Those with youth polytechnic education were 7% in Ndavaya and 9% in Kinango Division. Besides, 12% of women in Ndavaya had secondary education as compared to 18% in Kinango. Further, only 4% of women in Ndavaya had tertiary or university education compared to 9% in Kinango (Figure 4.4). This perhaps explains the reason why most of the women in Ndavaya were not in formal employment. The variation in the level of education reached by women in Ndavaya and Kinango Divisions was highly significant ($N=204$; $\chi^2 = 31.74$; $P \leq 0.001$).

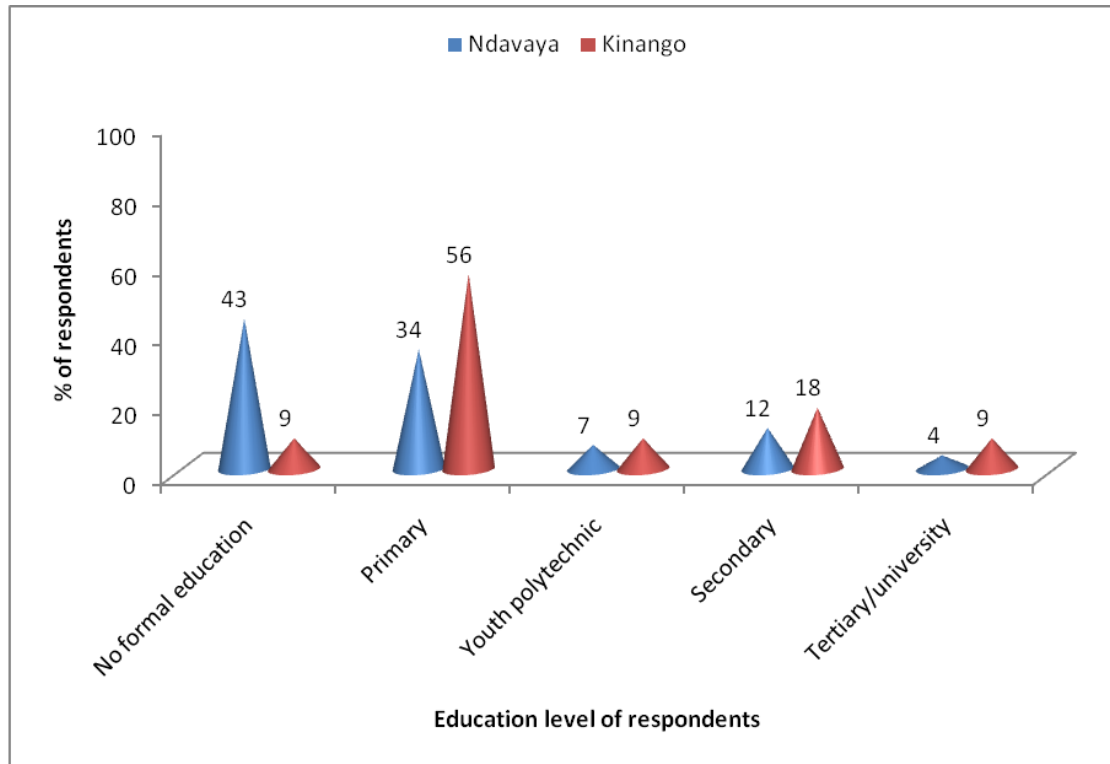


Figure 4.4: Education level of women in Ndavaya and Kinango

4.1.6 Income levels of the respondents

In Kinango 4% of women earned over Ksh. 12,000 while in Ndavaya only 1% earned the same amount monthly. Those earning between Ksh. 9,001-12,000 in Kinango were 13% while Ndavaya had 4%. Notably, both divisions had nearly equal number of women earning between Ksh.6, 000 and 9,000 (17% for Ndavaya and 15% in Kinango). However Ndavaya had more women earning Ksh.1, 000-3,000 (40% compared to 28%) and Ksh. 3,000-6,000 (25% compared to 19%) as shown in Figure 4.5. Kinango on the other hand had more (23%) women earning less than Ksh. 1,000 compared with Ndavaya (14%). The level of incomes for women respondents in both Ndavaya and Kinango Divisions differed significantly ($N= 204$; $\chi^2 = 12.15$; $P \leq 0.05$).

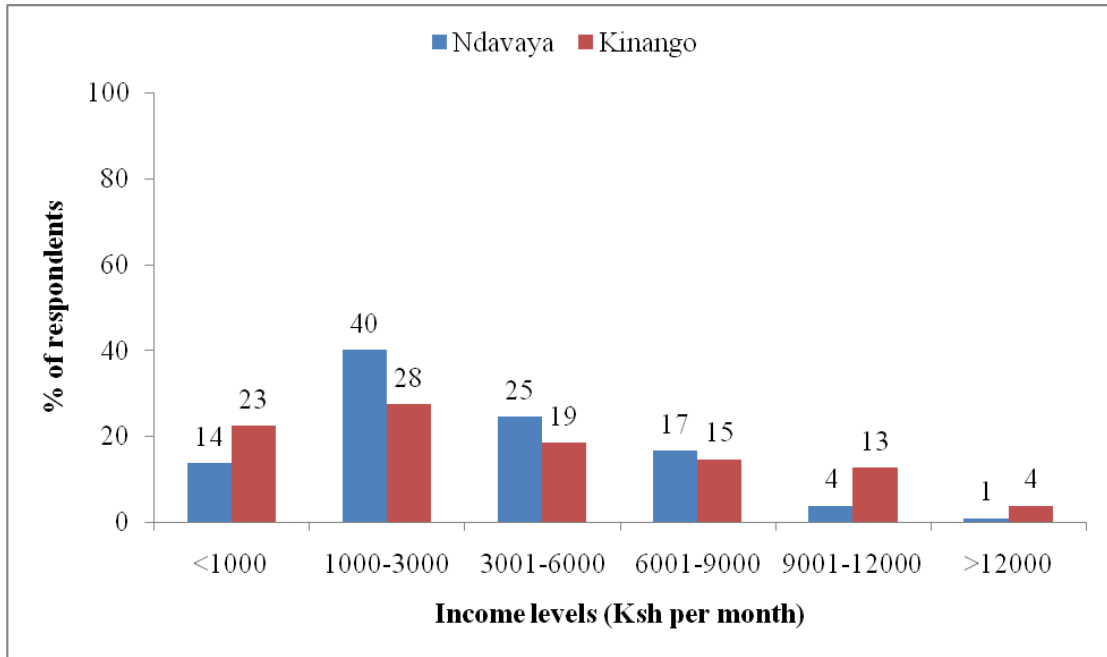


Figure 4.5: Income levels of women in Kinango and Ndavaya Divisions

4.1.7 Sources of income for Kinango and Ndavaya women

Of all respondents who sourced their income from salaries, 7.8% resided in Kinango with 2.9% emanating from Ndavaya Division. Further, 7.8% of respondents in Ndavaya and 19.6% in Kinango sourced their income from wages. Two percent of respondents in Ndavaya and 18.6% of respondents in Kinango sourced their income from business. Only 1% of respondents in both Divisions sold trees to earn their income. Cash crop sales were another source of income with 10.8% of respondents from Ndavaya and 13.7% from Kinango. Most of the respondents in Ndavaya (60.8%) sourced their income from livestock sales as compared to 26.5% in Kinango as shown in Table 4.2. About 14.7% of respondents in Ndavaya and 12.7% in Kinango depend on other sources for their income. The sources of incomes for respondents in both Ndavaya and Kinango Divisions differed very significantly ($N=204$; $\chi^2 = 35.44$; $P \leq 0.001$).

Table 4.2: Sources of income for women in Ndavaya and Kinango Divisions

Major income source of respondent	% of respondents	
	Division of the woman respondent	
	Ndavaya	Kinango
Salary	2.9	7.8
Wages	7.8	19.6
Business	2.0	18.6
Tree sales	1.0	1.0
Cash crop sales	10.8	13.7
livestock sales	60.8	26.5
other	14.7	12.7
	100	100

4.1.8 Marital status of women in Ndavaya and Kinango

Most of the respondents in both Divisions were married with Ndavaya having 84% while Kinango had 74%. However, 10% of women in Ndavaya were single while Kinango had 22% in this category. Those divorced were very few with Ndavaya having only 1% while Kinango had 2%. Widowed women in both Ndavaya and Kinango divisions were 5% and 2% respectively as shown in Figure 4.6. The marital status of respondents across the two divisions did not differ significantly (N= 204; $\chi^2 = 6.74$; $P \geq 0.05$).

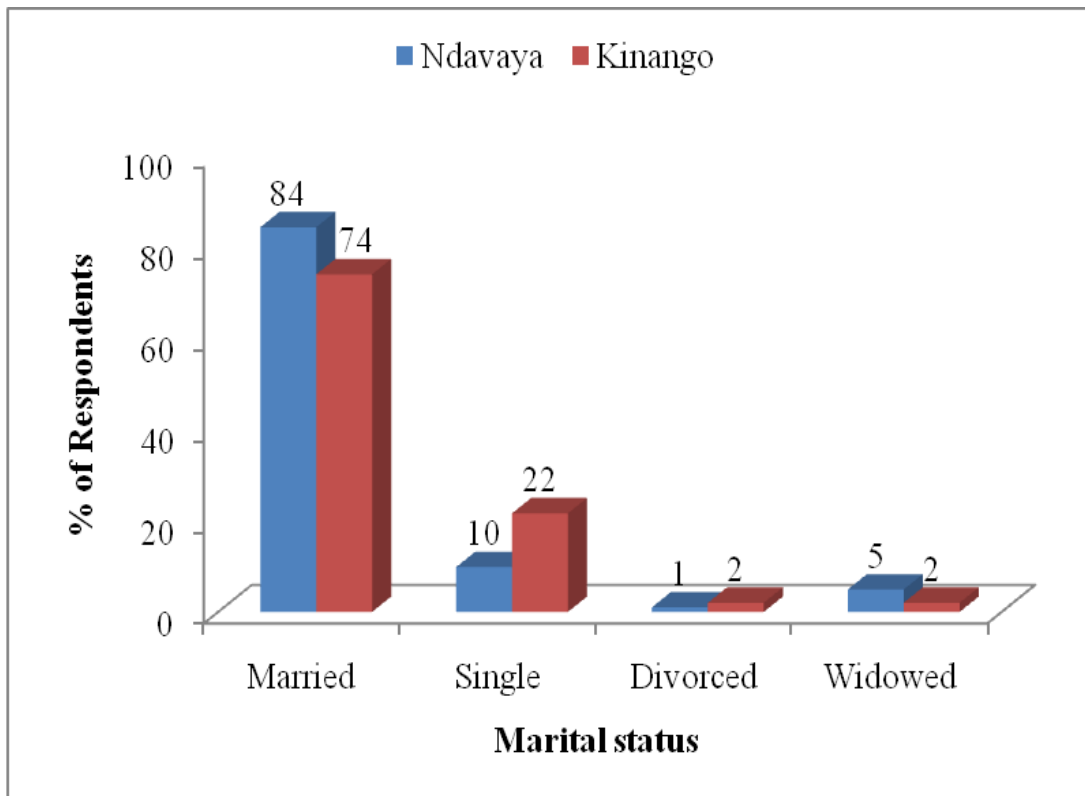


Figure 4.6: Marital status of women in Kinango and Ndavaya Divisions

4.2 Women access to healthcare

4.2.1 Health care providers frequented by women

Significant number of respondents in the two divisions (34%-Ndavaya and 31%-Kinango) sought treatment from government health centers. Private clinics were frequented more by women in Kinango (52%) while Ndavaya had 12%. More women (54%) visiting traditional healers were from Ndavaya compared to 17% from Kinango division as illustrated in Figure 4.7 below.

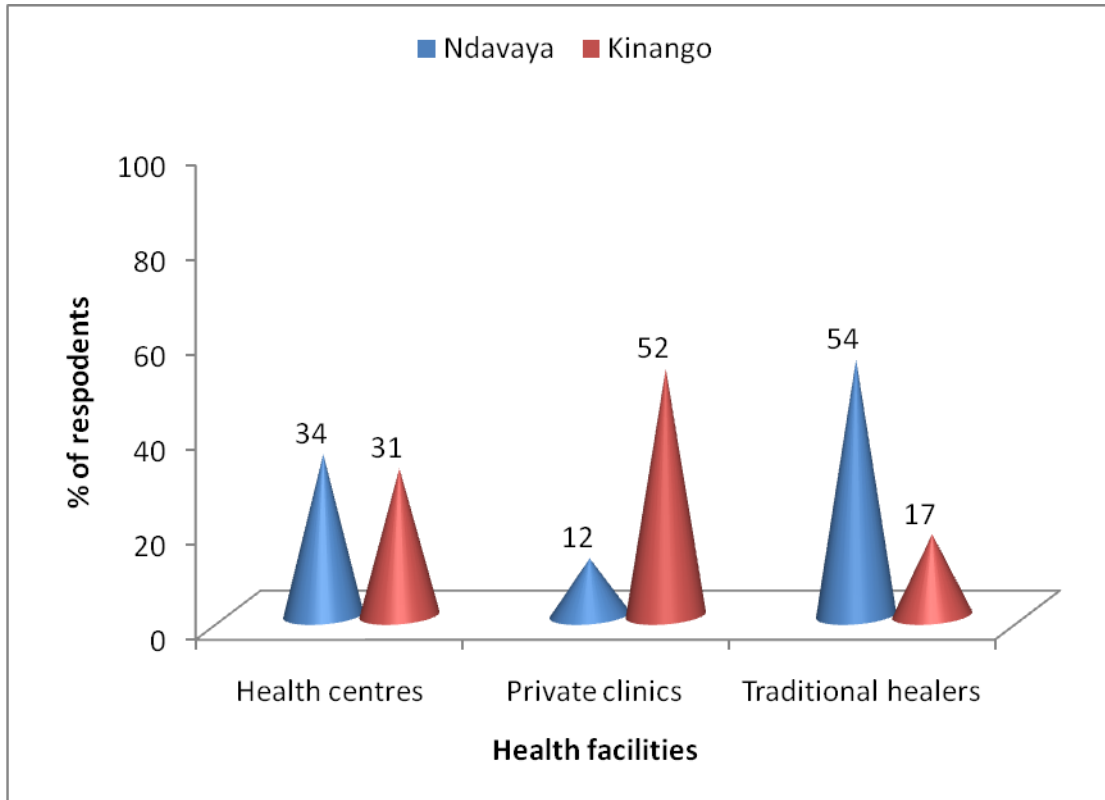


Figure 4.7: Health facilities where women sought treatment

4.2.2 Availability of laboratory services

Only 4% of the women in Ndavaya Division visited health facilities with a laboratory for diseases diagnosis as compared to 42% in Kinango. Similarly, 40% of respondents in Ndavaya and 31% in Kinango visited a facility without a laboratory. Notably, 56% of the respondents in Ndavaya were not aware whether the facility they attended had lab services compared to 27% in Kinango as indicated in Figure 4.8.

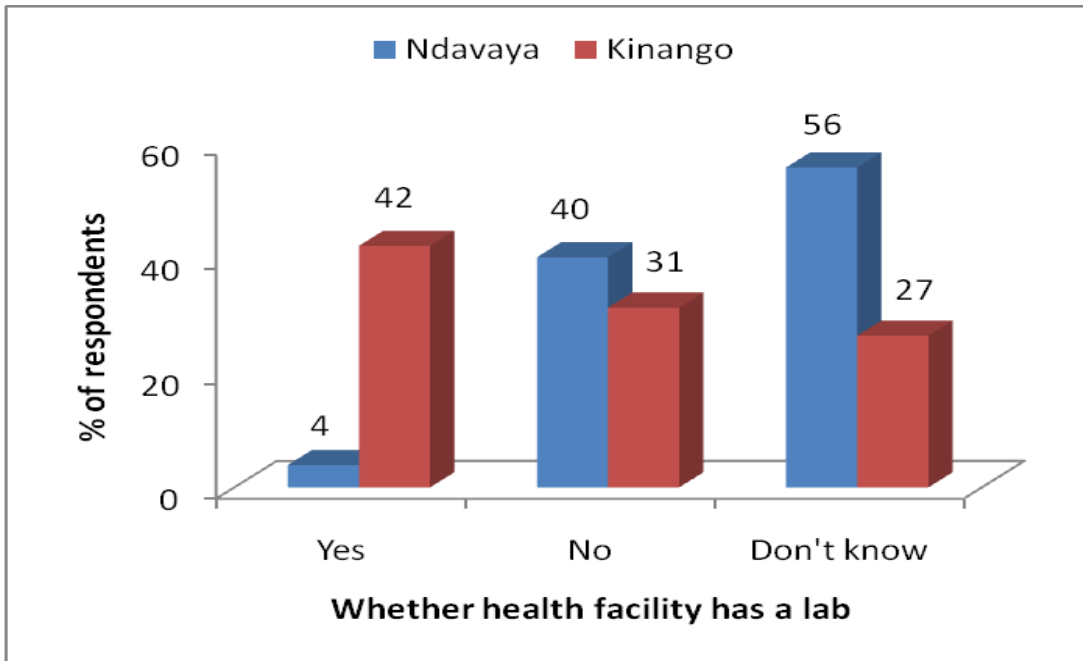


Figure 4.8: Presence of a laboratory in the health facilities visited by women

4.2.3 Laboratory diagnosis during visit to health facility

Majority of Women in Kinango Division (41%) were diagnosed in labs while in Ndavaya only 4%. had received this service. About 15% of respondents from Ndavaya and 10% in Kinango were not diagnosed in a laboratory. This was however not applicable to 81% of respondents in Ndavaya and 49% in Kinango as shown in figure 4.9.

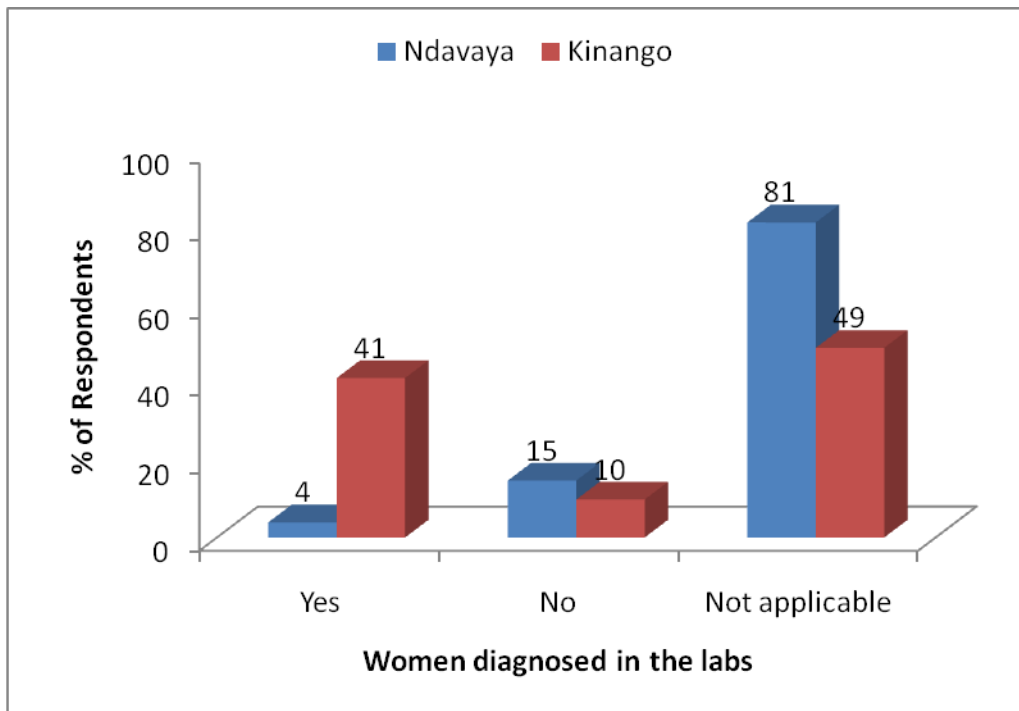


Figure 4.9: Women diagnosed in the laboratories of the health facility visited

4.2.4 Ante - natal clinic attendance by women

Majority (73%) of women in Kinango attended ante-natal clinic as compared to 56% in Ndavaya. Approximately 44% of respondents in Ndavaya did not attend ante-natal clinic while Kinango had 27% in the same category.

4.2.5 Access to anti-malarial drugs during ante-natal clinic

A mere 31% of women in Ndavaya and 70% in Kinango who attended ante-natal clinic received the vital anti-malarial prophylaxis (Sulpadoxine Perimethamine – SP). Only 3% from Kinango did not get anti-malarial drugs while 17% from Ndavaya did not know whether they were given the drugs. Similarly, 52% of women in Ndavaya and 27% in Kinango did not attend ante-natal clinic therefore the question was not applicable to them as indicated in Figure 4.10.

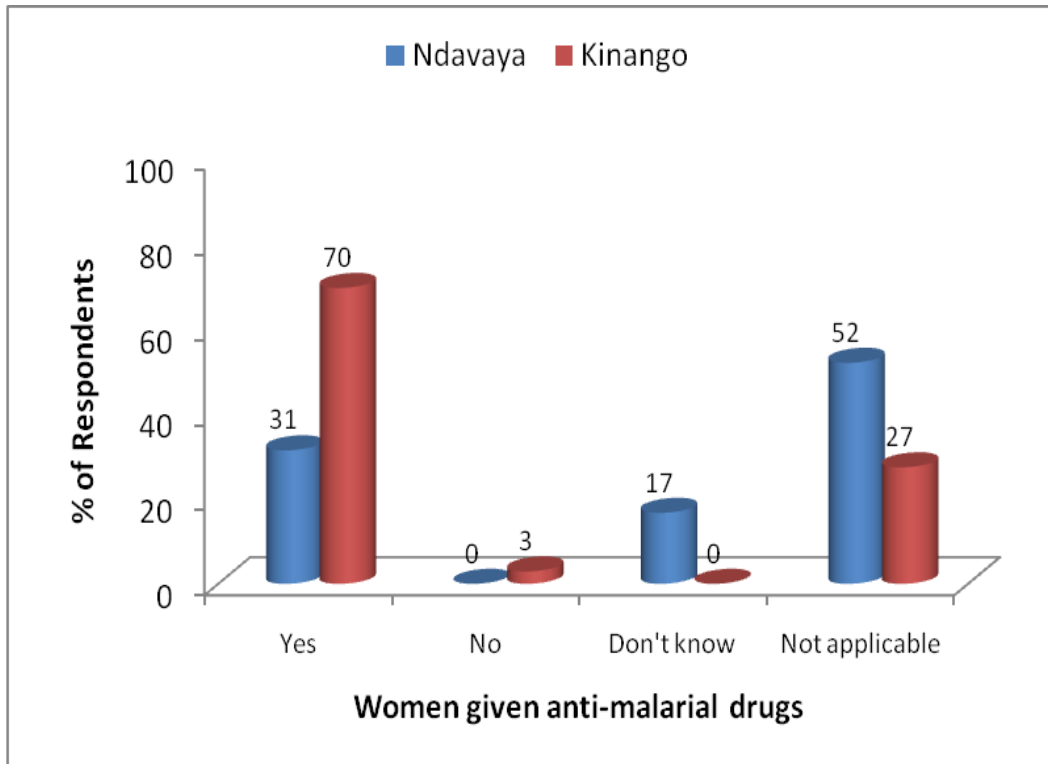


Figure 4.10: Access to anti-malarial drugs by women

4.3 Women's perception of basic malaria epidemiology

4.3.1 Local descriptions of malaria

Terminologies used to describe malaria were quite similar in the two areas. Notably, *Joto Mwili* which is a Kiswahili expression of fever was used by 65% of women in Ndavaya and 59% in Kinango. *Ndetema* was common among 34% of the respondents in Kinango Division and 22% of women in Ndavaya. *Ndetema* is derived from the Kamba word “*kutetema*” meaning shaking; in this context due to the fever that accompanies a malaria attack. Only 14% of women in Ndavaya used the term malaria compared to 7% in Kinango (Figure 4.11).

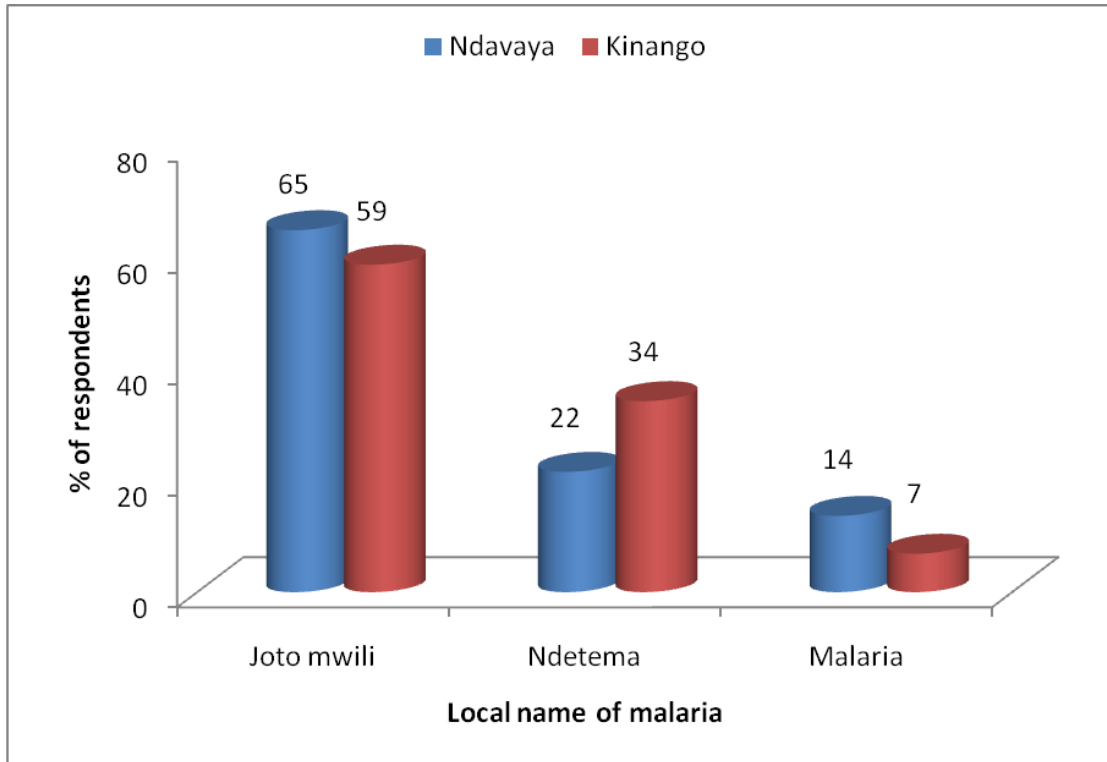


Figure 4.11: Local names of malaria in Ndavaya and Kinango Divisions

4.3.2 Mosquito breeding areas

Majority (28.1%) of the respondents in Kinango argued that mosquitoes bred everywhere in their environment while in Ndavaya it was only 13.5% who thought so. Those who cited stagnant water as areas where mosquitoes bred were 18.1% from Ndavaya and 22.3% from Kinango. Similarly, 27% of respondents in Ndavaya and 11.3% in Kinango cited that mosquitoes bred in rivers. Those who cited bushes as areas where mosquitoes bred were 13.9% in Ndavaya and 27.7% in Kinango. About 27.5% of those who attributed breeding to cattle sheds lived in Ndavaya as compared 10.6% in Kinango (Table 4.3)

Table 4.3: Areas in the village where mosquitoes breed

Division of respondent	Where mosquitoes breed				
	% of respondents				
	Everywhere	Stagnant water	Rivers	Bushes	Cattle shed
Ndavaya	13.5	18.1	27.0	13.9	27.5
Kinango	28.1	22.3	11.3	27.7	10.6

4.3.3 Control of mosquito breeding

There were concerted efforts in Kinango to control mosquito breeding with 70% of the respondents revealing that they got involved in the exercise compared with only 32% in Ndavaya. Similarly 68% of those who did not engage in measures to curb mosquito breeding resided in Ndavaya while 30% of respondents in Kinango did not curb mosquito breeding. The responses of whether women in Ndavaya and Kinango Divisions control mosquito breeding differed significantly ($N= 204$; $\chi^2 = 28.325$; $P \leq 0.001$).

4.3.4 Responsibility of controlling mosquito breeding

Kinango had a huge number (39%) of respondents feeling that control of mosquito breeding should be facilitated by the general community compared to 11% of respondents from Ndavaya. However, 35% of the respondents from Ndavaya maintained that the villagers should take responsibility and control mosquito breeding as compared to Kinango's 19%. Besides, 38% and 35% of respondents from Ndavaya and Kinango respectively believed the government had the responsibility of controlling malaria. More so, 16% of respondents from Ndavaya and 7% from Kinango did not know who has the responsibility of controlling Malaria (Figure 4.12). The responsibility of controlling malaria in Ndavaya and Kinango Divisions differed significantly ($N= 204$; $\chi^2 = 25.386$; $P \leq 0.001$).

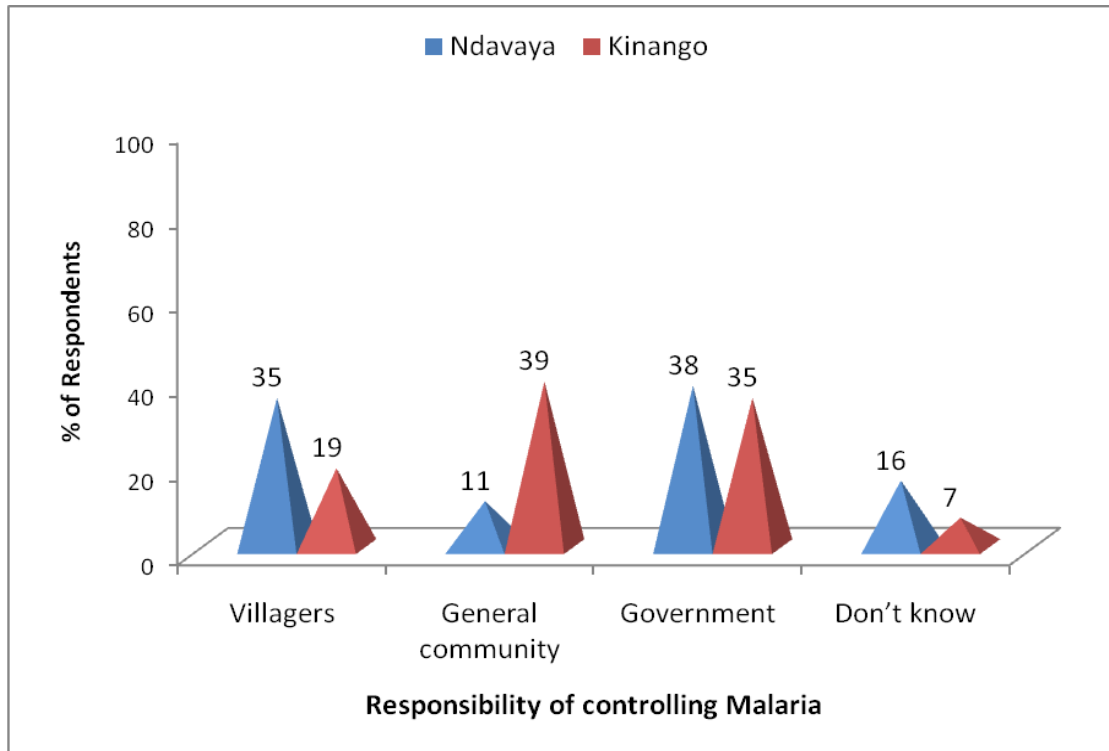


Figure 4.12: Responsibility of controlling malaria in Ndavaya and Kinango

4.3.5 Methods of controlling mosquito breeding

In Ndavaya 17.1% of respondents and 13.5% in Kinango controlled mosquito breeding by clearing bushes. Further, 22.3% of women in Ndavaya used ITNs to control mosquitoes as compared to 11.9% in Kinango. Draining stagnant water was another method used by 13.8% and 14.4% of respondents in Ndavaya and Kinango respectively. More so 4.2% of respondents in Ndavaya and 17.1% of respondents in Kinango controlled mosquitoes by removing open containers. Burning litter was employed by 18.2% of women in Ndavaya and 13% in Kinango. Observing general hygiene was used by a higher number of women in Ndavaya (23.1%) than in Kinango (11.9%). Most of the respondents who put oil into stagnant water resided in Kinango (18.2%) while Ndavaya had 1.3% in this category (Table 4.4).

Table 4.4: Methods of controlling mosquitoes in Ndavaya and Kinango

Division of respondent	Methods of controlling mosquitoes						
	% of respondents						
	Clearing bushes	ITNs	Draining stagnant water	Removal of open containers	Burning litter	General hygiene	Oiling stagnant water
Ndavaya	17.1	22.3	13.8	4.2	18.2	23.1	1.3
Kinango	13.5	11.9	14.4	17.1	13.0	11.9	18.2

4.3.6 Alternatives to ITNs use by women

A total of 19.2% of all respondents in Kinango cited using Neem (Mwarubaine) leaves compared with only 9.4% in Ndavaya. Those who used anti-malarial drugs were almost equal in both divisions with Ndavaya having 16.7% and Kinango with 16.6%. Notably, 21.8% of respondents in Ndavaya and 14.9% in Kinango used medicinal herbs. Minority of respondents in Ndavaya (5.7%) used insecticides while Kinango had 20.4% applying the same. More so 10.1% of women in Ndavaya and 18.9% in Kinango used mosquito coils. Another alternative for ITNs was cow dung smoke with majority of respondents from Ndavaya (36.4%) while Kinango had 9.9% as shown in Table 4.5.

Table 4.5 Alternative to ITNs used by women in Ndavaya and Kinango

Division of respondent	Alternatives for ITNs					
	% of respondents					
	Neem leaves	Anti-malarial drugs	Medicinal herbs	Insecticides	Mosquito coils	Cow dung smoke
Ndavaya	9.4	16.7	21.8	5.7	10.1	36.4
Kinango	19.2	16.6	14.9	20.4	18.9	9.9

4.3.7 Anti-malarial plant species used by women

Aloe emerged as the most preferred plant species in Kinango with 42% of all respondents having used it compared to 10% in Ndavaya. However, 37% of the women from Ndavaya used Baobab while 32% of women in Kinango used the same plant species. Majority of respondents in Ndavaya (53%) utilized Neem tree compared with Kinango (26%) as in Figure 4.13.

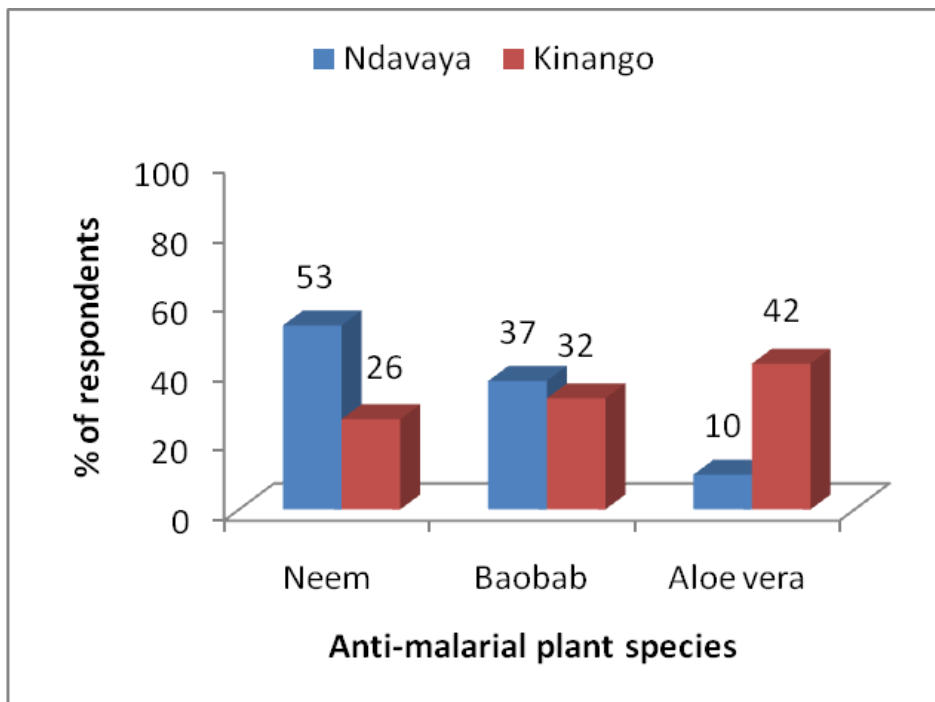


Figure 4.13: Anti-malarial plant species used by women

4.3.8 Re-treatment of bed-nets with insecticides

Majority (65%) of respondents from Ndavaya had not re-treated their bed-nets at all while Kinango had only 33%. It was found that 63% of respondents in Kinango had re-treated their nets within 6 months preceding the study while in Ndavaya only 31% had done so. Both divisions however shared equal numbers for those who had re-treated their bed-nets within the previous year or a longer duration (Figure 4.14). The

interval between which women in Ndavaya and Kinango Divisions treated their ITN differed significantly ($N= 204$; $\chi^2 = 20.907$; $P \leq 0.001$).

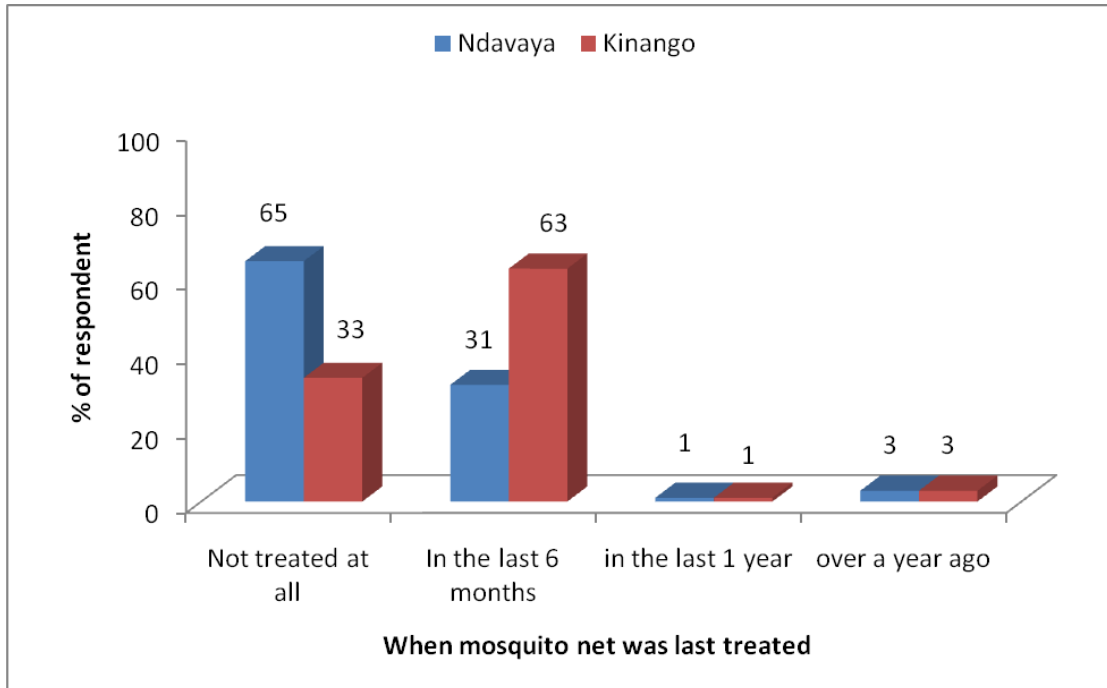


Figure 4.14: Frequency of bed-nets re-treatment by women

4.3.9 Person responsible for re-treatment of bed-nets

Kinango had a small population (1%) who held that the husband should re-treat their bed-nets with Ndavaya having none. Besides, 17% of all women in Kinango said they had the responsibility to re-treat their bed-nets while only 6% held that in Ndavaya. More Kinango women (49%) thought that other family members should re-treat their nets as compared to 29% in Ndavaya. A whole 65% of the respondents in Ndavaya and 33% in Kinango did not have a net or were not re-treating as indicated in Figure 4.15. The individuals who treated bed-nets in Ndavaya and Kinango differed significantly ($N= 204$; $\chi^2 = 21.501$; $P \leq 0.001$).

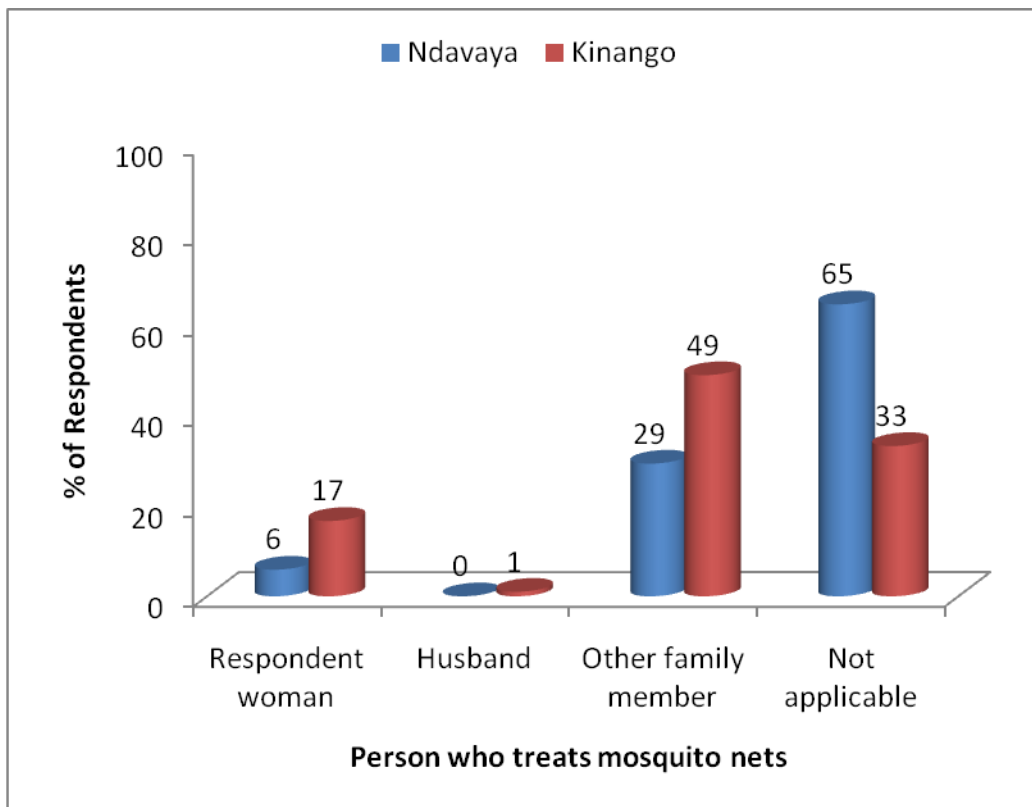


Figure 4.15: Person who re-treats bed-nets in Ndavaya and Kinango

4.4 Use of ITNs by Women in Kinango and Ndavaya

4.4.1 Ownership of Insecticide Treated Bed-Nets

Over 80% of the respondents in Kinango division had mosquito nets compared to 64% in Ndavaya (Figure 4.16). The proportion of respondents with or without bed-nets in Ndavaya and Kinango Divisions differed significantly ($P \leq 0.05$).

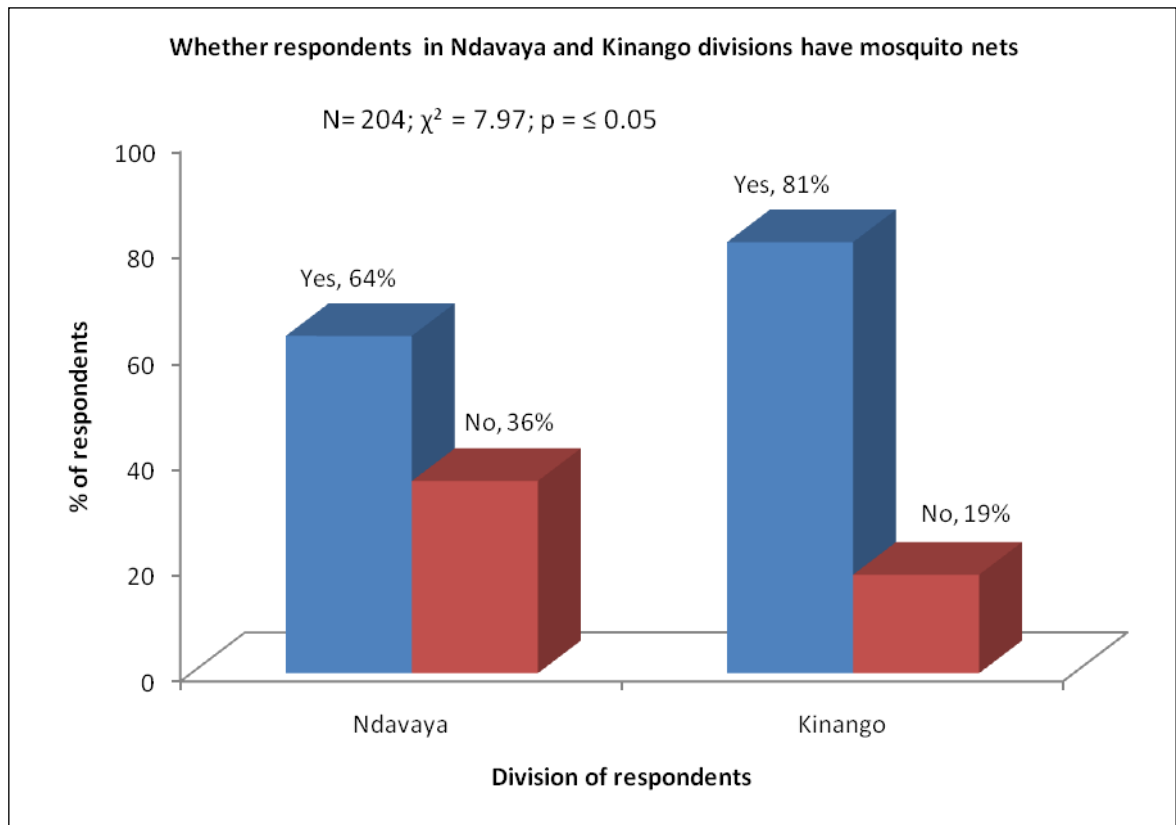


Figure 4.16: Ownership of ITNs by the respondents

4.4.2 Number of nets per family

In Ndavaya, 35.3% of the respondents did not have any mosquito nets compared to 18.6% in Kinango. Ownership of one net was higher in Ndavaya (33.3%) than Kinango (26.5%). Similarly, Kinango had 22.5% of respondents with two nets while Ndavaya had 26.5% in this category. However, Ndavaya had only 2% of women with 3 nets compared with Kinango's 16.7%. While Kinango had 2.9% and 2% of respondents with four and five nets respectively, Ndavaya had only 2% with four nets and none with five. Only 1% of respondents had six nets and over while Kinango had 10.8% of women in this category (Table 4.6). The distribution of mosquito bed nets in both Ndavaya and Kinango Divisions differed very significantly (N= 204; $\chi^2 = 28.75$; $P \leq 0.001$).

Table 4.6: Distribution of the number of bed-nets per family

Number of mosquito bed nets per family	% of respondents	
	Division of the respondent	
	Ndavaya	Kinango
none	35.3	18.6
One	33.3	26.5
Two	26.5	22.5
Three	2.0	16.7
Four	2.0	2.9
Five	0.0	2.0
6 and over	1.0	10.8

4.4.3 Reasons for not owning an ITN

In Kinango Division, 83% of women did not have a reason why they didn't own nets while in Ndavaya it was only 69%. Notably, 1% of respondents in Ndavaya and 3% of respondents in Kinango could not afford bed nets. More so 30% of women in Ndavaya and 14% in Kinango were ignorant about information on the use of ITNs as Figure 4.17 indicates. The reasons given by respondents in Ndavaya and Kinango Divisions for not owning a bed-net differed significantly (N= 204; $\chi^2 = 8.87$; $P \leq 0.05$).

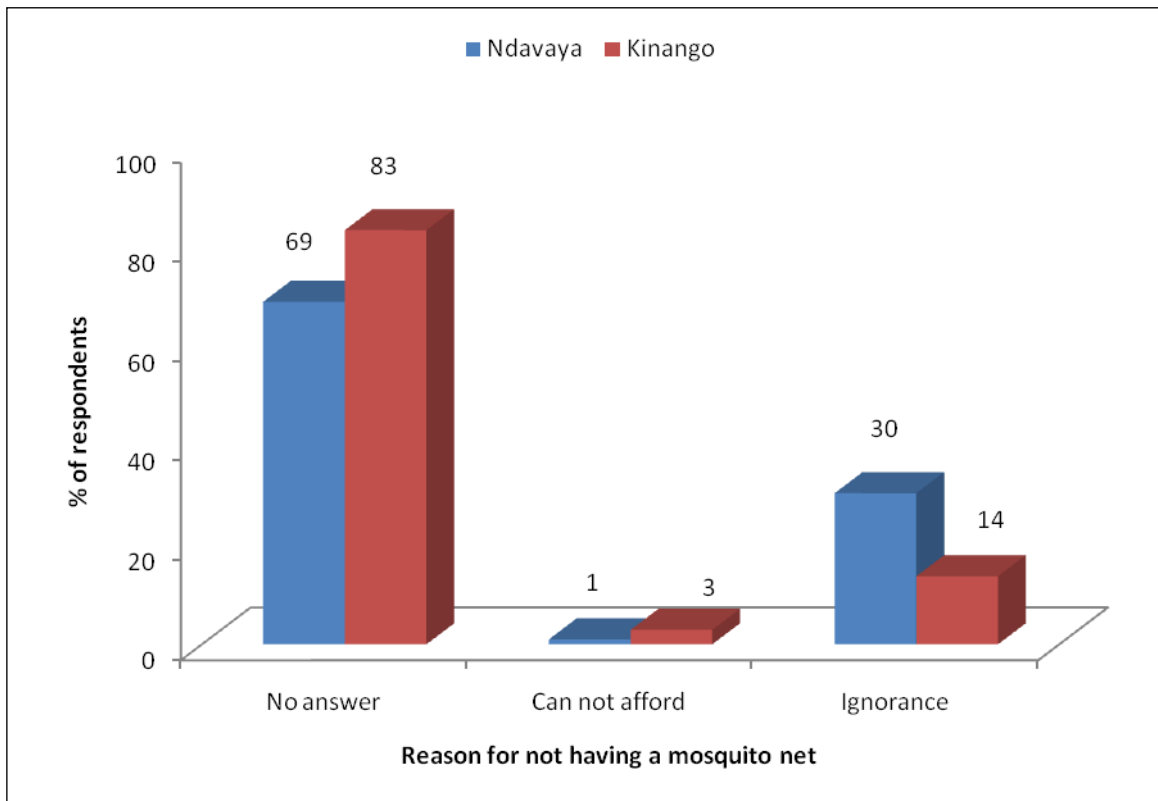


Figure 4.17: Reasons why women in Ndavaya and Kinango Divisions did not have bed-nets

4.4.4 Type of bed-nets used by women

The proportion of women having both normal and long lasting mosquito nets was more in Kinango than in Ndavaya Division. Data showed that Kinango had over 52% of the women using Long Lasting Insecticide Treated Nets (LLITNs) while Ndavaya Division had only 39% within this category. Those having normal nets were 25% in Ndavaya and 29% in Kinango. However, 36% of women in Ndavaya had no nets while Kinango had only 19% within this category. LLITNs are the type of bed-nets that are treated during manufacture and have residual insecticide of up to three years. The type of mosquito nets used by women in Ndavaya and Kinango Divisions differed significantly ($N= 204$; $\chi^2 = 8.06$; $P \leq 0.05$) as illustrated in Figure 4.18.

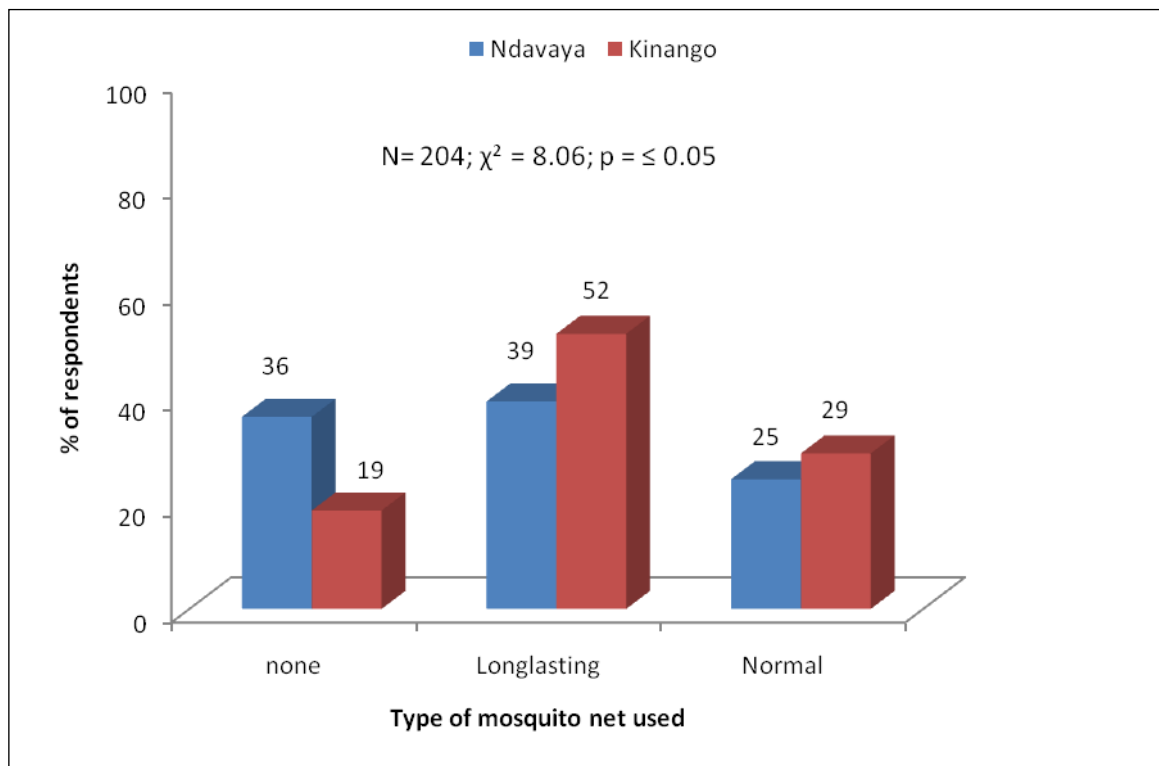


Figure 4.18: Type of bed-nets used by women in Ndavaya and Kinango Divisions

4.4.5 Family members who used ITNs

In Ndavaya Division, 40% of the women used ITNs together with their children aged below five years as compared to Kinango Division (16%). However, 16% of the women in Ndavaya said that everybody used a mosquito net compared with 31% in Kinango. In Ndavaya division 12% of respondents said it was parents only who used ITNs compared to 33% in Kinango. In Ndavaya 32% of the children aged below 5 years sleep alone under mosquito bed nets as compared to 20% in Kinango (Figure 4.19). The variations between the family members who used ITNs in the two divisions of was highly significant ($N= 204; \chi^2 = 32.44; P \leq 0.001$).

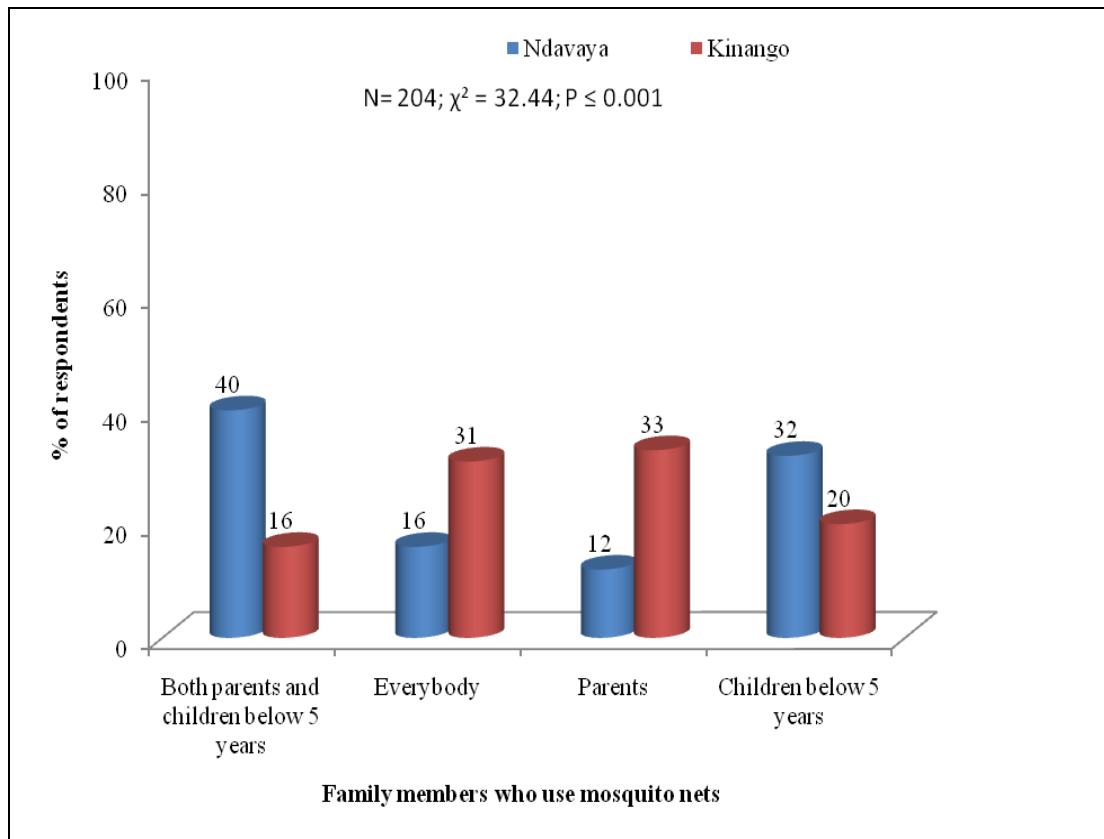


Figure 4.19: Family members who used mosquito nets in Ndavaya and Kinango

4.4.6 Frequency of ITNs use

Majority (64.7%) of the women interviewed in Kinango and 42.2% in Ndavaya use the nets daily as demonstrated in Table 4.7. Only 2% of the respondents in Ndavaya used nets thrice per week while Kinango had 8.8%. Besides, 12.7% of respondents in Ndavaya and only 2% in Kinango used nets twice. Those who used nets once were 2.9% in Ndavaya and 2% in Kinango. A good number of respondents did not use nets in both divisions with 40.2% in Ndavaya and 22.5% in Kinango. The frequency of using ITNs in Kinango District varied very significantly across the two divisions (N=204; $\chi^2 = 22.64$; $P \leq 0.001$).

Table 4.7: Weekly frequency of using ITNs in Ndavaya and Kinango

Frequency of using ITNs per week	% of respondents	
	Division of the respondent	
	Ndavaya	Kinango
Do not use	40.2	22.5
Once	2.9	2.0
Twice	12.7	2.0
Thrice	2.0	8.8
Daily	42.2	64.7
Total	100	100

4.4.7 Consistent use of ITNs by women in Kinango and Ndavaya

In Ndavaya, only 32% of respondents had used an ITN the night before the study compared with 57% in Kinango Division. Majority (68%) of the respondent in Ndavaya did not sleep under an ITN while in Kinango this category was represented by 43% (Figure 4.20). The responses of whether women in Ndavaya and Kinango Divisions slept under ITN the previous night differed significantly ((N= 204; $\chi^2 = 8.023$; $P \leq 0.005$).

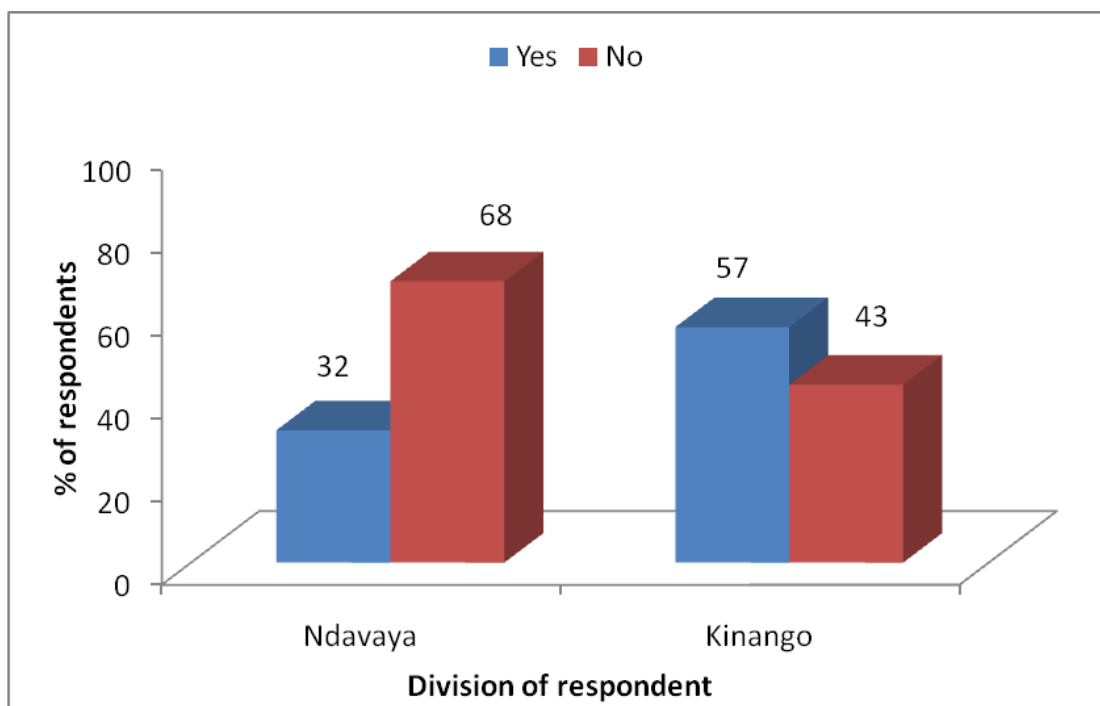


Figure 4.20: Whether women slept under ITN the previous night

4.4.8 Reasons why women did not sleep under ITNs

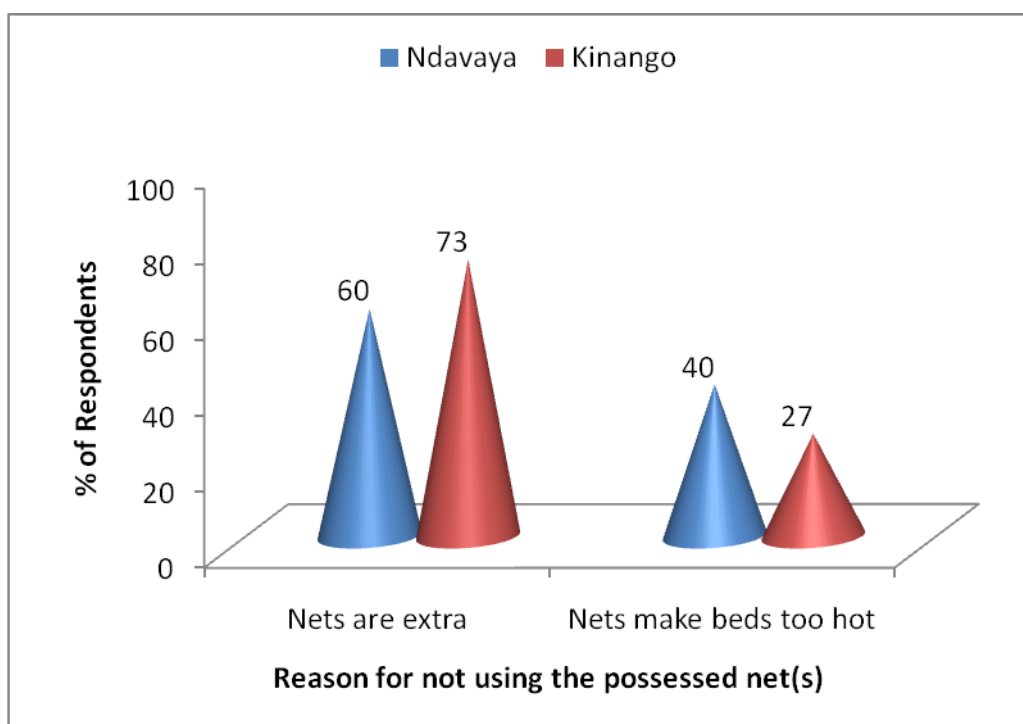
When asked why they did not cover themselves with an ITN while asleep, 37.3% of respondents in Ndavaya cited lack of ITNs compared with 16.7% in Kinango. Kinango had 2% of women who did not sleep under ITNs because they did not believe that nets keep away mosquitoes and hence prevent malaria while 1% of respondents from both Divisions said they did not have enough nets as shown in the following Table 4.8. An equal percentage (5.9%) of women in both divisions stated that they did not use nets because they made the bed hot and stuffy.

Table 4.8: Reasons why women did not sleeping under mosquito nets

Reasons for women not sleeping under mosquito nets	Division of respondent	
	Ndavaya	Kinango
Don't have any net	37.3	16.7
Nets don't keep away mosquitoes	0	2
Nets are hot and stuffy	5.9	5.9
Family does not have enough nets	1	1
Not applicable	55.9	74.5

4.4.9 Reasons for non-utilization of the nets owned

In Kinango, 27% indicated that the nets made the beds unbearably hot while 40% of respondents in Ndavaya had a similar reason. Further 73% of the respondents in Kinango did not use their bed-nets because they had extra nets in the house compared to 60% in Ndavaya (Figure 4.21)

**Figure 4.21: Main reasons why women did not use their ITNs**

4.4.10 Sources of ITNs

Most of the respondents in Ndavaya Division (81%) got mosquito nets from the local dispensaries sponsored by the Ministry of Health (MoH) as compared to 32% in Kinango. However, 44% of respondents in Kinango got their nets from Community Based Organizations (CBOs) while in Ndavaya it was only 15%. More so, 8% of respondents in Kinango and 4% in Ndavaya got their nets from other sources. (Figure 4.22). The sources of mosquito nets in the two divisions of Kinango District varied significantly ($N= 204$; $\chi^2 = 20.42$; $P \leq 0.01$).

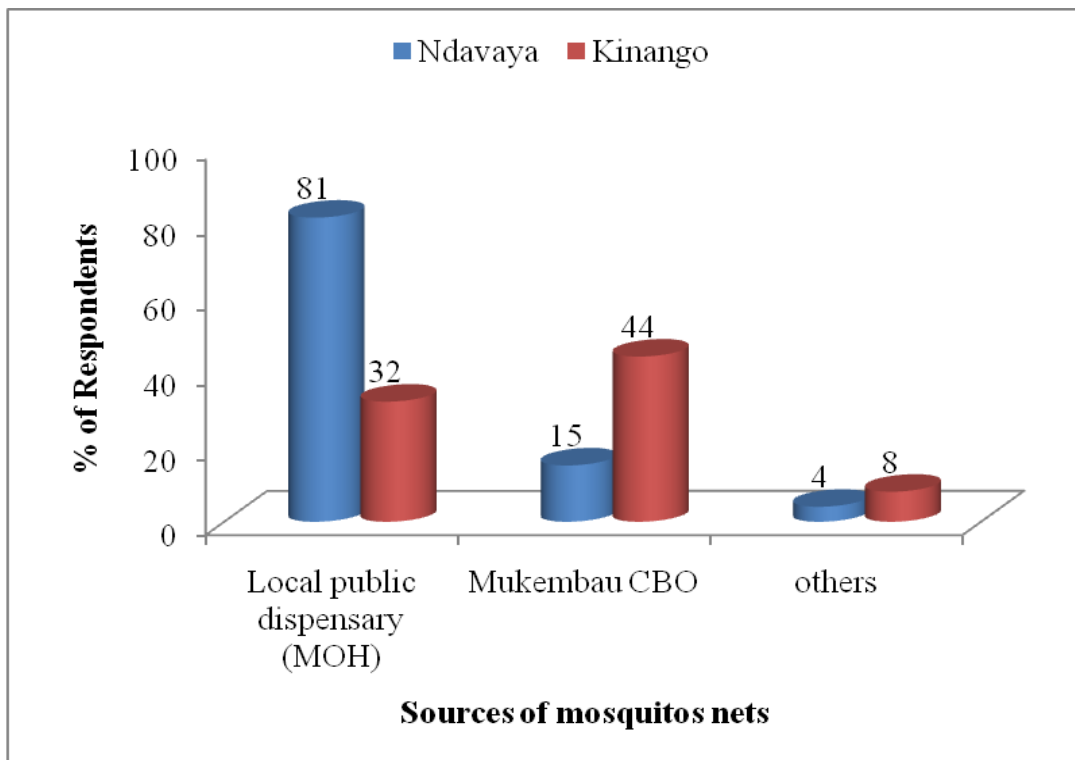


Figure 4.22: Sources of mosquito nets in Ndavaya and Kinango Divisions

4.4.11 Methods of acquiring ITNs in Kinango and Ndavaya

Majority (48%) of respondents from Kinango purchased their bed-nets while in Ndavaya only 30% did so. Similarly, 30% of women in Ndavaya and 21% in Kinango had been issued with free ITNs as shown in Figure 4.23. Some 13% of respondents in Kinango and 3% in Ndavaya had got nets through both purchase and for free. The methods of acquiring ITN in Ndavaya and Kinango differed significantly (N= 204; $\chi^2 = 18.009$; $P \leq 0.001$).

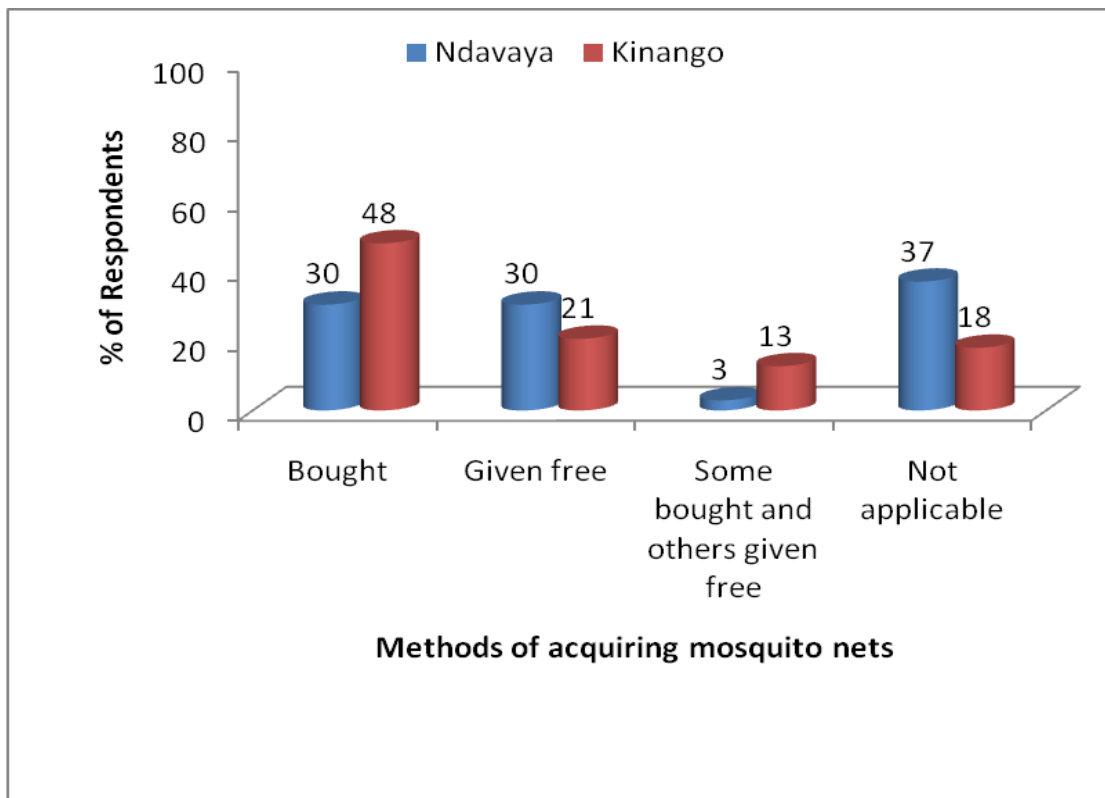


Figure 4.23: Methods of acquiring mosquito nets in Ndavaya and Kinango

4.4.12 Cost of bed-nets in Ndavaya and Kinango

Overall, 66.7% of respondents from Ndavaya and 39.2% from Kinango did not buy their nets while 11.8% of respondents from Ndavaya and 36.3% from Kinango had acquired their nets at Ksh.50. Only 1% of respondents from Ndavaya bought their nets at a cost between Ksh.151- 200 with 2% of the respondents buying their nets at between Ksh. 201-250. Furthermore, only 1% of respondents from Ndavaya and 2% from Kinango bought between Ksh.251-300. Another 1% in Ndavaya bought mosquito nets between Ksh.301-350 while Kinango had 2.9% in the same category. Notably, 16.7% of respondent from Ndavaya and 2.9% from Kinango bought between Ksh.351-400 with 14.7% of women in Kinango and 2% in Ndavaya buying the ITNs at a cost higher than Ksh.400 as shown in Table 4.9 below. The cost price of ITNs in the two divisions varied significantly ($N= 204$; $\chi^2 = 44.089$; $P \leq 0.001$).

Table 4.9: Cost of mosquito nets in Ndavaya and Kinango Divisions

Division of respondent	% of respondents							
	Cost price of mosquito nets (Ksh)							
	Not bought	50	151-200	201-250	251-300	301-350	351-400	Over 400
Ndavaya	66.7	11.8	1	0	1	1	16.7	2
Kinango	39.2	36.3	0	2	2	2.9	2.9	14.7
N= 204; $\chi^2 = 44.089$; $P \leq 0.001$								

4.5 Determinants of ITNs use by Women in Ndavaya and Kinango divisions

4.5.1 Source as a determinant

In Ndavaya 64.1% of women who sourced their mosquito nets from Makembau CBOs used them as compared to 60.8% in Kinango. In Kinango 78.7% of the respondents sourced their ITNS from C.H.W and used them as compared to 87.9% in Ndavaya. Further, 61.5% of the respondents from Ndavaya who sourced their mosquito nets from Public Health Technicians (PHT) used them as compared to 64.2% in Kinango. In Ndavaya only 47.3% of the respondents who sourced their ITNs from local public dispensaries used them as compared to 49.3% in Kinango.

Similarly, in Kinango 59.6% of the respondents who sourced their mosquito nets from NGOs used them as compared to 62.4% in Ndavaya. Ndavaya had also 66.3% of respondents who sourced their ITNs from Mivuco CBO and utilized them as compared to 64.1% of Kinango. Notably, 72.8% of nets from other sources were used in Ndavaya as compared to 70.5% in Kinango. Majority of respondents who sourced mosquito nets from the local MoH dispensary did not use them at home (Table 4.10) perhaps indicating need for appropriate sensitization before the bed-nets are issued to women at the facilities. The use of mosquito nets is very significantly influenced by source (N= 204; $\chi^2 = 79.01$; $P \leq 0.001$).

Table 4.10: Relationship between source and use of ITNs

Source of mosquito bed nets	% of respondents			
	Whether mosquito net is used at home			
	Ndavaya		Kinango	
	Yes	No	Yes	No
Mukembau CBO	64.1	35.9	60.8	39.2
C.H.W	87.9	12.1	78.7	21.3
PHT	61.5	38.5	64.2	36.8
Local public dispensary (MOH)	47.3	52.7	49.3	51.7
NGOs	62.4	37.6	59.6	40.4
Mivuco CBO	66.3	33.7	64.1	35.9
Other	72.8	27.2	70.5	29.5

4.5.2 Role of husbands

Notably, 30% of the husbands who supported and encouraged their wives to use mosquito nets were found in Kinango Division while Ndavaya had only 13%. Further, 39% of the husbands to respondents in Ndavaya Division did not like the use of mosquito nets while Kinango had 25%. Some women; 48% in Ndavaya and 45% in Kinango noted that there was no influence from their husband regarding use of ITNs (Figure 4.24). The influence of the husband significantly determines use of mosquito nets by women in both areas. (N= 204; $\chi^2 = 13.71$; $P \leq 0.01$).

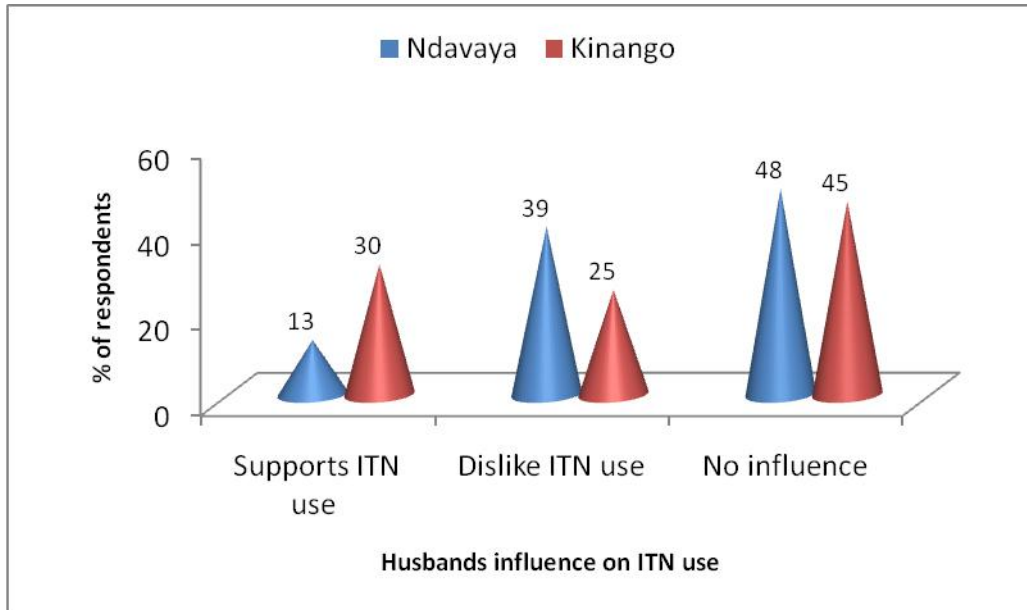


Figure 4.24: Influence of husbands on the use of ITNs by women

4.5.3 Influence of income levels

In Ndavaya 70.5% of the respondents earning less than Ksh. 1,000 did not use a mosquito net as compared to 29.5% who used. More so, 61%, of the respondents earning between Ksh. 1,000 – 3000 did not use ITNs while 39% used. About 52.5% of the respondents earning between Ksh. 3,001 – 6,000 did not use ITNs while 47.5% used them. Similarly, 41.5% of the respondents earning between Ksh. 6,001 – 9,000 did not ITNs compared to 58.5% who used, with 34.7% of the respondents earning between Ksh. 9,001 – 12,000 not using ITNs compared to 65.3% who used. Most (84.6%) respondents earning an income of over Ksh. 12,000 used ITNs while only 15.4% in this category never used them at home (Table 4.11).

A similar scenario was replicated in Kinango where 69.8% of the respondents earning less than Ksh. 1,000 never used ITNs compared to 30.2% who used. About 62.4%, of the respondents earning between Ksh. 1,000 – 3000 did not use ITNs while 37.6%

used. A whole 56.2% of the respondents earning between Ksh. 3,001 – 6,000 did not use nets while 43.8% utilized them. Similarly, 43.5% of the respondents earning between Ksh. 6,001 – 9,000 did not ITNs while 56.5% used them. Respondents earning between Ksh. 9,001 – 12,000 had 31.3% not using ITNs compared to 68.7% who used. As in Ndavaya, most (80.2%) of respondents earning an income of over Ksh. 12,000 used ITNs while only 19.8% never used them (Table 4.11). The use of ITNs was significantly influenced by the income levels of women in Kinango District (N= 204; $\chi^2 = 46.86$; $P \leq 0.001$).

Table 4.11: Effects of income levels on the use ITNs by women

Income level of respondent	% of respondents			
	Whether ITN is used at home			
	Ndavaya		Kinango	
	No	Yes	No	Yes
<1000	70.5	29.5	69.8	30.2
1000-3000	61.0	39.0	62.4	37.6
3001-6000	52.5	47.5	56.2	43.8
6001-9000	41.5	58.5	43.5	56.5
9001-12000	34.7	65.3	31.3	68.7
>12000	15.4	84.6	19.8	80.2

4.5.4 Family size as a determinant to ITN use

Only 13% of the respondents in Ndavaya and 10% of respondents in Kinango with a family size of 1-2 members used ITNs. Most of the respondents in Kinango (39%) who used ITNs were in the family category of 3-4 members while Ndavaya had 14% in this class. Majority (46%) of the respondents in Ndavaya who used ITNs were in the family size of 5 – 6 members as compared to 30% in Kinango. In the family size of 7 – 8 members, 17% of respondents in Ndavaya used ITNs compared to 20% for Kinango. In the family size of 9 members and above 10% of the respondents in Ndavaya used ITNs while Kinango had only 1% (Figure 4.25). The use of ITNs in both divisions was found to be significantly influenced by the size of respondent's family ($N= 204$; $\chi^2 = 63.54$; $P \leq 0.001$).

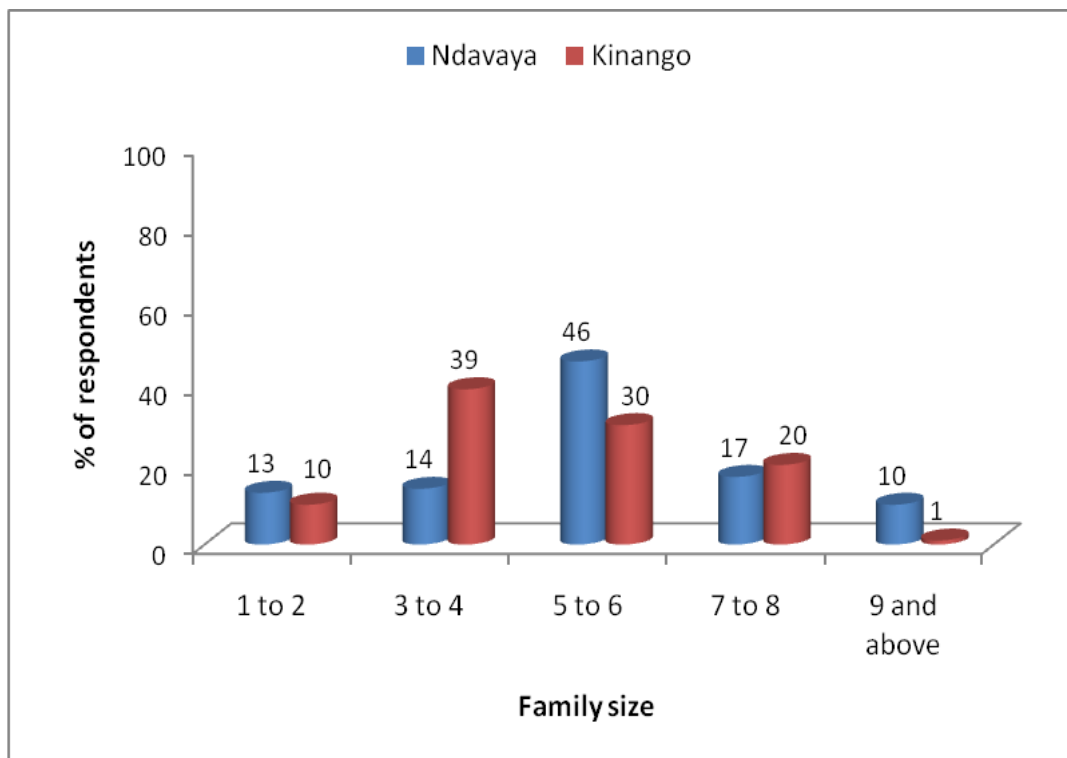


Figure 4.25: Effect of family sizes on the use of ITNs by women in Kinango and Ndavaya Divisions

4.5.5 The role played by marital status

In Ndavaya 74.8% of married women used ITNs as compared to 25.2% who did not use. About 31.3%, of single women used ITNs while 68.7% did not use. Majority of divorced women (57.4%) used ITNs as compared to 42.6% who did not use while 39.8 % of widowed women used ITNs compared to 60.2% who didn't. In Kinango 81.3% of married women used ITNs as compared to 18.7% who did not use. Only 29.8%, of single women did not use ITNs compared to 70.2% who were using. Most divorced women (52.4%) used ITNs as compared to 48.6% who didn't. Majority (55.1 %) of widowed women did not use ITNs compared to 44.9% who did as demonstrated in Table 4.12. The use of ITNs in both divisions was significantly influenced by the marital status of the respondents (N= 204; $\chi^2 = 16.00$; $P \leq 0.05$).

Table 4.12: Effect of marital status to the use of ITNs by women in Kinango and Ndavaya Divisions

Marital status of respondent	% of respondents			
	Whether ITN is used at home			
	Ndavaya		Kinango	
	Yes	No	Yes	No
Married	74.8	25.2	81.3	18.7
Single	31.3	68.7	29.8	70.2
Divorced	57.4	42.6	52.4	48.6
Widowed	39.8	60.2	44.9	55.1

4.5.6 Influence of training and awareness creation

Majority (73%) of Kinango respondents and 61% of respondents in Ndavaya who had been trained on how to use ITNs indeed used them at home. However, 27% of the respondents in Kinango and 39% in Ndavaya used ITNs at home although they had not been trained on how to use them (Figure 4.26). Training was found to have significant influence on the use of ITNs in Kinango and Ndavaya (N= 204; $\chi^2 = 33.09$; $P \leq 0.001$).

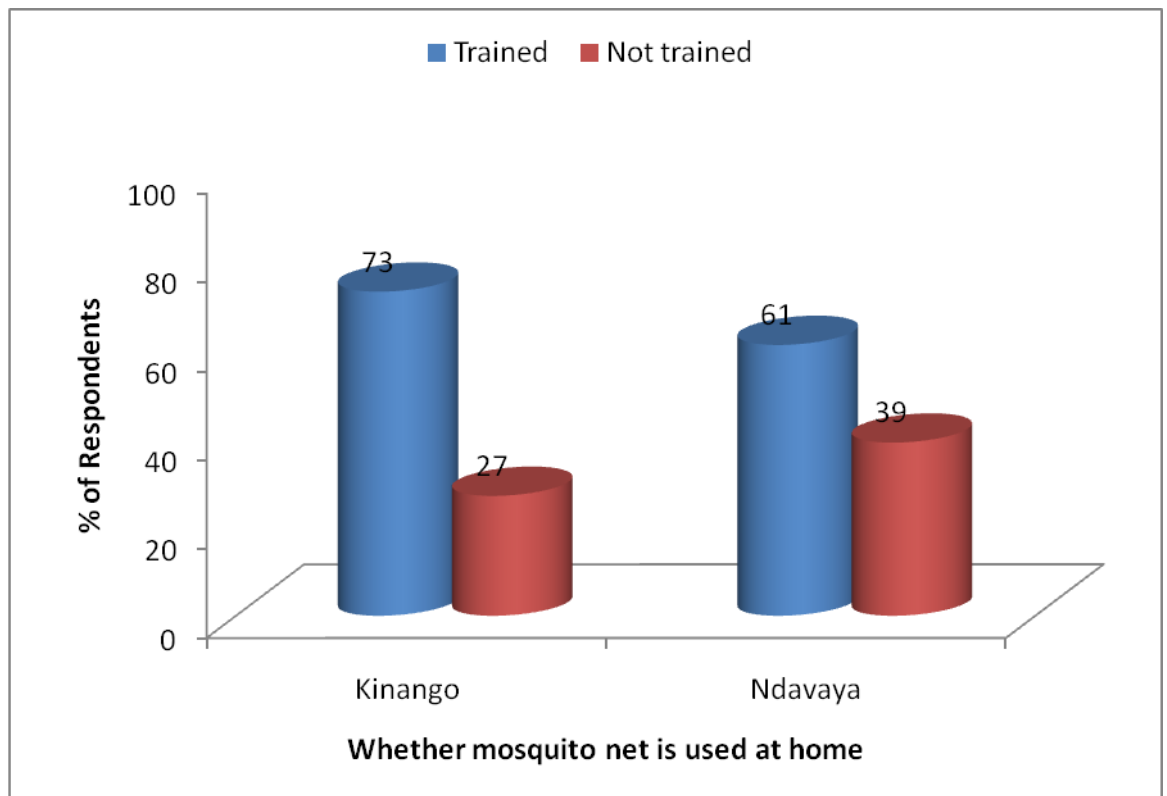


Figure 4.26: Influence of training on the use of ITNs by women

4.5.7 Colour preferences and ITN usage

In Ndavaya 28.7% of women who preferred green ITNs used them compared to 72.3% who did not. Majority (62.4%) of women who preferred blue ITNs used them compared to 37.6% who didn't. Most (89.8%) of respondents who liked white

colored ITNs used them while only 10.2% didn't. Similarly, 39.9 % of the women preferring pink coloured ITNs used them with 60.1% not using. Notably, 41.2% of the respondents without any colour preference regarding choice of ITN used them at home compared to 58.8% who did not use them (Table 4.13).

Kinango had 38.8% respondents who preferred green ITNs and used them at home compared to 61.2% who didn't while 67.6%, of respondents who liked blue ITNs didn't use them. Most women (75.2%) with a preference of white colour used ITNs while only 25.1 % with pink colour preference used ITNs. Similarly, 37.3% of the respondents without any colour preference regarding choice of ITN used them at home compared to 62.7% who did not use them (Table 4.13).

Table 4.13: Influence of net color on the use of ITNs by women

Preferred color of ITN	% of respondents		% of respondents	
	Ndavaya		Kinango	
	Yes	No	Yes	No
Green	28.7	72.3	38.8	61.2
Blue	62.4	37.6	67.6	32.4
White	89.8	10.2	75.2	24.8
Pink	39.9	60.1	25.1	74.9
No special preference	41.2	58.8	37.3	62.7

4.5.8 Education level as a determinant of ITN use

About 81% of respondents in Ndavaya and 89% in Kinango who had reached tertiary level of education used ITNs as compared to 19% and 11% respectively who did not use. In Ndavaya 58% of women who acquired secondary education used ITNs compared to 72% in Kinango. Notably 42% and 28% of respondents in Ndavaya and Kinango respectively who had high school education did not use ITNs. However approximately 37% of respondents in Ndavaya and 44% in Kinango who had acquired primary level of education used ITNs compared to 63% and 56% respectively who did not use. In Ndavaya majority (84%) of respondents who had no formal education did not use ITNs compared to 16% who used. More so 74% of women in Kinango in a similar category did not use ITNs with only 26% using them. Education level of the respondents was found to significantly influence use of ITN by women in Kinango and Ndavaya Divisions ($N=204$; $\chi^2 = 114.41$; $P \leq 0.001$).

Table 4.14: Influence of education level on the use of ITNs by women

Education level reached	% of respondents who use ITNs		% of respondents who use ITNs	
	Ndavaya		Kinango	
	Yes	No	Yes	No
No formal education	16	84	26	74
Primary level	37	63	44	56
Secondary level	58	42	72	28
Tertiary (College/University)	81	19	89	11

4.5.9 Influence of the type of occupation

In Ndavaya 56.2% women who worked as peasant farmers used ITN at home as compared to 43.8% who did not. Most (86.7%), of women who were engaged as teachers used ITNs while only 13.3% did not use them. Similarly, 75.2% of business women in Ndavaya used ITNs compared to 24.8% who did not. Only 37.4% of the unemployed women used ITNs as compared to 62.6% who did not.

In Kinango 54.8% women who worked as peasant farmers used ITN at home as compared to 45.2% who did not while most (82.4%), of respondents who were employed as teachers used ITNs with only 17.6% not using. Notably, 68.8% of business women used ITNs compared to 31.2% who did not. Only 34.9% of the unemployed women used ITNs as compared to 65.1% who did not. The occupation of women was thus significantly associated with use of ITN by women in Ndavaya and Kinango as illustrated in Table 4.16 below. ($N=204$; $\chi^2 = 35.35$; $P \leq 0.001$).

Table 4.15: Influence of occupation on the use of ITNs by women in Kinango and Ndavaya Divisions

Occupation of respondent	% of respondents		% of respondents	
	Ndavaya		Kinango	
	Yes	No	Yes	No
Peasant farmer	56.2	43.8	54.8	45.2
Teacher	86.7	13.3	17.6	82.4
Business	75.2	24.8	68.8	31.2
Not employed	37.4	62.6	34.9	65.1

4.5.10 Distance to health facility as a determinant

Approximately 74% of women in Ndavaya Division who travelled less than 1 km to reach a health facility used an ITN at home as compared to 26% of the respondents as illustrated in Table 4.17. Similarly Kinango had 87% of respondents in this category using ITNs compared to 13% who did not. However, 66% and 79% of women in Ndavaya and Kinango Divisions respectively who had to travel over 1-2 KMs to the nearest health facility were found to be using an ITN while 34% and 21% respectively did not use. Only 51% of those who travel 3 -5 KMs to the health centre in Ndavaya used ITNs while Kinango had 56% in this class. Notably, 49% and 44% of respondents in Ndavaya and Kinango Divisions falling within 3 to 5 KM radius of a health facility were not using ITNs. Majority of the respondents in both areas (Kinango – 59%, Ndavaya – 63%) who travelled for over 5KMs to a health facility did not use ITNs. Only 37% and 41% of respondents in Ndavaya and Kinango respectively lived beyond a radius of 5KMs to a health facility and used ITNs. The distance travelled by women to the nearest public health facility significantly influenced the use of ITN in both divisions (N= 204; $\chi^2 = 41.67$; $P \leq 0.001$).

Table 4.16: Influence of distance to health facility on use of ITNs by women

Distance to health facility	% of respondents who use ITNs		% of respondents who use ITNs	
	Ndavaya		Kinango	
	Yes	No	Yes	No
Less than 1 KM	74	26	87	13
1 to 2 KM	66	34	79	21
3 to 5 KM	51	49	56	44
Over 5 KM	37	63	41	59

4.5.11 Perceptions on malaria that influence ITNs use

There is a general perception that malaria is a problem in both divisions. In Ndavaya Division 87.3% of the respondents reported malaria as a big problem compared to 73.5% in Kinango (Figure 4.27). The perception of malaria as a problem differ significantly in Ndavaya and Kinango Divisions ($N= 204$; $\chi^2 = 6.09$; $P \leq 0.05$).

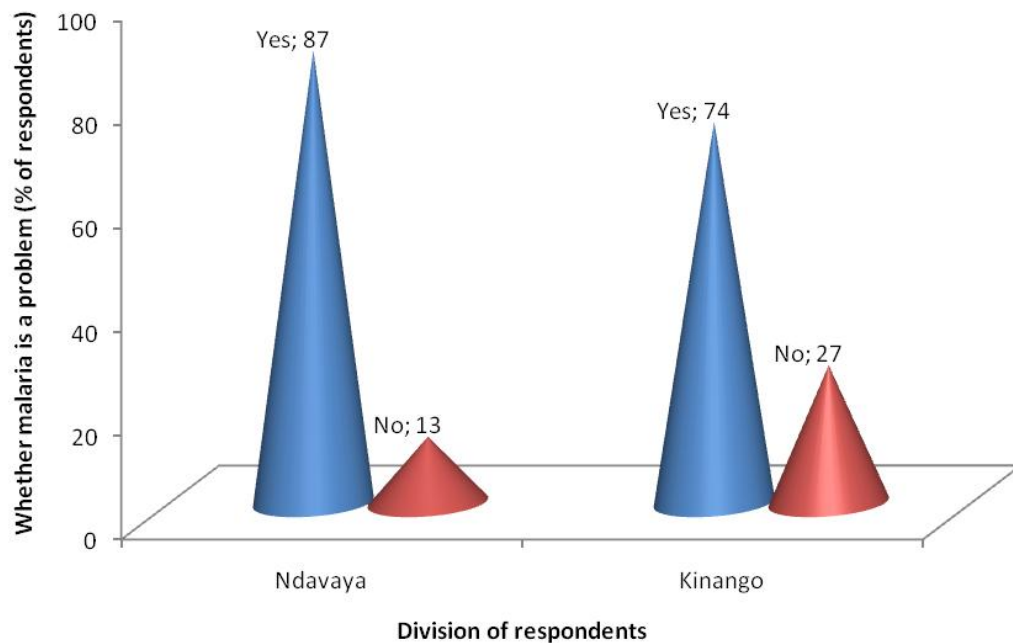


Figure 4.27: Women perception of malaria as a problem in Ndavaya and Kinango Divisions

4.5.12 Influence of Non-Governmental Organizations on use of ITNs

Majority (60%) of the women in Kinango and 51% from Ndavaya who knew of NGOs that operated in their area used ITNs at home. Only 31% of women in Ndavaya and 37% in Kinango who did not know of NGO operating in the area used ITNs at home. Similarly, 18% of women in Ndavaya and 3% in Kinango who used ITNs did not have any idea about NGOs in their area as illustrated in Figure 4.28. The presence

of NGOs in both divisions significantly influenced the use of ITNs (N= 204; $\chi^2 = 55.56$; $P \leq 0.001$).

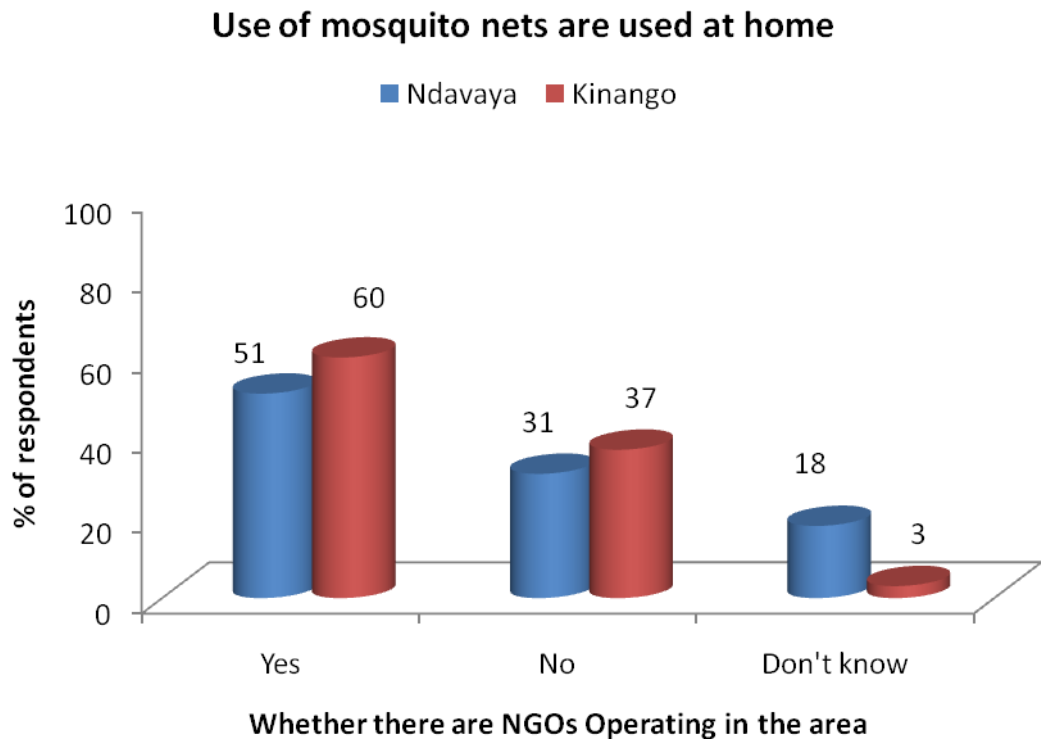


Figure 4.28: Influence of NGOs on the use of ITNs by women

4.5.13 Perception and knowledge on the causes of malaria

Majority (68%) of the respondents in Kinango Division knew that malaria was caused by mosquitoes as compared to 53% in Ndavaya. Only 1% of respondents from Ndavaya and 2% from Kinango thought that malaria was caused by stagnant water. However a whole 46% of the respondents in Ndavaya and 30% in Kinango did not know the basic malaria transmission route (Figure 4.29). The perception of respondents about the causes of malaria in Ndavaya and Kinango Divisions did not differ significantly (N= 204; $\chi^2 = 5.44$; $P \geq 0.05$).

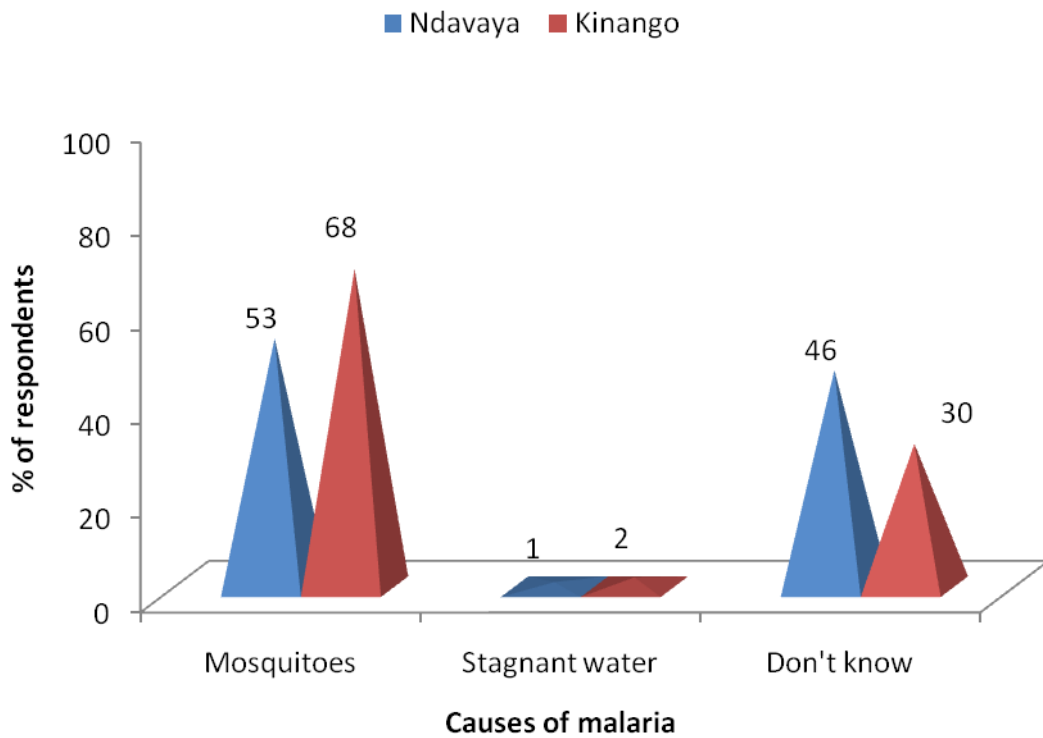


Figure 4.29: Perception of respondents in Ndavaya and Kinango Divisions on the causes of malaria

4.5.14 Influence of knowledge on the causes of malaria and use of ITNs

Notably, 78% of the respondents in Ndavaya and 74% in Kinango who knew the causes of malaria used mosquito nets at home whereas over 22% of respondents in Ndavaya and 26% in Kinango who did know that malaria is caused by mosquitoes never used nets at home (Figure 4.30).

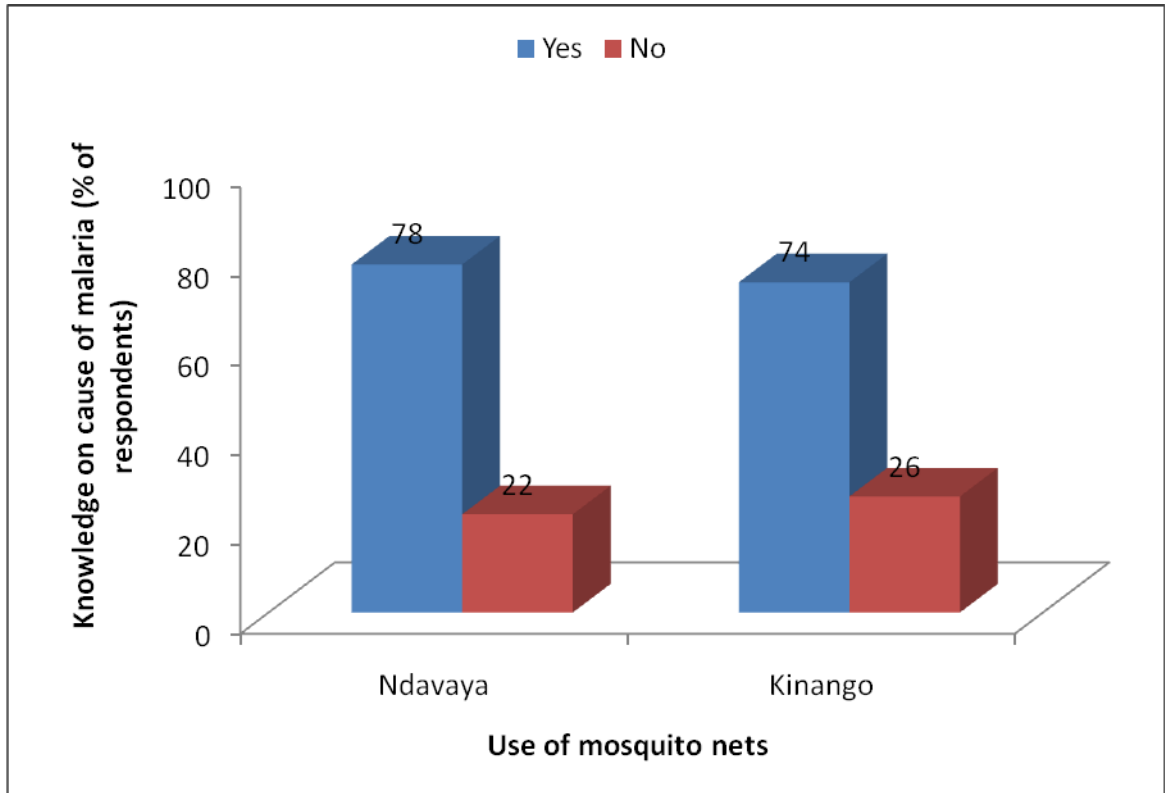


Figure 4.30: Influence of knowledge on the causes of malaria and use of ITNs in Kinango and Ndavaya Divisions

4.5.15 Reasons why women slept under ITNs

A higher number (57%) of women in Kinango indicated that they used ITNs to prevent malaria compared with 43% of similar responses in Ndavaya. Similarly women in Ndavaya (57%) reported that they slept under ITNs to prevent bites from mosquitoes which normally irritated them as demonstrated in Figure 4.31 in the following page.

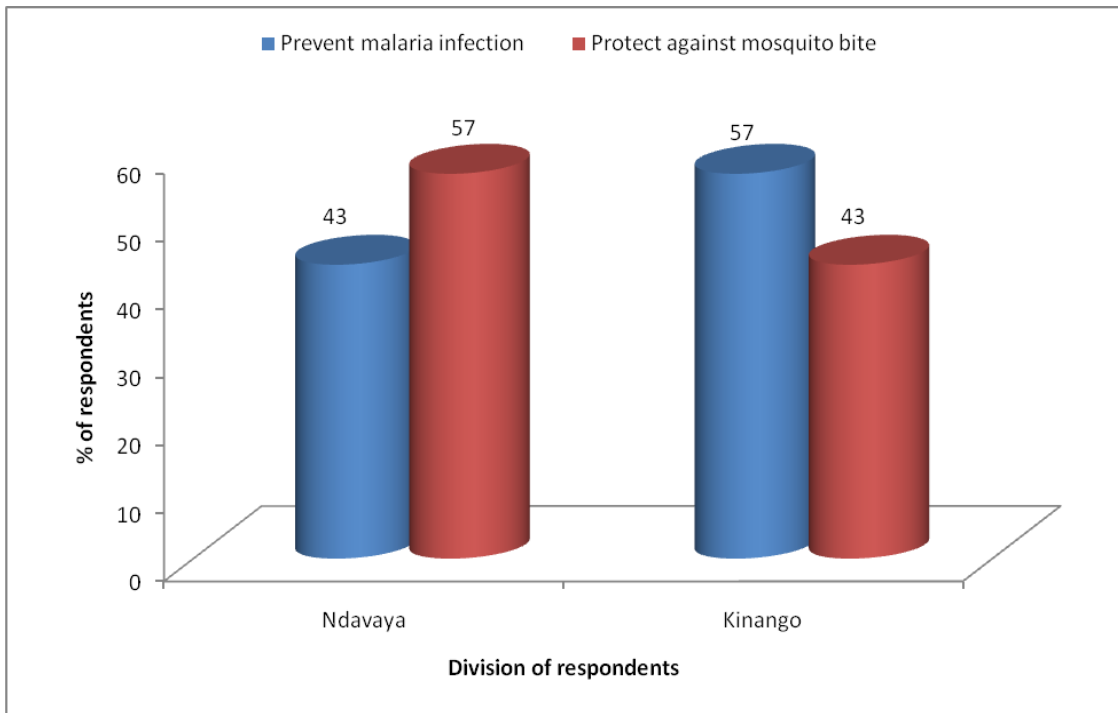


Figure 4.31: Main reasons why women slept under ITNs

CHAPTER V: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study sought to identify and compare between the factors that influence ITNs use by women in Kinango and Ndavaya Divisions of Kinango District in Coast Province of Kenya. It intended to assess whether the source of ITNs affected their use by women, the relevant socio-cultural factors that were at play and the women perceptions and knowledge levels that hinder or facilitate utilization of bed-nets in the two areas.

5.2 Socio-demographic characteristics

The age of respondents in the two divisions did not differ significantly. This could be attributed to the fact that climatic conditions and lifestyles in the two areas are quite similar. However, Ndavaya had fairly larger family sizes than Kinango Division. This perhaps was due to the massive interventions within Kinango by NGOs towards scaling up of family planning services. The findings corroborates with the results of the Kenya Demographic and Health Survey of 2008 which notes that access to reproductive health services is associated with reduced fertility rates (Kenya National Bureau of Statistics, 2009). Notably, both divisions had the Duruma ethnic group as the most dominant community although Kinango had a huge Kamba migrant community. FGDs revealed that the immigrants were from the neighboring Kubo Division which has a settlement scheme around Shimba Hills area. A number of them had moved and settled in Kinango Division.

Ndavaya had a bigger percentage of the respondents who were not employed compared to Kinango with most of them being peasant farmers. Data also showed that fewer women in Ndavaya had acquired formal education compared to Kinango and this could explain the small number of Ndavaya women who were in formal employment. Kinango similarly had more respondents earning over Ksh. 9,000 per month and fewer earning between Ksh.1, 000 to 3,000 monthly. More women in Kinango relied on salaries and wages while Ndavaya had the greater proportion of women who depended on livestock sales for income. Interviews with respondents indicated that men controlled sale of livestock and therefore this source was not readily available for women to convert to disposable income. Data suggested that salaries and wages availed ready and higher incomes to women in both divisions.

5.3 Access to health care

Kinango division had more women seeking treatment from private clinics compared to Ndavaya. This could be due to the better incomes of the respondents in Kinango and proximity to Kinango town which had several private health facilities. Conversely, Ndavaya had more of the women who sought treatment from traditional healers. Participants in FGDs indicated that health facilities in Ndavaya were fewer and one had to walk long distances to reach the centers. Perhaps due to this better access to conventional health care by women in Kinango, the division also had more women who had accessed laboratory services, utilized ante-natal services and taken malaria prophylaxis in pregnancy. This was in agreement with the findings of the 2007 Kenya Malaria Indicator Survey which showed a similar trend in the country (Division of Malaria Control, 2009).

5.4 Women perception of basic malaria epidemiology

There were greater concerted efforts in Kinango to control mosquito breeding compared with Ndavaya. More respondents in Ndavaya felt that the government had the responsibility to control mosquito breeding in their area. Lack of a coordinated system to control malaria in Ndavaya might have led to this view. This was coupled with minimal understanding of malaria transmission by women in Ndavaya and thus the disinterest in measures to control its spread. Being pastoralists, more women in Ndavaya used cow dung smoke while more women in Kinango used insecticides to keep away mosquitoes. Respondents in Kinango had higher incomes and could access markets easily and perhaps that is why they used insecticides. Ndavaya had a higher proportion of women who did not re-treat their bed-nets as required after six months compared to Kinango. This is in line with findings reported in Uganda by Nuwaha (2001) that revealed that knowledge of malaria transmission in the community led to increased bed-net use and retreatment.

5.5 Use of insecticide treated bed-nets

The ownership of ITNs differed significantly between the two divisions with a higher ownership being recorded in Kinango. Similarly ownership per family was higher in Kinango than in Ndavaya. This perhaps gave further evidence to the role played by knowledge on malaria transmission and better incomes. Kinango had a bigger proportion of women who used Long Lasting ITNs as recommended in the National Strategic Plan, 2008-2012 (Ministry of Public Health and Sanitation, 2009). Consistency in use of ITNs was more in Kinango than Ndavaya and the former had a larger number of women who slept under the nets on the night preceding the study.

Perhaps due to minimal civil society activities in Ndavaya, more women had acquired their nets from Ministry of Health facilities while a larger percentage of Kinango women had received their ITNs from CBOs in the area. More women in Kinango indicated that they had bought their nets at over Ksh. 400 while Ndavaya had more women who had acquired their nets for free. Alaii *et al.*, (2003) demonstrated in a study in western Kenya that better incomes and awareness on malaria contribute to the ability and willingness to purchase ITNs from shops and nearby markets.

5.6 Determinants of ITNs use by women

The study sought to assess the various factors that determined use of insecticide treated bed-nets in Kinango and Ndavaya Divisions. These included the socio-cultural and economic factors as well as the underlying perceptions and knowledge levels of the respondents in regard to malaria transmission. The environmental aspects, shape and color of ITNs were also considered. Besides, source of ITNs and access were important variables of the study.

5.6.1 Socio-cultural and economic determinants to ITNs use by women

Women from a considerable range of socio-economic status were represented which probably reflected the urban catchment area of Kinango Town and the largely dry Ndavaya. In both divisions, data showed that many of the factors indicative of relative wealth in a poor community were associated with increasing levels of knowledge – and that knowledge was positively associated with ITNs uptake among women.

The results are consistent with the findings of Nganda *et al.*, (2004) in Tanzania, indicating the use of ITNs was lowest among women from the poorest homesteads

with use increasing with homestead incomes. Approximately 70% of respondents in Ndavaya and Kinango earning less than Ksh. 1,000 per month were not using ITNs. Only 15% and 20% of women in Ndavaya and Kinango respectively with an income of over Ksh. 12,000 did not use ITNs. Cost has been reported as a major barrier to ITN ownership and use in other studies. An evaluation undertaken in Congo (DRC) by Audrey *et al.*, (2008) found that contrary to beliefs of local stakeholders, the vast majority of women in this study did not report thinking that bed-nets provided free of charge were less effective or that they would prefer to use one that they had bought compared with one provided free of charge.

As noted by Nuwaha (2001) in Uganda this study identifies education as a strong predictor of ITN use by women perhaps owing to exposure to information on malaria transmission and ability to access and purchase a net, particularly if the woman is employed. Women with tertiary level of education were thrice as likely to use ITNs compared to their counterparts who had no formal education. This suggests better understanding of malaria transmission and prevention as one goes up the education ladder and hence adoption of ITN as a control measure. However, use of ITNs was higher in Kinango even compared within similar education levels. Perhaps this was a result of sensitization undertaken in the division by civil society groups. Audrey *et al.*, (2008) also noted in a study in Congo (DRC) that net ownership and net use was higher among those with secondary school education or higher. Increased education, particularly for young women, has been found to be associated with a number of beneficial health outcomes, including reduced infant and maternal mortality.

The presence of children aged below five years in the homestead seemed to potentially increase the chances of women using ITNs. In Ndavaya 40% of the

respondents stated that they used ITNs with their children aged below five years. However, only 16% of the respondents in Kinango shared a similar trend, perhaps indicating that children in Kinango were sleeping in separate beds with their mothers. Overall, the focus on under fives could be attributed to the initiative by the Ministry of Health to avail ITNs to all pregnant women and children less than five years of age.

In both areas ITNs were normally sold to mothers at a subsidized cost of Ksh. 50 or occasionally issued for free during National Immunization Days (NIDs). FGDs and KII deliberations confirmed that majority of Aid Agencies involved in malaria control and prevention in both Ndavaya and Kinango also issued ITNs for free to mothers and children below the age of five. Free-distribution of ITNs resulted in substantial increases in net coverage compared to subsidized, "social marketing" approaches. Despite incomes differing significantly in both Ndavaya and Kinango Divisions, it was clear that this variable is a powerful determinant of ITN use among women. As Meltzer *et al.*, (2003) realized, cost is a clear factor in ITN uptake as individuals who are on stable income are more likely to purchase and use ITNs.

The marital status of women had a significant role to play in ITN usage in both Kinango and Ndavaya. In Ndavaya division, about 75% of married women reported to be using ITNs while 80% of married women in Kinango were using ITNs. Minority of single and widowed women were found to be using ITNs in both divisions. Ndavaya had a bigger proportion of widows (60%) not using ITNs compared to the 55% of Kinango. This might point to a lack of time by the widows to attend public awareness forums on malaria control due to competing demands at home and limited incomes. FGDs revealed some window support mechanisms in Kinango. Husbands significantly determined use of mosquito nets by women in both divisions. The study

indicates a strong association between support from husbands and consistent use of ITNs by the respondents.

However, during KII with two *Kaya* elders, (the custodians of Mijikenda heritage), it was revealed that most men were uncomfortable sleeping under ITNs due to various reasons. As community protectors, men felt trapped while under a ITNs at night just in case they needed to respond to a distress call within their homestead or the neighbourhood. The elders also opined that visibility was limited through the bed-nets when monitoring the situation in their compounds at night. Besides, the ITN made the bed warmer and thus uncomfortable to sleep during hot weather. Notably, most men in the majority Digo and Duruma communities had a separate bed from their wives.

5.6.2 Effect of perceptions and knowledge of malaria

The attitudes and behavior of mothers regarding malaria and its prevention are important determinants of success in malaria control programs that promote ITNs use in rural Africa as argued by Alaii *et al.*, (2003) in a study in Western Kenya. This study suggests that information disseminated to mothers through community health workers, public health professionals and facility nurses about ITNs and malaria was received and retained. Awareness was significantly greater in mothers residing in Kinango Division than in Ndavaya. Notably Kinango also had higher numbers (73%) who had been sensitized on ITNs use and were indeed utilizing them as compared to Ndavaya's 61%. This suggests that there could have been gaps in the manner in which awareness was created in Ndavaya, making it not as effective as in Kinango. Further, it was found that a higher proportion of mothers from Kinango (68%) identified mosquitoes to be the sole cause of malaria, compared with those from Ndavaya (53%). Data also revealed that majority of women in Kinango (70%) compared to

only 32% in Ndavaya participated in activities to control mosquito breeding. This may have been as a result of enormous promotional campaigns on malaria prevention undertaken by various civil society groups in Kinango. These groups (NGOs and CBOs) receive donor funds that they use to undertake trainings and social marketing on ITNs use in the community.

Community Health Workers (CHWs) were also found to be more active in Kinango division. Their role is vindicated by a study in Luwero district in Uganda where Kiuwa and Mufubenga (2008) noted that through the use of trained community owned resource persons, pregnant women were periodically made aware about the consequences of malaria in pregnancy and the necessity of an early ANC visit so as to benefit from administration of a full IPT regimen and acquisition of ITNs. The results of this study suggest that creation of awareness increased the rates of ITNs use among women. Previous attendance of a training session was significantly associated with ITN use in both divisions. Numerous awareness campaigns had been undertaken in Kinango on malaria control and prevention while little sensitization had been done in Ndavaya. This could explain the low levels of ITNs adherence in the latter. In Tanzania, Nganda *et al.*, (2004) found that ITN use increased when individuals received health promotional activities about ITNs. This included consistent use and impregnation with insecticides when necessary. Use of ITNs by children under five years and pregnant women who are most vulnerable was also recorded in the Tanzania study and attributed to awareness creation.

Perceptions as to whether ITNs really control malaria are important among women as they determine use or non-use. During FGDs, women in Ndavaya indicated that they

did not think ITNs would help them address the malaria problem. Most women in the division had not been sensitized on malaria prevention and this could explain their viewpoint. The findings therefore demonstrated that access to information on malaria as was the case in Kinango, and the options available for control and prevention would go a long way in increasing the consistent use of ITNs by women. The findings also underpin the importance of women's knowledge of malaria in pregnancy and of antenatal attendance for the uptake of preventative interventions. As argued by the Ministry of Health (2001a), effective malaria interventions are available and there is political will to implement them in order to maximize the potential for health impact. It is thus essential to empower the intended recipients of interventions by providing the knowledge which can influence their health decisions.

5.6.3 Environmental predictors of ITNs use by women

Weather conditions play a significant role in determining use of ITNs by women. During focused group discussions with women in Ndavaya, participants indicated that they were hesitant to use bed-nets during hot periods because they made them uncomfortable. Data analysis showed that in Kinango, 27% of respondents did not use the nets they had because they made their beds unbearably hot compared with 40% for Ndavaya. The higher percentage in Ndavaya could have been due to the fact that the area has higher average temperatures compared to Kinango. Besides, Ndavaya women had minimal awareness on malaria control measures and this could have contributed to the reduced adherence. Key Informant Interviews (KII) also revealed that most of the people in both areas living near areas known to support mosquito breeding including dams, rivers and forests were more responsive to ITN use. The findings are in tandem with those of Alaii *et al.*, (2003) who observed that environmental disposition had a significant influence on ITNs use particularly when

combined with health promotional activities within the target community. This shows that weather patterns and other environmental elements play a significant role even among a sensitized population as in the case of Kinango division.

5.6.4 Shape and color of ITN as determinants of use

Women had varying preferences regarding the colour and shape of ITNs and this had an influence on net use. Close to 90% of respondents in Ndavaya who had a liking of white colour nets used them at home compared to 75% in Kinango. It was noted that in both divisions white coloured nets were preferred mainly by women in white collar jobs or those running businesses. Education also seemed to play a significant role in the choice of net colour with those having primary level of education and below preferring blue or green coloured nets. Conversely women with secondary and tertiary level literacy demonstrated inclination to white colour nets.

During FGDs and KII participants argued that white colour nets were difficult to maintain due to their propensity to collect dirt immediately after cleaning. Accordingly, this had implications on resource requirements including cleaning detergents, labour and the scarce water in both areas. Perhaps this explains the close association observed between monthly incomes, education levels and choice of colour. Women in FGD sessions also stated that white coloured nets resembled the ceremonial nets used at funerals to cover coffins. Use of white ITNs over their beds therefore elicited imaginations of a coffin and would disrupt their sleep at night.

Cone shaped nets were preferred by most women in Ndavaya while those in Kinango preferred nets which were rectangular shaped. The strong preference for cone shaped ITNs in Ndavaya is perhaps associated with their ease to fix the bed-net on the rafts as

most people in this division resided in traditional houses with no ceiling. Those inclined to rectangular shaped nets argued that these allowed more aeration in their beds and thus allowed better sleep at night. FGD participants concurred with this assertion adding that rectangular shaped nets could be used more conformably even during hot weather.

The dominant challenge with regard to use of rectangular shaped bed-nets raised in all sessions was the unique designs of most coastal houses which do not provide for a ceiling for tying the net. Use of strings across the walls of the houses had been experimented by a number of women but this seemed to be a bother in the houses which are also used as kitchens and stores. This was because the strings had to be fixed every evening prior to retiring to bed and removed every morning to allow fire to be lit.

5.6.5 Source and access as determinants of ITNs use

A significant number of women acquired their bed-nets at subsidized prices from the Ministry of Health clinics while others particularly in Kinango received nets for free from NGOs and CBOs operating in the area. Most women in the two divisions resided over 15 km away from the nearest government health facility, the latter are mandated by the government to ensure maximum ITN coverage in the country as per the National Health Sector Strategic Plan of 2005 – 2010.

Women in such areas are, therefore, unable to attend antenatal clinics as required due to the long distances they have to cover despite their state of pregnancy. Further they are also unable to take their children for child welfare clinics (MoH, 2005). In effect these women neither access information on malaria prevention nor benefit from the

subsidized ITNs at the MoH facilities. Further, they are denied Intermittent Prophylaxis Treatment (IPTp-SP) which is a crucial intervention to prevent malaria in pregnancy for women in malaria endemic areas such as the coast where this study was conducted (MoH, 2004).

A related study in Tanzania found that women attending Ante Natal Clinic were more likely to participate in health education sessions, and therefore more likely to use IPTp-SP than women who did not (Nganda *et al.*, 2004). Besides, women using ITNs were more likely to cite the ANC sessions and community health workers as their most important source of health information.

The study noted a strong association between distances from respondents' home to the nearest facility and their use of ITNs. Seventy four percent of respondents in Ndavaya and 87% in Kinango living within a radius of less than one Kilometre to a health facility used ITNs at home. Within a distance of over 5KMs only about 40% used ITNs in both divisions. As observed by Osero *et al.*, (2005) this study illustrates that availability of healthcare services increases ITN use among women. More so in Nigeria, Onwujekwe *et al.*, (2003) demonstrated that ITNs distribution strategies that decrease time and travel costs to households are needed to increase net coverage. This shows that establishment of more primary healthcare facilities leading to reduction of radius of access by women would ultimately increase uptake of ITNs as envisaged. This would also impact on ANC and IPT coverage thus a reduction in malaria morbidity and mortality in the country (MoH, 2005).

The importance of access to resources has been illustrated by Meltzer *et al.*, (2003) previously for both preventative interventions and treatment. At the time of this study, ITNs were sold at Ksh 50 to pregnant women via the antenatal clinics in the Ministry

of Health facilities (MoH, 2005). Social marketing of bed-nets at the national and local levels had also been undertaken targeting pregnant women and children under five who are the high risk groups as indicated in the PSI report of 2006.

In order to increase national coverage Nganda *et al.*, (2004) noted that the Tanzania government initiated ITN voucher scheme for pregnant women to improve access. It was hoped that via mass health education and substantial price subsidy, some socio-economic inequities in access will also be addressed. FGD participants in the two divisions indicated that presence of Community Health Workers (CHWs) within their villages greatly enhanced accessibility of ITN and hence promoted their use. Indeed, 88% and 79% of respondents in Ndavaya and Kinango respectively who acquired their nets from CHWs utilized them at home. The discrepancy between the two divisions could be attributed to the effectiveness of CHWs in Ndavaya as attested during FGDs with women. A previous study done in Mali by Michelle *et al.*, (2005) demonstrated that individuals who used ITNs were predominantly from communities that had distribution and net-treatment services in their village – a role played by CHWs. Besides, the study showed that community involvement was an important factor to the success of programs aimed at scaling up ITNs uptake.

5.7 Conclusions

- 1.** The study revealed that fewer women in Ndavaya owned and slept under ITNs compared with their counterparts in Kinango.
- 2.** Access to a health facility was found to positively contribute to increased usage of ITNs in both divisions.

3. Low income levels among women, insufficient levels of knowledge about malaria transmission and prevention and limited involvement of men in malaria control initiatives were found to hinder ITNs uptake among women.
4. Higher levels of formal education and better incomes were positively associated with increased use of ITNs.
5. Community health workers were more effective in promoting consistent use of ITNs due to their proximity to the women and acceptance within the community.
6. Various environmental factors including weather patterns and location of mosquito breeding grounds near homes influenced use of ITNs.
7. Women preferred bed-nets of varying colours and shapes and this should always be factored into any intervention aimed at scaling up ITN usage by women.

5.8 Recommendations

Policy formulation – Ministry of Health

1. The government, development agencies and communities must prioritize education of girls at least up to secondary level. This would enhance their understanding of basic malaria transmission routes.
2. School Health Programs (SHP) should be initiated to sensitize girls and boys on use of ITNs and employment of other malaria control methods.
3. There is need to tailor a malaria package for use in Information, Education and Communication (IEC) in malaria endemic zones of the country.

Operational – Kinango District health officials

1. Communities should be organized into focused units for raising awareness on malaria and the importance of sleeping under ITNs.
2. CHWs should serve as ITNs distribution agents and Trainer of Trainers (ToT) on malaria and other health concerns within the villages.
3. Maternal and Child Health (MCH) Clinics should be re-invigorated and used to distribute ITNs to women.

Recommendation to residents of Ndavaya and Kinango Divisions

1. Women should utilize existing structures and organisations within the community to promote use of ITNs by women.
2. Men should take active roles towards ensuring that women in Kinango and Ndavaya Divisions sleep under ITNs. They should avail funds to their wives for purchase of ITN and also encourage them to consistently sleep under ITNs.

5.9 Proposed further research

1. Although some vital information was generated on why most men dislike sleeping under ITNs during KII with the *Kaya* elders, it would add great value to undertake a research on the predictors of ITNs use by men.
2. There were differences and varying successes in the mode of ITN delivery between the MoH centers and NGOs/CBOs. A comparative study would unravel these differences and ensure improved utilization of ITNs in malaria endemic areas.

3. A study to understand the efficacy of local alternatives to ITNs would add immense value in the on-going search for a sustainable and cost-effective strategy to address the malaria menace.

REFERENCES

- Agyepong, I.A.** (1992). Women and Social, Economic Cultural and Behavioral determinants of malaria. In *Women and Tropical Disease*. Wijerante P, Rathegeber E.M, and St.Onge, E. (Editors). IDRC-MRC 14e Ottawa Canada pp 176- 193
- Alaii, J.A, Hawley,W.A , Kolczak,M.S , Ter Kuile,F.O , Gimnig, J.E, Vulule.** (2003). Factors affecting use of permethrin-treated bed nets during a randomized controlled trial in western Kenya. *Am. J Trop Med Hyg*, 68: 137-141.
- Audrey, P, Eboni, T, David, N, Sandra, D, Martine, T, Steve, M, and Frieda, B** (2008). Bed net ownership, use and perceptions among women seeking antenatal care in Kinshasa, Democratic Republic of the Congo (DRC): Opportunities for improved maternal and child health. *BMC Public Health*, 8:331doi:10.1186/1471-2458-8-331
- Cattani, J and Lengeber C.** (1997). Insecticide Treatment Bed nets and prevention of malaria. *Recent Advanmces in Paediatrics*. 16, 105 – 119
- Centers for Disease Control and Prevention.** (2007). Epi Info Version 3.4 for Epidemiological Data Analysis. CDC. Atlanta, Georgia.
- Division of Malaria Control.** (2009). 2007 Kenya Malaria Indicator Survey. Division of Malaria Control, Ministry of Public Health and Sanitation, Kenya
- Guyatt,H.L, Noor,A.M, Ochola,S.A, Snow, R.W.** (2004). Use of intermittent presumptive treatment and insecticide treated nets by pregnant women in four Kenyan districts. *Tropical medicine international health*, 9:255-261
- Guyatt,H.L and Snow,R.W.** (2001).The epidemiology and burden of plasmodium falciparum-related anemia among pregnant women in sub-Saharan Africa. *Am J Trop Med Hyg*, 64: 1-106.
- Kenya National Bureau of Statistics.** (2009). The 2008 Kenya Demographic and Health Survey – Preliminary Report. Kenya National Bureau of Statistics, Nairobi.
- Kiwuwa, S. Mpungu and Patrobas Mufubenga.** (2008). Use of antenatal care, maternity services, intermittent presumptive treatment and insecticide treated bed nets by pregnant women in Luwero district, Uganda. *Malaria Journal*, 7:44doi:10.1186/1475-2875-7-44

Leedy Paul D. (2001). *Practical Research: Planning and Design*. Prentice – Hall, Inc., Upper Saddle River, New Jersey.

Meltzer,M.I, Terlouw,D.J, Kolczak,M.S, Odhacha,A, Ter Kuile,F.O, Vulule,J.M, Alaii,J.A, Nahlen,B.L, Hawley,W.A, and Phillips-Howard, P.A. (2003). The household-level economics of using permethrin-treated bed nets to prevent malaria in children less than five years of age. *Am J Trop Med Hyg*, 68: 149 - 160.

Michelle,R, Mahamadou,S, Sharon, P, Willi, M, Julie, P and Ogobara, D. (2005). Use of insecticide-treated nets (ITNs) following a malaria education intervention in Piron, Mali: a control trial with systematic allocation of households. *Malaria Journal* 2005, 4:35doi:10.1186/1475-2875-4-35.

Ministry of Finance and Planning (Central Bureau of Statistics). (1999). *Kenya Population and Household Census*. Government Printer, Nairobi.

Ministry of Health. (2001a). *Insecticide Treated Nets Strategy: 2001 – 2006*. Division of Malaria Control. Ministry of Health. Government of Kenya. Nairobi.

Ministry of Health. (2001b). *National Malaria Strategy: 2001 – 2010*. Division of Malaria Control. Ministry of Health. Government of Kenya. Nairobi.

Ministry of Health. (2004). *Health Management Information Systems; Government of Kenya (GoK), Ministry of Health (MoH), Kwale, Records for year 2004*.

Ministry of Health. (2005). *Health Management Information Systems; Government of Kenya (GoK), Ministry of Health (MoH), Kwale, Records for year 2005*.

Ministry of Health. (2006). *Health Management Information Systems; Government of Kenya (GoK), Ministry of Health (MoH), Kwale, Records for year 2006*.

Ministry of Public Health and Sanitation. (2009). *Strategic Plan 2008 – 2012: National Health Sector Strategic Plan III*. Government of Kenya. Nairobi.

Mugenda, M. Olive and Mugenda, G. Abel. (1999). *Research Methods: Quantitative and Qualitative Approaches*. Acts Press, Nairobi.

- Nganda, Y.R, Drakely,C, Reyburn,H, Marchant,T.** (2004). Knowledge of malaria influences the use of insecticide treated nets but not intermittent presumptive treatment by pregnant women in Tanzania. *Malaria Journal*, 3; 42.
- Nuwaha, F.** (2001). Factors influencing the use of bed nets in Mbarara municipality of Uganda. *Am J Trop Med Hyg*, 6: 877-882.
- Onwujekwe, O., Hanson, K.K., Fox-Rushby, J. A.** (2003). Who buys insecticide-treated nets? Implications for increasing coverage in Nigeria. *Journal of Health Policy and Planning*, 2003; 18(3):279-89
- Osero, J.S, Otieno, M.F, Orago, A.S.** (2005). Maternal use of insecticide-treated nets in the prevention of malaria among children under five years in Nyamira district, Kenya. *East Africa Medical journal*.82 (10)
- Population services International (PSI).** (2006). PSI-Kenya Research Brief, April 2006. PSI-Kenya, Nairobi.
- Remme, J.H.F, De Raadt, P and Godal, T** (1993) The burden of tropical diseases. *Medical Journal of Australia*. 158 (7) 465 –469
- Republic of Kenya** (1991) Fourth Rural Child Nutrition Survey 1987. CBS/MNPD, Nairobi
- Saunders, D and Carver, R** (1995) The struggle for health medicine and the politics of underdevelopment. Macmillan Education Ltd. London and Basiystroke. Pp 167 – 169
- Snow RW, Amstrong, J.R.M, Peshu, N, Forester, D, Newton, C.R.J, Winstanley, P, Mwangi, T, Waruiru, C, Warn, P.A, Newbold, C, and Marsh, K.** (1993). Periodicity and time-space clustering of severe childhood malaria on the coast of Kenya. *Trans Roy Soc. Tropical Medicine Hygiene*, 87, 386 – 390
- Sungano, M, Christopher, S, Philip, E. T, Clive, J. S, and David, J .S.** (2006). PCR detection of *Plasmodium falciparum* in human urine and saliva samples. *Malaria Journal*, 5:103

Ter Kuile,F.O, Terlouw,D.J, Kariuki,S.K, Phillips-Howard,P.A, Mirel,L.B, Hawley,W.A, Friedman,J.F, Shi,Y.P, Kolczak,M.S, Lal,A.A, Vulule,J.M, and Nahlen,B.L. (2003). Impact of permethrin-treated bed nets on malaria, anemia, and growth in infants in an area of intense perennial malaria transmission in western Kenya. *Am J Trop Med Hyg*, 68: 68 - 77.

Toure, Y.P and Coluzzi, D. (2000). The challenges of doing more against malaria particularly in Africa. *Bulletin of the WHO* (2000) 78 No. 12 pp 1376

White, N .J and Cook, G.C. (1996) Malaria. In *Masons Tropical diseases*, 20th Edition WB Saunders Co. Ltd.

World Health Organization. (2005a). Roll Back Malaria Initiative -EMRO. Regional Office for the Eastern Mediterranean Website.

World Health Organization. (2005b). World Malaria Report 2005. World Health Organization Website.

World Health Organization. (2008). World Malaria Report 2008. World Health Organization Website.

APPENDICES

Appendix I: Map of Kinango District

Appendix II: Research tools

Survey questionnaire

DETERMINANTS OF INSECTICIDE TREATED BED NETS USE BY WOMEN FOR MALARIA CONROL: A COMPARISON OF NDAVAYA AND KINANGO DIVISIONS, KINANGO DISTRICT, KENYA.

Name of interviewer-----

Questionnaire Serial # -----

Date -----

Name of respondent ----- Age -----

Ethnic group-----Location-----

Sub- Location ----- Village -----

1.0 Background information.

1.1 How many people live in your household? -----1.Males-----2.Females-----

1.2 What is the age of your last born? 1. Under 1 year (), 2. 1 - 2.9 years (), 3. 3– 4.9 (), 4. 5 years and above

1.3 What is your occupation? -----

1.4 What is the level of your education? (tick as appropriate) 1. Uneducated (), 2.Primary (), 3. Youth polytechnic (), 4. Secondary (), 4. Tertiary i.e. College or University ()

1.5 What is your major source of income? 1. Salary (), 2. Wages (), 3. Business () 4. Tree sales (), 5. Cash crop sales (), 6. Others (specify) -----

1.6 What is your income bracket per month in Kenya shillings? (Tick as appropriate) 1. Less than 1000 (), 2. 1000-3000 (), 3. 3001 – 6000 (), 4. 6001– 9000 (), 5. 9001 – 12000 (), 6. Over 12,000 ()

1.7 What is your marital status? (tick as appropriate) 1. Married (), 2. Single (), 3. Divorced (), 4. Widowed (), 5. Other (specify)-----

2.0 Source and use of treated mosquito bed nets

2.1 Do you have mosquito net(s) in your family/house? (tick as appropriate) Yes/No.

2.2 If yes how many-----and which ones? 1. Long lasting treated nets 2. Normal

2.3 If no, give reasons for not having one-----

- 2.4 Are the mosquito net(s) you have at home used? Yes/No
- 2.5 If yes, how many times in a week? -----
- 2.6 Who use the mosquito nets in your home 1. Parents 2. Children below 5 years 3. Everybody 4. Nobody uses a mosquito net
- 2.7 How often are the mosquito nets used? 1. Everyday 2. During rainy season 3. During sunny seasons 4. Once a week 5. irregular times
- 2.8 Do you use the net to cover children who are under the age of 5 years when they are asleep? Yes/No
- 2.9 Do you sleep under a mosquito net? Yes/No
- 2.10 If yes why? -----
- 2.11 If no why? -----
- 2.12 Have you ever been trained on how to use the mosquito nets? Yes/No
- 2.13 If yes, who trained you -----

- 2.14 Where was the training held? -----

- 2.15 Is the net you use treated against mosquitoes? 1. Yes (), 2. No () 3. Don't know ()
- 2.16 When was the mosquito net last treated (tick as appropriate) 1. In the last 6 months (including LLITNs) (), 2. In the last 1 year (), 3. over a year ago ()
- 2.17 Who treated the mosquito net? 1. Self 2. Son 3. Daughter 4. Husband 5. Other (specify)-----
- 2.18 If you have a mosquito net(s) but don't use it/them give reasons-----

- 2.19 How does your husband influence the use of your mosquito net 1. Support and encourages the use of the net 2. Does not like the use of the net 3. No influence
- 2.20 What color of mosquito nets do you prefer most? 1. Green (), 2. Blue (), 3. White (), 4. Pink (), 5. No special preference (), 6. Other (specify)-----

- 2.21 What shape of mosquito nets do you prefer and why?
1. Cone shaped (), Reason(s) -----

2. Rectangular (), Reasons-----

-----3. Other (), Reason(s) -----

- 2.22 How did you acquire the mosquito net you have 1. Bought (), 2. Given free (), 3. Other-----

- 2.23 If you bought the net, how much did it cost (Ksh)-----

- 2.24 If you were given, who gave you the net(s)? -----

- 2.25 Is malaria disease a big problem to you? Yes/No
- 2.26 What causes malaria-----

2.27 What do you call malaria in your mother tongue? -----

2.28 What contributes to mosquito breeding or increase of mosquitoes? -----

2.29 Which places in your village do you find many mosquitoes?-----

2.30 Do you control mosquito breeding in your area? Yes/No

2.31 Whom do you think should control the spread of malaria-----

2.32 What methods do you use to control mosquitoes and why? (fill the table)

Method for mosquito control	Reason
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

2.33 Apart from the use of mosquito nets what other ways do you use to prevent the spread of malaria?-----

2.34 Do you know of plants/herbs/trees which can control/kill mosquitoes? 1.
Yes/No

2.35 If yes give the names of these plants and the part used (fill the table below)

Anti malarial plant species	Part used
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

3.0 Policy issues

3.1 Has any one in your family suffered from malaria? Yes/No

3.2 If yes when was it? (tick as appropriate) 1. In the last 1 – 3 weeks () 2. In the last 1 – 3 months () 3. In the last 4 – 6 months () 4. In the last 7 – 9 months () 5. In the last 9 – 12 months () 6. Over a year ago

3.3 What other disease has affected any of your family members?-----

3.4 Where do you normally seek medical assistance when you are sick and why?

- i. Public health centre (), Reason -----
- ii. Private clinics (), Reason -----
- iii. Traditional healers () Reason -----
- iv. Other () Reason-----

3.5 Did you attend clinics in your last pregnancy? Yes/No

3.6 Were you given any anti-malarial drugs in the clinic?

3.7 How far is your nearest health facility? (fill the table below)

Medical facility	Distance from you (km)
1. Public health centre	
2. Private clinic	
3. Traditional healer	
4. Other	

3.8 Does the medical facility where you seek medical assistance have a diagnostic laboratory (lab)? 1. Yes (), 2. No (), 3. I don't know ()

3.9 Have you ever been diagnosed in the lab of the medical facility where you seek assistance when you are sick? 1. Yes (), 2. No (), Not applicable

3.10 What are the major health problems in your area? Name and rank the

Health problem (disease)	Rank
1.	
2.	
3.	
4.	
5.	
6.	
7.	

4.0 How do you cope with the above health problems (fill table below)

Health problem	Solution

4.1 Are there non-governmental organizations (NGOs) which promote health issues in your area? 1. Yes (), 2. No (), 3. I don't know ()

4.2 If yes name them-----

4.3 Among the NGOs that promote health issues which ones have been the most helpful to you?

Name -----Rank-----
 -
 Name -----Rank-----
 -
 Name -----Rank-----
 Name -----Rank-----
 -
 Name -----Rank-----
 Name -----Rank-----
 Name -----Rank-----
 Name -----Rank-----
 -

Name -----Rank-----

-

Name -----Rank-----

-

4.4 Do you need to be assisted to overcome the health problems you face? Yes/No

4.5 If No give reasons-----

4.6 If you need assistance whom would you prefer most to give you the assistance and why? (Tick and fill in the table as appropriate)

Most preferred assistance source	Reason
1. Government	
2. Friends	
3. NGOs	
4. Church	
5. Mosque	
6. Other	

5.0 Additional notes by observation/other.

Thank you.

Guide for Key Informant Interviews (KII)**DETERMINANTS OF INSECTICIDE TREATED BED NETS USE BY WOMEN FOR MALARIA CONTROL: A COMPARISON OF NDAVAYA AND KINANGO DIVISIONS, KINANGO DISTRICT, KENYA.****Date** -----**Name of Interviewer** -----**Name of Key Informant** -----**Position in community** -----

1. What is the greatest health problem in this community?
2. Is malaria a key health burden in this area (how)?
3. What do people know (and what is their perception) about malaria transmission?
4. What methods do people use to prevent, treat and control malaria (Mosquito breeding/bites, curative and preventive measures)?
5. How many bed-nets are owned by an average family and what type (treated/untreated)?
6. What makes some women not to have/use nets within this area? (Probe for various reasons)
7. Who mostly uses bed- nets in this community and why (age cohorts)?
8. Have women ever been trained on malaria control and use of mosquito nets (by whom, when)?
9. What is the most preferred type of bed-net in the community (color, shape, treated un-treated)?
10. Who determines use of nets in a family?
11. What other reasons influence use of ITNs by women in this area?
12. Any other issue related to the study

Guide for Focused Group Discussions (FGDs)**DETERMINANTS OF INSECTICIDE TREATED BED NETS USE BY
WOMEN FOR MALARIA CONTROL: A COMPARISON OF NDAVAYA AND
KINANGO DIVISIONS, KINANGO DISTRICT, KENYA.****Date** -----**Name of location** -----**Name sub-location** -----**Moderator's name** -----

1. What is the most important health problem in this community?
2. Is malaria a key health burden in this area (how)?
3. What is women's knowledge and perception of malaria?
4. What methods are used to prevent, treat and control malaria by the community?
(Mosquito breeding/bites, curative and preventive medicines)
5. What makes some women not to have/use nets within this area? (Probe for wide range of reasons)?
6. What is the most preferred type of net (colour, shape, treated un-treated) why?
7. What factors influence use of ITNs by women in this area (core discussion)?

Appendix III: Research permit

APPENDICES

Appendix I: Map of Kingango District

