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MATERNAL USE OF INSECTICIDE-TREATED NETS IN THE PREVENTION OF MALARIA AMONG CHILDREN UNDER FIVE YEARS IN NYAMIRA DISTRICT, KENYA.

BY:

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APRIL, 2005.

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university or for any other award.

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Signature.....Date.....APRIL 27, 2005

We confirm that the candidate under our supervision carried out the work reported in this thesis.

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DEDICATION

This thesis is dedicated to my mother the late, Mrs Milkah Kemunto Osero who taught me the value of hard work.

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LIST OF ACRONYMS AND ABBREVIATIONS USED IN THIS REPORT

ACT	Artemisinin based Combination Therapy
AMREF	African Medical Research Foundation
DDSO	District Disease Surveillance Officer
DIC	Disseminated Intravascular Coagulopathy.
DPHO	District Public Health Officer
FGD	Focus Group Discussion.
ICIPE	International Centre for Insect Physiology and Ecology
IRS	Indoor Residual Spraying
ITBN	Insecticide Treated Bed Nets.
ITN	Insecticide Treated Nets.
LLIN	Long-Lasting Insecticidal Nets
MCH	Maternal and Child Health.
MOH	Ministry of Health.
PIB	Permethrin Impregnated Bed net
PRSP	Poverty Reduction Strategy Paper
RBM	Roll Back Malaria.
ROK	Republic of Kenya.
SP	Sulphadoxine-Pyrimethamine.
TBA	Traditional Birth Attendants.
UN	United Nations.
UNICEF	United Nations Children's Fund.
WHO	World Health Organisation.

ABSTRACT

Malaria continues to be a major public health problem in most countries in the tropics and subtropics. In search for sustainable malaria control measures, studies have shown that the use of insecticide-treated-bed-nets is an effective malaria control strategy. However, although a lot of progress and promotion is being made, the World Health Organization has reported a very low usage of ITNs by mothers with young children. This prompted for a cross-sectional study aimed at determining the mothers' knowledge and use of insecticide treated nets in the protection of children under five years from malaria in Nyamira district, Kenya. Data was collected from 400 mothers who had children under five years using an interview guide, focus group discussions and observation checklists. The data were then analysed using statistical package for social sciences (SPSS) and summarised using frequency tables and bar charts. Chi-square test and relative risk (RR) were used to determine the relationships between different variables and net acquisition and its use. Results from the study indicated that the use of mosquito nets and insecticide treated nets were very low being determined at proportions of 33.3% and 23.8% respectively. This was attributed to lack of money to purchase them, unavailability in the nearby shops/kiosks, forgetting to purchase, drunk husbands unwilling to purchase the nets, ignorance, dependence on parents to provide them and use of other mosquito repellents. Also most mothers did not treat/retreat their nets using insecticides, which was due to ignorance and lack of the insecticide. Approximately 63.7% of mothers were unable to define what malaria was; as for them it could cover a number of diseases. However, 91.8% (367/400) of the respondents associated malaria with mosquitoes. It was clear from the study that mothers were knowledgeable on malaria symptoms such as headache (70%), fever (68.8%), cold (65%), body/joint pain (61.5%) and abdominal pain/ vomiting (0.5%).

Their knowledge was associated with previous attacks and awareness created through radio tuned in the vernacular language. However 59% (236/400) of the mothers did not identify children under five years as one of the most vulnerable groups to malaria. The study showed that only 50% of the maternal child health clinics (MCH) had bed net/ITN posters mounted within their premises. In addition, health care providers in the MCH clinics did not inform and educate mothers on the use of insecticide treated nets for their children under five years. Fifty percent of the MCH clinics had bed net/ITN posters poorly positioned and hence, would not be easily seen and read. The majority of the women (63.8%) who attended MCH clinics had never seen bed net/ITN posters. This was all attributed to absence of posters, poor positioning of the posters and some mothers did not know how to read which made it difficult to identify the posters. These results will assist in increasing and sustaining ITNs coverage. This, in addition will be useful to policy makers and programme developers in implementing projects on malaria control using ITNs.

CHAPTER 1: INTRODUCTION.

1.1 General introduction.

Malaria is caused by a protozoan parasite of the genus *Plasmodium* and it is transmitted from one person to another through the bite of female mosquito. Globally, it is estimated that there are 300-500 million clinical cases with 1.5 – 2.7 million deaths annually with countries in sub-Saharan Africa accounting for more than 90% (WHO, 1998). Malaria is Africa's leading cause of under five mortality and constitute 10% of the continents' overall disease burden (WHO, 2002b). One of the greatest challenges facing Africa is malaria drug resistance.

In Kenya, over 70 percent of the population (approximately 20 million Kenyans) is at the risk of disease, which claims 34,000 children annually (approximately 93 children per day). The burden is mainly felt in children below five years and pregnant women (UN, 2004).

Insecticide treated nets (ITNs) have proved as one of the effective ways of reducing malaria morbidity and mortality in pregnant women and children. The effectiveness of ITNs has been demonstrated by accurate trials in Africa, Asia and Latin America. Although progress and promotion of ITNs is being made, in the year 2003 fewer than 5% of the African children were sleeping under insecticide treated nets and at the same time fewer than 10% women slept under any kind of mosquito net (WHO/UNICEF, 2003a)

One of the targets set in Abuja summit by African heads of states in April 2000 was to ensure that 60% of the populations at risk sleep under ITNs by the year 2005. It is for this reason that a lot has to be done to make ITNs affordable, widely available and most importantly appealing to consumers.

1.2 Rationale for the study.

1.2.1 Statement of the problem.

Presently, a lot is being done in increasing public awareness of malaria symptoms to encourage early reporting to the health facilities. There is support for malaria control activities through the radio, press, community, religious leaders, vernacular, health workers, schools and so on. The biggest problem is whether information, education, and communication materials are directed to the at-risk group (for instance children under five years and pregnant women) to significantly reduce the rate of the disease.

The use of insecticide treated nets has been identified as one of the most effective methods of reducing morbidity and mortality in children under five year of age. Nevertheless, the question is how many children sleep under nets and yet about 72 of them die every day? WHO/UNICEF (2003a) approximated that in the year 2003 less than 5% of African children slept under ITNs and less than 15% slept under any net at all. This means that those bestowed with the responsibility of caring for the young children (for example mothers, fathers, nurses at the MCH clinics among others) are doing very little to save the children from malaria.

1.2.2 Research questions

The study was guided by the following questions:

a) Do the mothers in Nyamira District know how malaria is transmitted?

b) Do they know the most vulnerable groups?

c) Do the mothers know about and use of insecticide treated nets to prevent mosquitoes from biting their children?

d) What are the factors contributing to use or non-use of ITNs by mothers in the prevention of malaria?

e) What is the role of child clinics in the prevention of malaria using insecticide treated nets?

f) Is there any problem with access to insecticide- treated nets?

1.3 Null Hypotheses.

(a) Mothers do not use insecticide treated nets to protect their children from malaria.

(b) There is no relationship between the mothers` demographic characteristics and knowledge on malaria and the use of insecticide treated nets for children under five.

(c) MCH clinics do not promote the use of insecticide-treated nets in malaria prevention.

1.4 Objectives of the study.

1.4.1 General objective.

To establish the mothers' knowledge and use of insecticide treated nets in the protection of their children from mosquito bites and hence malaria.

1.4.2 Specific objectives.

(a) To determine the mothers' demographic characteristics and use of insecticide treated nets.

(b) To establish whether mothers' knowledge on malaria has any influence in using insecticide treated nets for the protection of their young children against mosquito bites.

(c) To determine whether child clinics are promoting the use of insecticide treated nets in malaria prevention among children.

(d) To establish the factors for use or non-use of the insecticide treated nets for young children.

1.5 Justification of the study.

One of the targets of Abuja declarations by African heads of states and governments to be achieved by 2005 was that at least 60% of those at-risk from malaria (especially young children and pregnant women) benefit from the best use of ITNs (WHO/UNICEF, 2003a).

In Kenya the Ministry of Health aims at reducing the level of malaria morbidity and consequent mortality by 30% by the year 2006 and to sustain that improved level of control to the year 2010 (ROK-MOH, 2001). This can be achieved by ensuring the use of ITNs by communities at-risk to significantly reduce rate of the disease among other strategies.

Most ITNs projects, however, have been small scale focusing on a few villages and districts and involve limited collaboration with other organisations or sectors. Small-scale projects have often succeeded in promoting use of nets and insecticides in project areas, but these projects have only covered a small proportion of the total population at-risk of malaria. As a result, access to ITNs is still low in most malaria-endemic areas (WHO, 2003 ; Omumbo, 1999). Nyamira district is a malaria endemic area with malaria being the leading cause of morbidity and mortality throughout the year. It has hardly benefited from bed net programmes initiated by both the government and Non-Governmental Organization (NGOs).

Children under five years of age have not yet developed the protective level of immunity because of limited exposure to malaria. In areas of high endemicity young children are both at high risk of malaria infection and vulnerable to severe malaria disease when infected (WHO, 2003). That is why children under five years of age are a target group for malaria control interventions such as ITNs.

Mothers have a role to play in reducing the morbidity and mortality rates among children because they design the sleeping formulae and take immediate care of their children. At the same time MCH clinics are important in promoting the mothers' knowledge on malaria and use of insecticide treated bed nets to protect their children.

This study was intended to survey the extent to which mothers know about malaria and use bed nets/ITNs. Findings from the study will assist in increasing and sustaining ITNs coverage. This is in addition to being useful to policy makers and programme developers in implementing programmes on malaria control using ITNs.

CHAPTER 2: LITERATURE REVIEW.

2.1 Epidemiology of malaria.

Malaria is a life threatening parasitic disease transmitted by mosquitoes. It is an illness caused by a protozoan of the genus *Plasmodium,* with host red blood cells (Hommel, 2002; WHO, 1998; Warrell, 1993; Cox *et al.,* 1994; Na'jera, *et al.,* 1993). Human malaria involves infection with four species of *Plasmodium: Plasmodium falciparum, Plasmodium malariae, Plasmodium ovale* and *Plasmodium vivax. Plasmodium falciparum* is the most dangerous species of malaria as it may lead to the death of patients, particularly if diagnosis and treatment are delayed. It is a great risk to under- fives especially in the latter part of first year of life and non-immune individual (Kitua, 1998).

The common symptoms of malaria include: fever, headache, pain in the joints, vomiting, loss of appetite, diarrhoea and, convulsions (WHO, 2002a). The worst thing about malaria is that it can kill within hours. Death on this scale is not the only consequence; malaria undermines the development of the children who survives and the nations that depend on them. In severe cases of cerebral malaria, surviving children are left with epilepsy, spasticity, speech disorders, and blindness.

Malaria is responsible for one million deaths of young children each year (Mutero, *et al.,* 1998). New analyses confirm that malaria is the principal cause of at least one-fifth of all young children deaths in Africa (WHO, 2003). According to World Health Organisation (1995), malaria is one of the most important causes of mortality and morbidity among infants and young children, and infection during pregnancy contributes, primarily in primiparae, to maternal mortality, as well as neonatal mortality and low birth weights.

In malaria prone areas, most of the adult population is protected from severe disease by some degree of acquired immunity because with every successive attack of malaria survived, the individual develops immunity (Brinkmann and Brinkmann, 1991). However, children under five years of age and pregnant women are highly vulnerable. In areas of unstable malaria there is less acquisition of protective immunity and all age groups may be at risk of disease (WHO, 1995). What everybody should be happy about is that malaria is a preventable and curable disease (WHO, 2001).

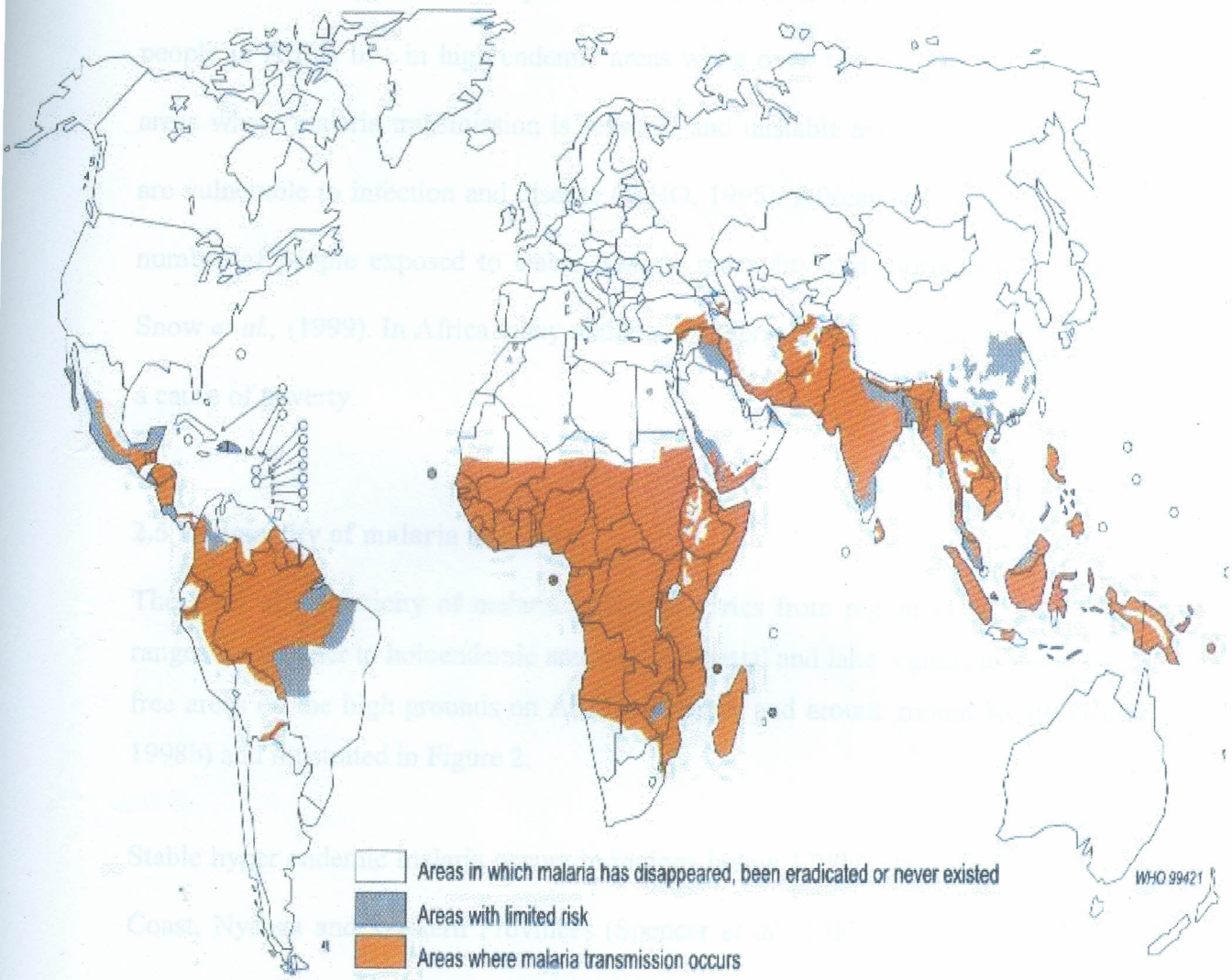
2.2 Malaria diagnosis.

The basis of proper treatment lies on proper diagnosis. Definitive diagnosis of malaria can only be made by microscopy (ROK-MOH, 1999). Other methods of diagnosis are presumptive diagnosis and clinical algorithms, blood examination for malaria parasite, detection of malaria antigen, serology (Gillespie and Chiodini 1988; Voller, 1988), molecular methods, and verbal autopsy (Hammel, 2002; Snow *et al.,* 1992).

2.3 Global malaria situation.

Malaria continues to be a major public health problem in most countries of the tropical world (WHO, 1997). Of the total world population of about 5.4 billion, 2200 million are exposed to malaria infections in some 90 countries (WHO, 2000). The most recent estimates indicate that there may be 300-500 million clinical cases each year, with countries in tropical African accounting for more than 90% (WHO, 1997) and illustrated in Figure 1.

Figure 1 Global Malaria status



Source: WHO, 2000

2.4 Malaria situation in Africa.

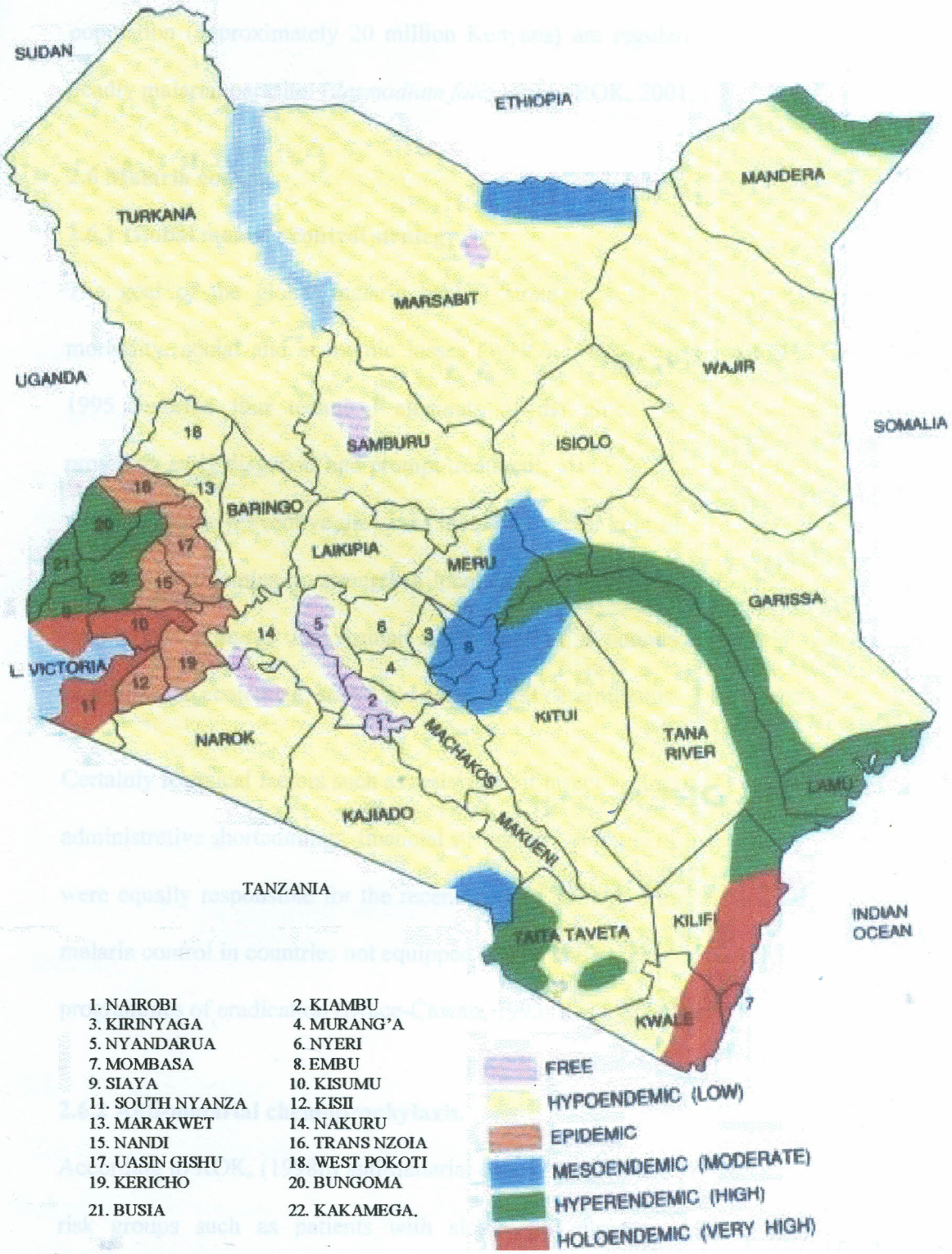
Of an estimated annual global total of 300-500 million clinical cases with 1.5-2.7 million deaths, over 90% are reported from Africa (WHO, 1997). About 75% of the people in Africa live in high endemic areas while over 18% live in epidemic prone areas where malaria transmission is seasonal and unstable and where all age groups are vulnerable to infection and disease (WHO, 1995). African region has the highest number of people exposed to stable malaria morbidity and mortality in the world Snow *et al.,* (1999). In Africa today malaria is understood as a disease of poverty and a cause of poverty.

2.5 Endemicity of malaria in Kenya.

The level of endemicity of malaria in Kenya varies from region to region. Malaria ranges from hyper to holoendemic areas of the coastal and lake regions to the malaria-free areas on the high grounds on Aberdare ranges and around mount Kenya (ROK, 1998b) and illustrated in Figure 2.

Stable hyper endemic malaria occurs in regions below 1300m above sea level on the Coast, Nyanza and Western Provinces (Spencer *et al.,* 1987; Githeko *et al.,* 1992). Stable malaria, which is seasonal, occurs in regions between 1300m-1700m above sea level for example, Mwea (Ijumba *et al.,* 1990). Unstable malaria occurs in regions, which lie between 1700m-2500m above sea level, and these are highlands such as Kisii, Nyamira, Nandi, and Kericho (Ngindu *et al.,* 1998; ROK, 1998b).

Figure 2: Endemic zones of malaria in Kenya.



Source: GOK, 1998b

In Kenya malaria kills over 34000 children per year (UN, 2004). It accounts for 30% of outpatient attendance and 19% of all admissions to our health facilities. About 170 million working days are lost to malaria each year and over 70 percent of the population (approximately 20 million Kenyans) are regularly affected by the most deadly malarial parasite: *Plasmodium falciparum* (ROK, 2001; UN, 2004).

2.6 Malaria control.

2.6.1 Global malaria control strategy.

The goal of the global malaria control strategy is to prevent mortality, reduce morbidity, social and economic losses (WHO, 1993). World Health Organization, 1995 reported four technical elements of the global strategy, which included providing early diagnosis and prompt treatment, planning and implementing selective and sustainable preventive measures including vector control, to detect early, contain or prevent epidemics, to strengthen local capacities in basic and applied research to permit and promote the regular assessment of a country's malaria situation in particular the ecological, social and economical determinants of the disease.

Certainly technical factors such as resistance of insect vector, inadequacy of planning, administrative shortcomings, financial stringency, shortage of personnel, poor training were equally responsible for the recent shift of strategy from malaria eradication to malaria control in countries not equipped for the undertaking of complex and difficult programmes of eradication (Bruce-Chwatt, 1993; Russell, 1978).

2.6.2 Anti-malarial chemoprophylaxis.

According to ROK, (1998b) anti-malarial chemo prophylaxis should be given to high-risk groups such as patients with sickle cell disease, patients with Immuno-suppression caused by illness (leukaemia, but no HIV infection or malnutrition) or

splenectomy, children under five years with recurrent febrile convulsion, pregnant women, all non-immune visitors to malaria areas.

Anti-malarial chemo-prophylaxis also cover two of the four strategic approaches, which include guaranteeing all people to access quick and effective treatment, to significantly reduce illness and death from malaria and provide malaria prevention measures and treatment to pregnant women.

2.6.3 Resistance to anti-malarial drugs.

Resistance of malaria parasites to anti-malarial drugs is threatening the control programmes throughout Africa (WHO, 2002b). The eventual emergence of parasite resistance is therefore the fate of all current treatments (Warrell *at el.,* 2002).

One of the greatest challenges facing Africa is malaria drug resistance (WHO, 2002b). Resistance to chloroquine, the cheapest and most widely used anti-malaria drug is common throughout Africa and there are signs that Sulphadoxine-pyrimethamine (SP), which is currently used, is losing its power. The next generation of anti-malaria drugs (Artemisinin-based Combination Treatment (ACT) has been developed, but the cost $1 and $3 per treatment are beyond the reach of most families (WHO/UNICEF, 2003a).

2.6.4 Malaria vaccine.

Vaccine development research is promising, though it may take seven to fifteen years before an effective vaccine is ready. The vaccines are undergoing clinical trials in Africa, Asia, and United States of America (USA). Some of these vaccines include merozoite surface protein-1 (MSP-1), serine repeat antigen (SERA), rhoptry-

associated protein-1 (RAP-1), erythrocyte binding antigen-175 (EBA-175), apical membrane antigen-1 (AMA-1), *falciparum* sporozoite vaccine-1 (FSV-1) and SPf66, which has been partly effective in field trials. Others include MustDO 15.1, a 15-gene malaria DNA vaccine designed to reduce morbidity and mortality in children in Sub-Saharan Africa and recombinant protein vaccine designed to prevent the malaria parasite infection stage from entering or developing within the human liver (WHO, 1999).

2.6.5 Vector control.

Vector control is within the global malaria control strategy. The principle objective of vector control is the reduction of malaria morbidity and mortality by reducing the level of transmission. The vector control options that are currently available include indoor residual spraying (IRS); use of personal protection measures that include use of insecticide treated materials (Alonso *et al.,* 1991; Onori *et al.,* 1993), repellents (dimethylphalate, pyrethrin and pyrethroids) and domestic insecticides; space spraying; environmental management; larviciding (including use of biocides) and Biological control (WHO, 1995).

2.7 Malaria control initiatives.

2.7.1 Roll Back Malaria (RBM).

Roll Back Malaria (RBM) is a global partnership initiated by the governments of malaria-afflicted countries, WHO, the UNICEF, World Bank, and UNDP in 1998.

The objective of RBM is to reduce the burden of malaria for the world by 2010 by saving lives, reducing poverty, boosting school attendance and making life better for millions of people living in poor countries especially in Africa (WHO, 2003). Some

of the principles of the RBM are early detection, rapid treatment, and multiple interventions, which include use of insecticide-treated nets.

2.7.2 The Abuja targets.

This was the Heads of states and governments summit on RBM held in Abuja Nigeria in the year 2000. The summit set out targets to be achieved by the year 2005 which included at least 60% of those at risk from malaria especially young children and pregnant women, to benefit from the best use of insecticide-treated nets; at least 60% of those struck by malaria to have access to effective and affordable treatment within 24 hours; at least 60% of pregnant women at risk form malaria to have access to effective preventive treatment; at least 60% of malaria epidemic to be detected within two weeks of onset and responded to within two weeks of detection (WHO,2000).

2.7.3 Kenya Chapter of RBM.

The four strategic approaches in the Kenya chapter of RBM between 2001-2010 were to guarantee all people access to quick and effective treatment, provide malaria prevention measure and treatment to pregnant women, ensure use of ITNs by communities at risk and improve epidemic preparedness and response (ROK-MOH, 2001). The focus was on two cross-cutting strategies which were information, education, and communication to arm the public with preventive and treatment knowledge, and secondly monitoring, evaluation and research to constantly up-date and up-grade control strategies. The main aim of these strategies was to reduce the level of malaria infection and consequent death in Kenya by 30% by the year 2006 and to sustain an improved level of control to the year 2010 (ROK, 2001).

2.8 Economic implications of malaria.

Malaria affects the health and wealth of nations and individuals. It has significant measurable direct and indirect costs and has been shown to be a major constraint to economic development (Snow *et al.,* 1999). The direct costs of malaria include a combination of personal and public expenditure, on both preventive and treatment of the disease. Personal expenditure include individual or family spending on ITNs, doctor fees, anti-malaria drugs, transport to the health facilities, support to the health facilities, support for the patient and sometimes on accompanying family members during hospital stays. Public expenditure includes, spending by government on maintaining health facilities and healthcare infrastructure, public managed vector control, education, and research. The disease may account for as much as 40% of public health expenditure, 30%-50% of inpatient admission and up to 50% of outpatient visits (Snow *et al.,* 1999).

The indirect costs of malaria include lost productivity or income associated with illness or death. In Kenya nearly all households are affected by the disease resulting in loss of productivity estimated to170 million days (Maneno *et al.,* 1998). This might be expressed as the cost of lost workdays or absenteeism from formal employment and the value of unpaid work done in the home by both men and women. In case of death the indirect cost includes the discounted future lifetime earnings of those who die (Snow *et al.,* 1999).

Malaria hampers children's schooling and social development through both absenteeism and permanent neurological and other complications associated with severe episodes of the disease. The risk of contracting malaria in endemic areas can

deter investment, both internal and external and affect individuals and household decision making in many ways that have a negative impact on economic productivity and growth. For example undeveloped markets due to traders unwilling to travel to and invest in malarias areas; and undeveloped tourism industry due to reluctance of travellers to visit endemic areas (Snow *et al.,* 1999).

2.9 Insecticide Treated Nets (ITNs).

One of the major breakthroughs of recent years is the realization that mosquito nets treated with insecticide give a higher degree of protection against malaria (WHO/UNICEF, 2003b). Trials of ITNs in the 1980s and 1990s showed that ITNs reduced deaths in young children by an average of 20%. In more than 15 years now, the use of residual pyrethroids to treat bed nets has become more fashionable than house spraying as a means of controlling malaria (Lengeler, 1998).

Experience on the past 20 years has shown ITNs to be a promising intervention for reducing the risk of malaria infection (WHO, 2003). Randomised-controlled trials have been done in Africa, Asia, Latin America and west Pacific comparing ITNs use with no-net use and less commonly, comparing ITNs use with use of untreated nets. A conchrane review concludes that ITNs reduce overall mortality by about 20% in Africa and that about six lives in every 1000 children aged between 1-59 months are saved each year.

Insecticide treated nets also reduce clinical episodes of uncomplicated malaria caused by *Plasmodium falciparum* and *Plasmodium vivax* infections by 50% as well as reducing parasitaemia (WHO, 2003). Mutinga (1993) showed that pyrethroid treated nets had been used successfully against malaria in Kenya (Nevill et al., 1996), Gambia (Snow *et al.,* 1998; D'Alessandro *et al.,* 1995), in Tanzania and in Burkina Fuso (Diallo, 1998; MacCormack and Snow, 1986), and Ghana (AHRTAG, 1997).

A study in rural Gambia has shown that ITNs are one of the most efficient ways of reducing deaths in children less than 10 years (Aikins *et al.,* 1998). In Kilifi at the Kenyan coast, introduction of ITNs led to a reduction of 33% in all cause mortality and incidence of severe malaria attacks fell by 44% among children aged 1-59 months (ROK, 1998a; Nevill *et al.,* 1996).

A study in an area of high malaria transmission in Kenya has shown that women protected by ITNs every night during their first four pregnancies produce 25% fewer under-weight or premature babies. Insecticide treated nets can protect pregnant women and the same net can be used to guard the life of the newborn baby. Malaria in pregnancy kills up to 20,000 newborn babies each year (WHO, 2003). It also raises the chance of spontaneous abortion, stillbirth, premature delivery, and low birth weight which is a leading cause of child death. The use of insecticide treated nets can cut down malaria transmission by more than half, especially protection for pregnant women using both ITNs and anti-malarial drugs given as part of normal antenatal care (WHO, 2003).

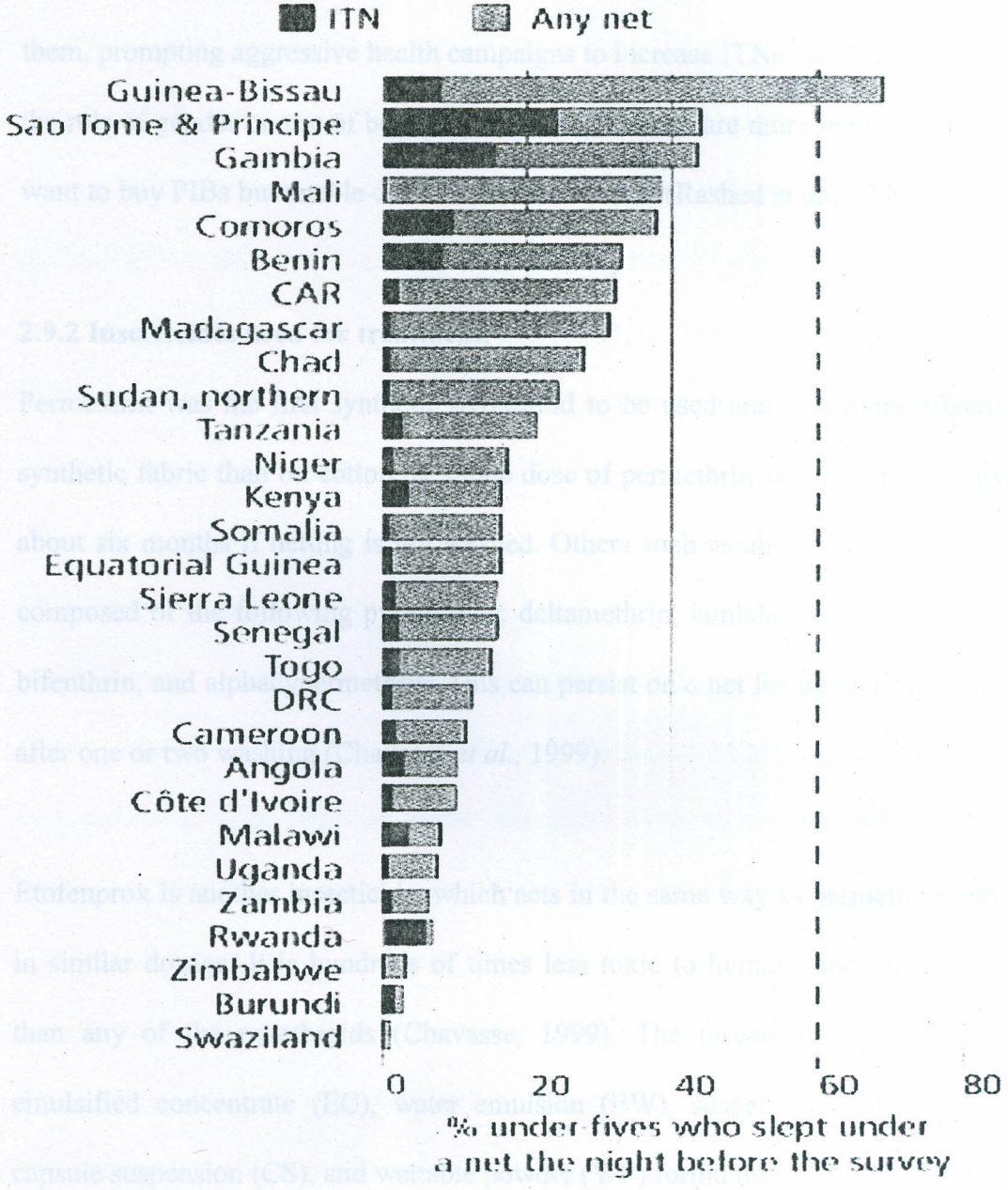
2.9.1 Coverage and acceptance of insecticide Treated Nets (ITNs).

Although progress has been made, the proportion of children under five years protected from malaria using any kind of mosquito net is still low – about 15% in many countries (WHO/UNICEF, 2003a). Figure 3 shows the use of nets in some African countries.

In the year 2003 less than 5% of Africa's children slept under ITNs and less than 15% slept under any net at all (WHO/UNICEF, 2003a). In the year 2003 less than 10% of women slept under any kind of mosquito nets. Many women in Africa lack access to medical care and many have limited access to tools such as ITNs, especially in remote areas. Most studies used impregnated bed nets, and a major assumption in recommending their use is that they are culturally acceptable and are affordable by the target communities (MacCormack and Snow, 1986). There are limited data about households' use of nets prior to the introduction of insecticide treated nets (WHO, 2003). Most African households do not posses any net, whether treated with insecticide or not (WHO/UNICEF, 2003a). Small-scale projects have often succeeded in improving use of nets and insecticide in project areas, but these projects only cover a small proportion of the total population at risk of malaria. As a result access to ITNs is still low (WHO, 2003).

It has been shown that pricing of ITNs would be the principle obstacle to their use (Aikins *et al.,* 1993; Makemba *et al.,* 1995; Stephen *et al.,* 1995). Where access to cash is seasonal, the procurement of commodities aimed at promoting health is not a priority (McCormack and Snow, 1986). The level of education may be an indirect determinant of PIB use as far as it affects the nature of employment and income (Rashed *et al.,* 1999).

Figure 3: Use of Nets in Africa.



Source: WHO/UNICEF 2003c

Studies show that most communities are able to afford at least one net (Muthami *et al.,* 1999; Onwujekwe, 1999). However, most women may still not be willing to buy them, prompting aggressive health campaigns to increase ITNs use. Little is known on the role of gender on use of bed nets. Similarly, women are more inclined than men to want to buy PIBs but unable due to their low income (Rashed *et al.*, 1999).

2.9.2 Insecticides used for treatment.

Permethrin was the first synthetic pyrethroid to be used and it is more effective on synthetic fabric than on cotton. A single dose of permethrin will remain effective for about six months if netting is not washed. Others such as alphacyno pyrethroids are composed of the following pyrethroids: deltamethrin, lambdacyhalothrin, cyfluthrin, bifenthrin, and alphacypermethrin. This can persist on a net for up to 12 months even after one or two washing (Chavasse *et al.,* 1999).

Etofenprox is another insecticide, which acts in the same way as permethrin and used in similar dosage. It is hundreds of times less toxic to humans and other mammals than any of the pyrethroids (Chavasse, 1999). The insecticides are available in emulsified concentrate (EC), water emulsion (EW), suspension concentrate (SC), capsule suspension (CS), and wettable powder (WP) formulations (WHO, 1997).

2.9.3 Long-lasting insecticidal nets (LLINs).

In response to low re-treatment rates for conventional insecticide-treated nets, especially in Africa, WHO prompted industries to develop long-lasting insecticidal nets (LLINs), ready-to-use, factory pre-treated nets that require no further treatment during their expected lifespan of four to five years (WHO/UNICEF, 2003b). This technology obviates the need for re-treatment and reduces both human exposure and the risk of environmental contamination. Using the more recent fibre technology, LLINs are regarded as a major breakthrough in malaria prevention (WHO/UNICEF, 2003b). Unlike the conventional ITNs, LLINs resist washing.

2.9.4 Target population.

World Heath Organisation, (2002c) identifies mothers, fathers, health workers, shopkeepers, and birth attendants as the main focus of promotion. The target audience may include intended users, household decision makers, carers, and influential people in the community. Pregnant women are usually an important target groups for promotion to ensure that they use ITNs to protect themselves and their children against malaria. If protection of children under five years is a priority, promotion will need to target mothers, fathers and others who care for young children (WHO, 2003). Community or religious leaders, traditional healers, grandparents and others who influence people's behaviour may also need to be targeted by promotional campaigns.

CHAPTER 3: MATERIALS AND METHODS.

3.1 The study area.

3.1.1 Location and Human population.

The study was conducted in Nyamira District of Nyanza Province, Kenya. Nyamira District lies between latitude 0^0 30" and 0^0 45" south and longitude 34^0 45" and 35^0 00" east. It borders by Transmara District to the south, Buret District to the east, Bomet District to the southeast, Kisii Central to the west and Rachuonyo District to the north (Figure 4).

The District has a total area of 896.4 square kilometres shared among seven divisions, namely, Nyamira, Nyamaiya, Nyamusi, Borabu, Ekerenyo, Rigoma, and Manga divisions (ROK, 2002). The study was carried out in four divisions, which were: Nyamira, Nyamaiya, Ekerenyo, and Borabu divisions.

According to the 1999 population census, the district had a population of 498,102 persons. This was projected to have reached 535,288 persons with a male population of 257,757 and a female population of 277,531 in 2002. The population of women of childbearing age (15-49 year) was projected to have reached 132,552 by the same year (ROK, 2002). Table 1 shows the population of the area covered by this study according to 1999 census.

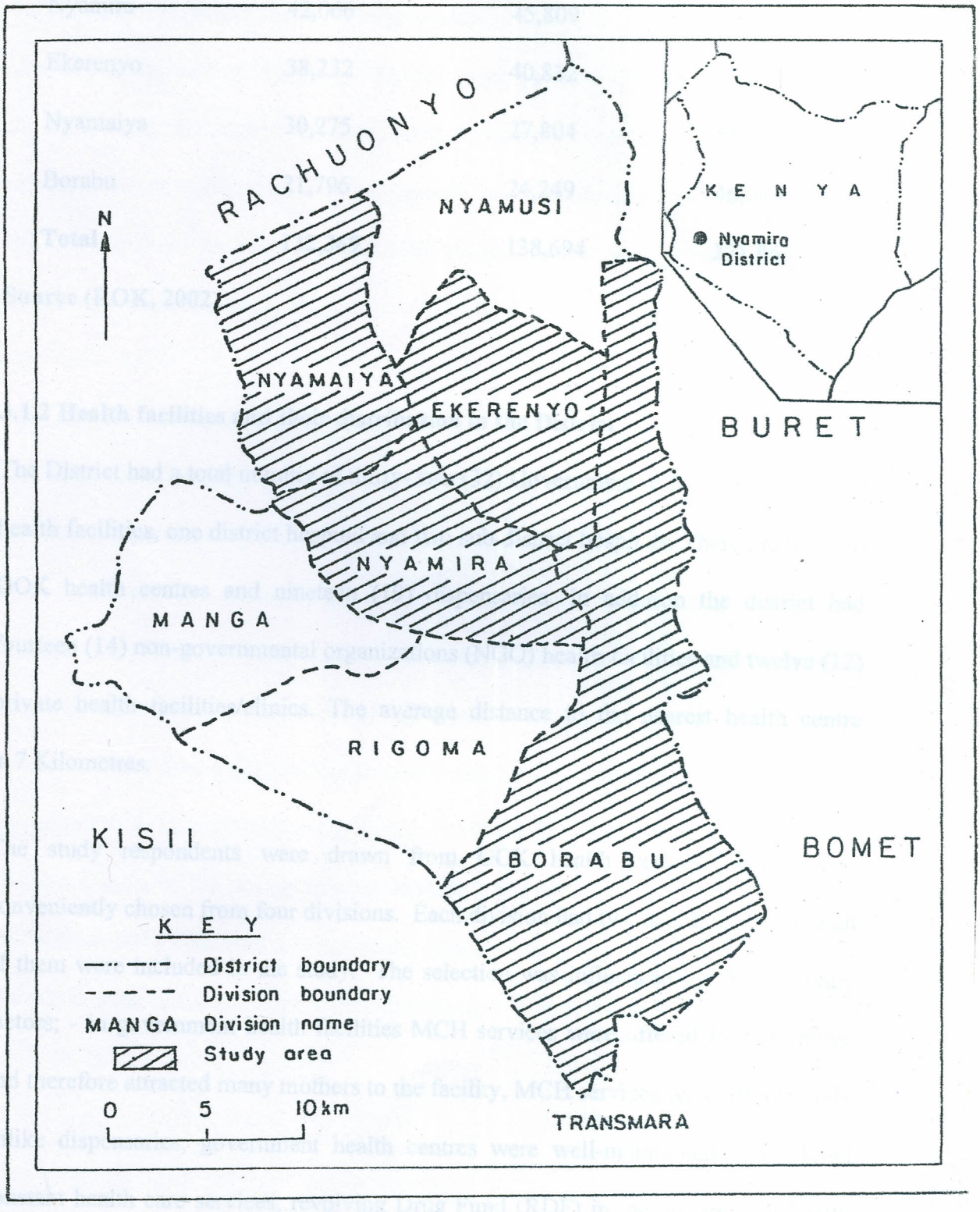


Figure 4: Location of the study area

Table 1: The total population of the area covered by the study

Division	Male	Female	Total
Nyamira	42,066	45,809	87,875
Ekerenyo	38,232	40,832	79,064
Nyamaiya	30,275	27,804	58,079
Borabu	21,796	24,249	46,045
Total	**132,369**	**138,694**	**271,063**

Source (ROK, 2002).

3.1.2 Health facilities and their distribution in the District

The District had a total number of thirty- two (32) Government of Kenya (GOK) rural health facilities, one district hospital and two sub-district hospitals. There are ten (10) GOK health centres and nineteen (19) dispensaries. In addition the district had fourteen (14) non-governmental organizations (NGO) health facilities and twelve (12) private health facilities/clinics. The average distance to the nearest health centre is 7 Kilometres.

The study respondents were drawn from GOK health centres, which were conveniently chosen from four divisions. Each division had two health centres and all of them were included in the study. The selection was influenced by the following factors; - in government health facilities MCH services were offered free of charge and therefore attracted many mothers to the facility, MCH services were offered daily unlike dispensaries, government health centres were well-maintained and offered constant health care services, revolving Drug Fund (RDF) in the government health facilities in the district ensured adequate, appropriate and affordable supply of

essential drugs and their medical supplies and finally government health centres had facilities to cater for large population of people including MCH services.

All the above reasons attracted a large population to the health centres from where I got the respondents of this study. On the other hand NGO and private health care facilities were not chosen because, service charges were higher. Further, private clinics were not stably established in the area and their charges were unaffordable by the vast majority. Due to these reasons private and NGO health facilities attracted less people to their premises.

3.1.3 Disease burden in the study area

The most prevalent diseases in the district included: malaria, upper respiratory tract infections, skin disease, diarrhoeal diseases, pneumonia, intestinal worms, urinary tract infections, eye diseases, accidents among others. Malaria tops the list and accounted for 40% of outpatient cases in health facilities in the district. The disease adversely affects the productivity of the district's labour-force and hence overall-earnings. There was a high infant mortality rate (80 per 1000) and the under five-mortality rate (111 per 1000) in the district (ROK, 2002). These rates were very high compared them to the national infant mortality rate (77 per 1000) and under five-mortality rate (115 per 1000). Some of the factors, which cause infant mortality in the district, include low income, poor diet, malaria and water borne diseases (ROK 2004).

3.1.4 Poverty levels in Nyamira District

Absolute poverty is defined, as inability by the poor to access basic needs such as food, clothing, shelter another social-economic activities such as education and health facilities. The 2001 participatory poverty assessment (PPA) study conducted by AMREF and district PRSP consultative forum confirmed that over 50% of the population cannot meet the minimum basic needs as housing, health, clothing and school fees. The major causes of poverty in the district include: inadequate health service, inaccessibility to credit facilities, impassable roads, small land parcels, inadequate energy supply, laziness and idleness, insecurity and agricultural decline among others. The effects of poverty in the district manifest themselves in the following forms: high incidences of disease such as malaria, respiratory tract infections, diarrhoeal disease, skin disease and sexually transmitted disease (including HIV/AIDS), high infant mortality rate (80 per 1000) and the under five mortality rate (111 per 1000) -(ROK, 2002)

The district is basically agricultural and 66% of its income is derived from agricultural activities. It is estimated that on average rural households earn about Kshs. 641.00 monthly while households in wage/salary income bracket earn an average of Ksh. 20I2.00 monthly (ROK, 2002).

3.2 The Study Population.

The population of interest included married and single mothers who had children up to five years old and were residents of the study area for at least one month.

3.2.1 Inclusion criteria.

The study focused on married and single mothers with babies aged from one month old to children of up to sixty months of age. The mothers were residents of the study area for at least one month because the incubation period of malaria may be as short as 12 days but may take months or even years.

3.2.2 Exclusion criteria

Those who were excluded from the study were all women who did not have children in the above age bracket and any adult man and children above 5 years of age.

3.2.3 Ethical considerations.

Ethical clearance for the study was obtained from Kenyatta University, the Ministry of Education Science and Technology, the District Commissioner, the District Education Officer and the Medical Officer of Health Nyamira district. Only respondents willing to participate in the study were recruited.

3.3 The Study design

This was a descriptive cross-sectional study to determine whether mothers were using ITNs to prevent their children under five years form malaria in Nyamira District at that particular time. Mothers were selected at the MCH setting and information obtained in over a period of three months.

3.3.1 The sample size

The number of respondents who participated in the study was determined using a formula as used by Fisher *et al.*, (1998) below:

$$N = \frac{Z^2 pqD}{d^2}$$

Where:

N= sample size (where population >10,000)

Z = 1.96 at 95% confidence level.

p = 0.5.

q =1-p = 0.5

d = Degree of accuracy/precision equalling to 0.05.

D = design effect = 1. (This is because research was done in one District).

Therefore the sample size (N) from the calculation was = 384 ≈ 400 to cater for attrition from the study.

3.3.2 Sampling method.

Purposive sampling was used to determine the study areas (Nyamira, Ekerenyo, Nyamaiya and Borabu divisions). Purposive sampling was used because malaria infection was prevalent in the District and therefore only representative regions were chosen. Convenient sampling method was used to identify the eight health centres studied because they had the features I was looking for. For instance government health centres attracted most mothers unlike dispensaries and private clinics, they offered free MCH clinic service, they operated on daily basis and they were well equipped and maintained. Probability proportion to size was used to determine the number of samples included in the study according to the size of the population of each division (Table 2). Simple random technique was used to select the mothers who

participated in the study each day from the mothers who brought their under fives children to the MCH clinics. This was done by use of a table of random numbers, a situation in which every mother coming to the MCH clinic had an equal chance of being included in the study.

Table 2: Division, health centres and number of mothers involved in the study

Divisions	Health centres	Number of mothers
Nyamira	Nyamira district hospital	66
	Ting'a	66
Ekerenyo	Ekerenyo	59
	Amatierio	59
Nyamaiya	Nyamaiya	40
	Ogango	40
Borabu	Chepng'ombe	35
	Isoge	35
Total 4	**8**	**400**

3.4 Research instruments.

3.4.1 Interviews.

In total, 400 interviews were conducted by use of the interview guide (Appendix 1). The interviews sought to collect information on demographic characteristics of the study population, knowledge, and attitudes on malaria, sleeping pattern, use and no-use of ITNs and promotion of ITNs by the MCH clinics.

3.4.2 Focus group discussions (FGDs).

Four focus group discussions were conducted, each in the four divisions studied. The focus groups had between eight and thirteen participants, a moderator, and a note taker. The entire discussion was recorded using a tape recorder. In addition the notes taker wrote down as much information as was practically possible. The discussions were mainly carried out in Kiswahili and Ekegusii for those who did not speak English or Kiswahili.

The FGDs comprised at least one or more of the following: nurse in charge (i/c) of MCH, Clinical officer, Lab. Technologists, Tradition birth attendant (TBA), Teacher, Women representatives, Opinion leaders, businessmen/women, male representative, Public health officer, community based organisation leaders, representative from the district administration. Figure 5 shows some of FGD participant at the Nyamira District Hospital. The FGDs collected information on mother's opinions about malaria, prevention practices, bed net/ITNs usage, and problems associated with usage of bed nets/ITNs (Appendix 2).

3.4.3 Observations.

This involved use of a checklist for the presence of bed net posters in the MCH clinics, which was scored for location, visibility, non-availability, and use by health care providers during the clinic hours (Appendix 3)

3.5 Data storage and analysis.

Data from interviews and checklist was first verified for its completeness, after which it was coded and entered into a computer and then stored in diskettes. The data was analysed using the statistical package for social sciences (SPSS). It was then summarised using descriptive statistics such as frequencies and presented by use of frequency tables, bar charts and pie charts. Data was further analysed by use of chi-square and relative risk (RR) for relationships between different variables and net acquisition and use.

Figure 5: Some of the FGD participants at Nyamira District Hospital.

CHAPTER 4: RESULTS

4.1 The mothers' demographic characteristics.

A total of 400 mothers with children under five years were interviewed. The majority (60.3%) were between 21-30 years old, 27% were between 16-20 years old, 12.5% between 31-40 years old, while 0.3% were between 41-50 years. The age of a mother was independent of the possibility of her having a bed net (χ^2 =2.850, df=3; p= 0.415) or an insecticide treated net (χ^2 = 1.799, df=3; p=0.615) for her child.

The study showed that 98.4% of the mothers had at least attended a formal education institution. Majority of the mothers (56.8%) had reached primary school level, 37.3% had reached secondary school level, while 4.3% had attained some college training and 1.8% had not gone to school (Table 3). There was a significant relationship between mother's level of education and the possibility of having a bed net (χ^2 = 24.247, df= 3; p = 0.000) or an insecticide treated net (χ^2 = 14.157, df= 3; p=0.003) for her child. Data showed that 70.6% of those with post secondary education had bed nets for their children while 47.1% of them had insecticide treated nets for their children. All the respondents who had not gone to school (1.8%) did not use bed nets or insecticide treated nets (Figure 6). The majority of mothers interviewed were married/cohabiting (84.3%) while the rest were single (12.3%) or separated/divorced (3.5%). Marital status of a mother was independent of the having a bed net (χ^2 =0.605, df= 2; p=0.739) or an insecticide treated net (χ^2 =1.138, df= 2; p=0.566).

Table 3: Mothers' level of education and the proportion (%) of bed nets/insecticide treated nets acquisition

Level of education	Frequency	Proportion of respondents (%)	Proportion with bed nets (%)	Proportion with ITNs (%)
None	7	1.8	00	00
Primary	227	56.8	26	18.5
Secondary	149	37.3	41.6	30.2
Post secondary	17	4.3	70.6	47.1

The occupation of the respondents ranged from housekeeping (14.3%) to casual labourers (0.3%), whereas 7.3% did not have any job (Table 4). some respondents had two jobs (57.6%), (Table 5). Occupation of a mother was significantly related with having a bed net ($\chi^2 = 29.092$, df=12; p=0.004) or insecticide treated net ($\chi^2 = 32.072$, df=12; p=0.001)

Figure 6: Proportion of mothers with ITNs Vs their level of education

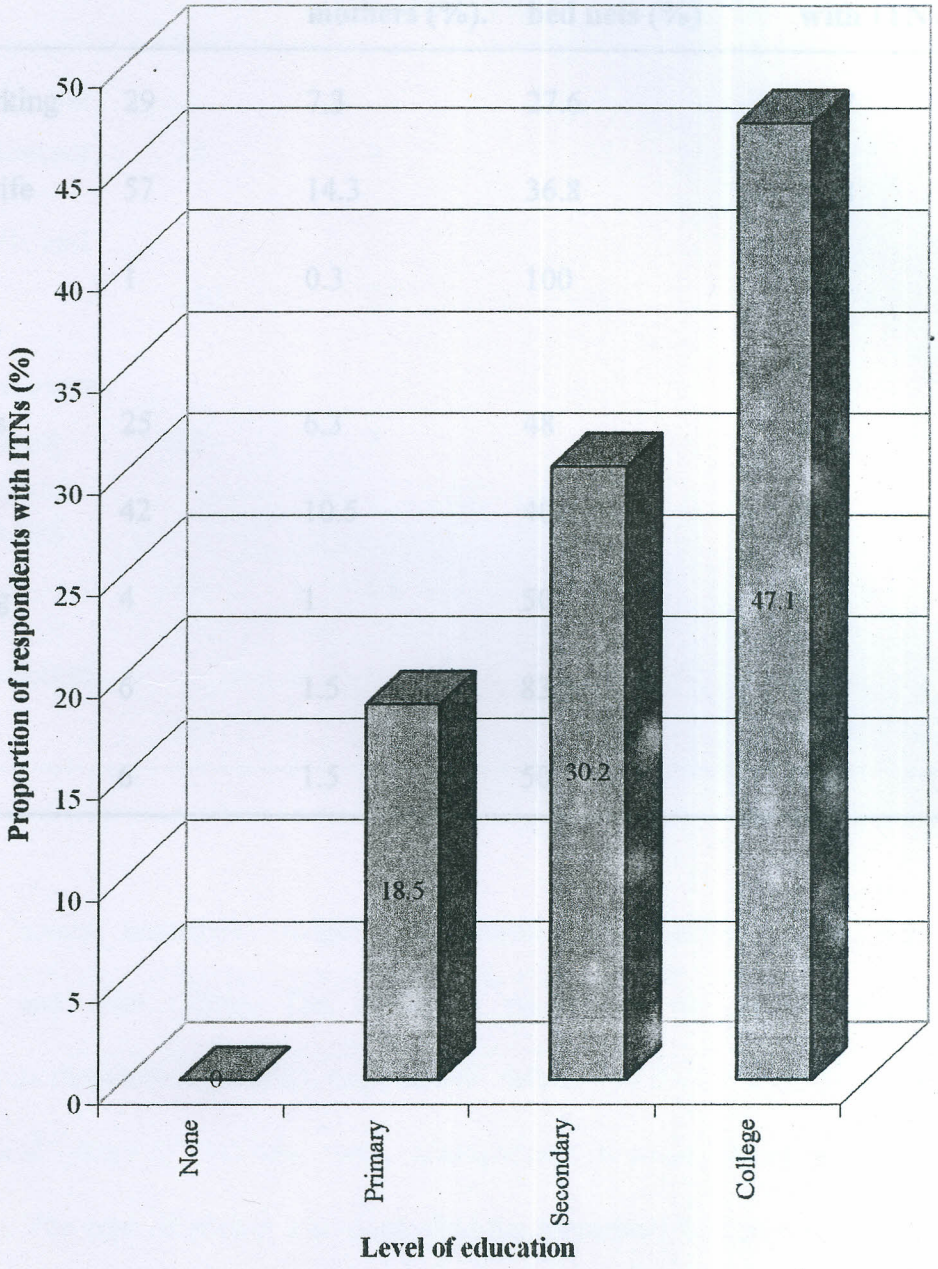


Table 4: Occupation of the respondents and the proportion of bed nets/ITNs acquisition among mothers.

Occupation.	Frequency.	Proportion of mothers (%).	Proportion with bed nets (%)	Proportion with ITN (%).
Not working	29	7.3	27.6	20.7
Housewife	57	14.3	36.8	29.8
Casual labourer	1	0.3	100	100
Business	25	6.3	48	36
Peasant	42	10.5	40.5	28.6
Tailoring	4	1	50	50
Teacher	6	1.5	83.3	83.3
Office	6	1.5	50	16.7

Table 5: Respondents with two occupations and the proportion with bed net/ITNs acquisition among mothers.

Occupation.	Frequency.	Proportion of mothers (%).	Proportion with nets (%).	Proportion with ITN (%).
Housewife and casual labourer	16	4	25	12.5
Housewife and peasant	140	35	30	19.3
Casual labourer and peasant	28	7	3.6	7.1
Business and peasant	35	8.8	42.9	31.4
Casual labourer business	11	2.8	18.2	00

In most homes, household budget was controlled by husbands (37%) and both husband and wife (35%). The remaining percentage was shared among the respondents themselves (10.5%), respondents' fathers (10.8%), respondents' mothers (5.5%), and others (1.3%) who were, grandparents, brothers/sisters, or uncle/aunt, (Table 6). The type of person who controlled the household budget did not have any significance on the presence of a bed net (χ^2 =0.772, df=5; p=0.979) or an insecticide treated net (χ^2 =2.165, df=5; p=0.826) for a child.

Table 6: Members who controlled the household budget

Member of the household.	Frequency.	Proportion of household (%).	Proportion with nets (%).	Proportion with ITNs (%).
Respondents' husband	148	37	35.1	25.9
Respondent herself	42	10.5	31	23.8
Both wife and husband	140	35	32.9	25
Respondents' father	43	10.8	32.6	16.3
Respondents' mother	22	5.5	31.8	18.2
Others	5	1.3	20	20

A high percentage of the mothers (93.5%) shared the sleeping space with their under five years children. Sharing the sleeping space between mothers and their children was not related with having a bed net (χ^2 =0.502, df=1; p=0.479) or an insecticide treated net (χ^2 =1.075, df=1; p=0.300).

Majority of the respondents (56.5%) had only one child below five years, while (43.5%) had more than one child below five years, (Table 7). Having more than one child was not related with insecticide treated net possession (χ^2 =4.438, df=2; p=0.109).

Most of the respondents (49.8%) shared the sleeping space with their children because of breastfeeding/nursing them at night, while 2% was due to other reasons including their preference on who to share the sleeping space with (Table 8).

Table 7: Number of children below five years.

Number of children.	Frequency.	Proportion (%) of mothers.
One	226	56.5
Two	143	35.8
Three	29	7.3
Four	2	0.5

Table 8: Reasons for sharing sleeping space with children under fives.

Reason	Frequency	Proportion (%)
Use/share a net	7	1.8
Share a bed/bedding	35	8.8
Can not sleep alone	151	37.8
Breastfeeding/nursing	199	49.8
Others (old enough, own liking).	8	2

The study established that in many homes (98%), members slept on bed, whereas 0.3% slept on mats/skins/hides (Table 9). Whatever mothers and children slept on was independent of the level of education of the mother (χ^2 =7.609, df=6; p=0.268), and the occupation of the respondent (χ^2 =33.385, df=24; p=0.096). The type members of the household slept on was not related with the possibility of having a bed net (χ^2 =0.572, df=2; p=0.751) or an insecticide treated net for a child (χ^2 =2.543, df=2; p=0.280). About 98% of household members slept on beds (Table 10). Of the household members who slept on mats, 59% were older siblings (Table 11).

Table 9: What members of the household slept on

What household sleep on	Frequency	Proportion (%)
Mats/skins/hides	1	0.3
Both bed/mats/skins/hides	7	1.8
Beds	392	98

Table 10: Members of the household who slept on bed.

Members sleeping on bed	Frequency	Proportion of household (%)
Parents	2	0.5
Less five years	2	0.5
Older siblings	4	1
All members	387	96.8
Parents and less fives	4	1
None	1	0.3

Table 11: Members of household who slept on mats/skins/hides

Members sleeping on mats	Frequency	Proportion of household (%)
Parents	1	0.3
Less 5 years	1	0.3
Older siblings	5	1.3
None	131	98
All	1	0.3

4.2 The mothers' knowledge on malaria, vector management strategies and use of ITNs in malaria control.

4.2.1 The mothers knowledge on malaria and vector control strategies.

Most respondents (53.3%) defined malaria as just a disease without further explanation while 25% associated mosquitoes with malaria and 11.5% explained malaria by symptoms such as headache, vomiting, body/joint pain, fever among others. Only 0.5% identified malaria correctly as a protozoan parasitic disease of genus *Plasmodium* species and this was attributed to the level of education of the respondents. About 3% described malaria as a disease brought by mosquitoes and dirty compound/utensils/food, lack of food (0.3%), germs (0.3%). Others (0.3%) defined malaria as a disease for children while 6.5% did not know anything about malaria. How mothers defined malaria was independent of using a bed net (χ^2 =12.511, df=1; p=0.186) or an insecticide treated net (χ^2=14.733, df=9; p=0.099).

When asked what causes malaria a big number of the respondents (91.8%) recognised mosquitoes as a cause of malaria. Other causes, which were associated with malaria, include stagnant water (8.3%), cold (13,3%), rain (4.3%), chewing sugarcane (6.3%), bushy environment (4.3%), and cooking fat (0.3%). Some respondents (29.9%) associated malaria with dirt, dirty compound, dirty food/utensils, unboiled water, and uncooked food. However 1.8% of the respondents did not know what caused malaria.

Most respondents identified, headache (70%), fever (68.8%), cold (65%) body/joint pain (61.5%) and abdominal pain/vomiting (0.5%) as the main symptoms of malaria (Figure 7). Other symptoms identified included loss of appetite (28.8%), shivering (16.3 %), dizziness (7.5%), body weakness (4.8 %), coughing (2.5%), diarrhoea (2%), inactivity (1.5%), while (0.3%) did not know any symptoms.

The study showed that mothers were less knowledgeable on the most vulnerable groups. About 41% of the respondents identified children under five years as the most vulnerable, while 3.3% did not know any group of people who are most vulnerable (Table 12). Knowledge on the most vulnerable groups was significantly related with possession of an insecticide treated net (χ^2 =18.631, df=7; p=0.009).

Most children under five years (78.5%) had previously suffered from malaria infections. Mothers whose children had previously suffered from malaria had the lowest chance of having bed nets for their children (RR = 1.250, 95% CI = 1.021,1.529).

Figure 7: Malaria symptoms as given by mothers

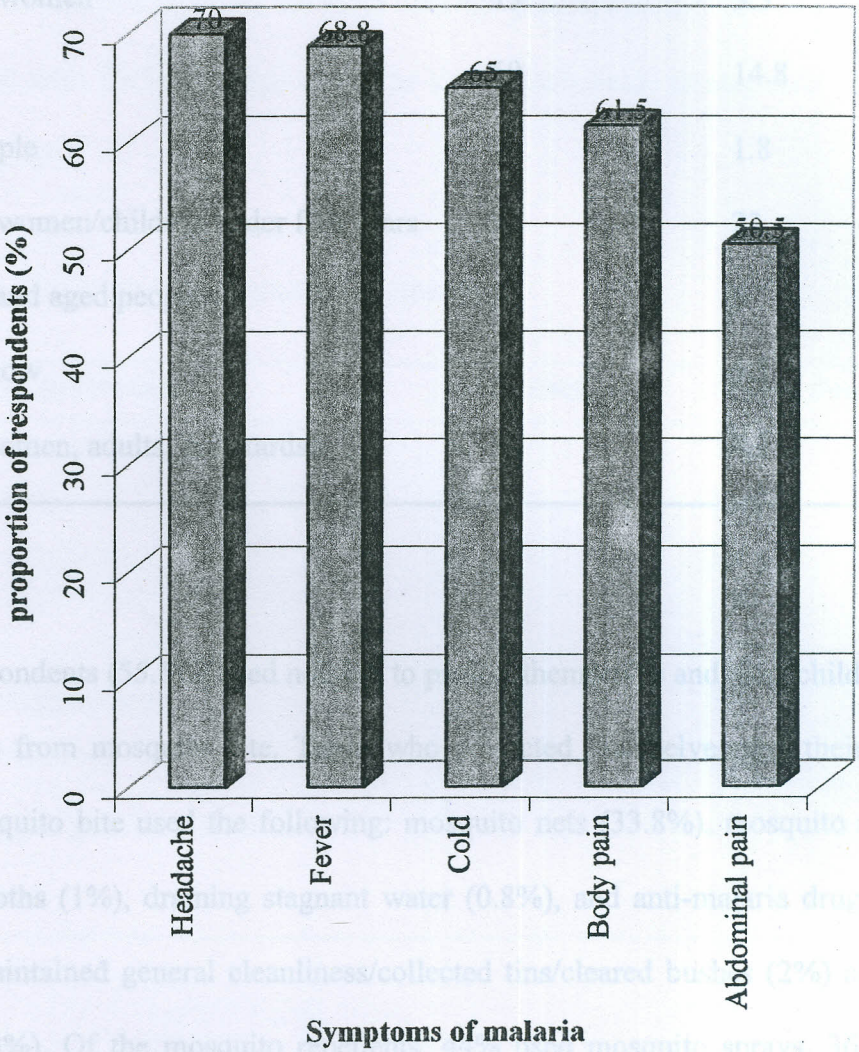


Table 12: Members of the household who are most vulnerable to malaria.

Most vulnerable members	Frequency	Proportion (%)
Children under five years	163	40.8
Pregnant women	13	3.3
All	59	14.8
Aged people	7	1.8
Pregnant women/children under five years	92	23
Children and aged people	20	5
Do not know	13	3.3
Others (women, adults, drunkards).	33	8.3

Most respondents (55.5%) used nothing to protect themselves and their children under five years from mosquito bite. Those who protected themselves and their children from mosquito bite used the following: mosquito nets (33.8%), mosquito repellents (6.8%) cloths (1%), draining stagnant water (0.8%), and anti-malaria drugs (0.5%). Others maintained general cleanliness/collected tins/cleared bushes (2%) and boiled water (0.3%). Of the mosquito repellents, 44% used mosquito sprays, 36.8% used coils, and 19.1% used other methods such as powder and cloths (Table 13).

The study revealed that mothers (80.3%) were knowledgeable about the use of mosquito nets/insecticide treated nets. Having an insecticide treated net for a child was highly related with the knowledge about the use of insecticide treated nets (χ^2 =21.641, df=1; p=0.000). Mothers who had not heard about insecticide treated nets were less likely to use them for their children compared to those who had heard about

them (RR = 0.742; 95% CI = 0.683, 0.805). The level of education was independent of the knowledge about the use of insecticide treated nets (χ^2 =3.515, df=3; p=0.319), while the occupation was related with knowledge about insecticide treated nets (χ^2 =23.649, df=12; p=0.023). At the same time the marital status of the respondents was not related with the knowledge about the use of insecticide treated nets (χ^2 =0.281, df=2; p=0.869).

Table 13: Mosquito bite protection methods.

Methods of protection	Frequency	Proportion (%)
Use nothing	222	55.5
Mosquito nets	135	33.8
Mosquito repellents	27	6.8
Cloths	4	1
Draining stagnant water	3	0.8
Anti-malaria drugs	2	0.5
Maintaining of general cleanliness	8	2
Boiling water	1	0.3

The study also revealed that the radio (70%) tuned in the local language, played a very important role in the respondents' knowledge about the use of mosquito nets and insecticide treated nets, while organised seminars (0.5%) scored the least (Table 14).

Table 14: Source of knowledge about use of the nets and insecticide treated nets

Source of information	Frequency	Proportion of source (%)
Radio	280	70
Health clinic	60	15
Press	4	1
Community leaders	4	1
Religious leaders	3	0.8
Health workers	3	0.8
Television	3	0.8
Organised promotions	13	3.3
Organised seminars	2	0.5
From people who have nets	23	5.8
See them at shops/market/vendors	10	2.5

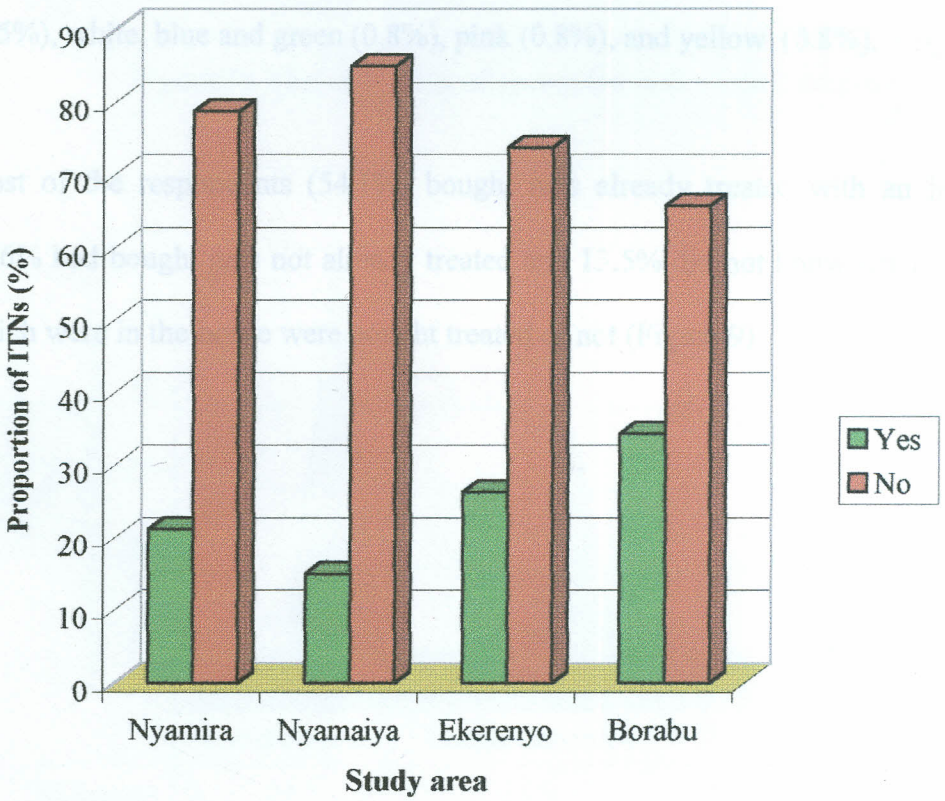
4.2.2 Maternal use of insecticide treated nets in the prevention of malaria among children under five years.

There was a very low usage (33.8%) of mosquito nets, with the percentage of under five using bed nets and insecticide treated nets being 33.3% and 23.8% respectively. Of the mothers who possessed bed nets, 48.1% had one mosquito net, 33.1% had two, 12% had three, 5.3% had four, and 1.5% had five mosquito nets (Table 15). Nyamaiya division had the least proportion of the mothers (15%) using ITNs while Borabu division had the highest proportion of mothers (34.3%) using ITNs for their children (Figure 8).

Table 15: Number of mosquito nets in the households.

Number of nets	Frequency	Proportion of household (%)
One	64	48.1
Two	44	33.1
Three	16	12
Four	7	5.3
Five	2	1.5

Figure 8: Coverage of ITNs within the study area



Most of the nets were bought from the local shops (72.2%) and local vendors (8.3%), promotion sites (3.8%), Hospitals (2.3%), place of work (0.8%), community workers (0.8%), local market (0.8%), and chemist (0.8%). Also some mother (5.3%), received nets free from hospitals (3.8%), Member of Parliament (0.8%) and relatives (0.8%). On the other hand 5.3% of those who had nets, did not know where they came from as they had found them in the house (Table 16).

The study showed that the mosquito nets commonly used were the large size (67.9%), followed by medium (31.3%) then small (0.8%). Round shaped nets (77%) were also very popular; while rectangle (20.6%), triangle (1.5%), and 0.8% households used both round and rectangle. Many respondents used white (54.4%) and blue (27.5%) colours while others used green (11.5%), white and blue (3.1%) white and green (1.5%), white, blue and green (0.8%), pink (0.8%), and yellow (0.8%).

Most of the respondents (54.1%) bought nets already treated with an insecticide, 31.6% had bought nets not already treated and 13.5% did not know whether the nets which were in the house were bought treated or not (Figure 9).

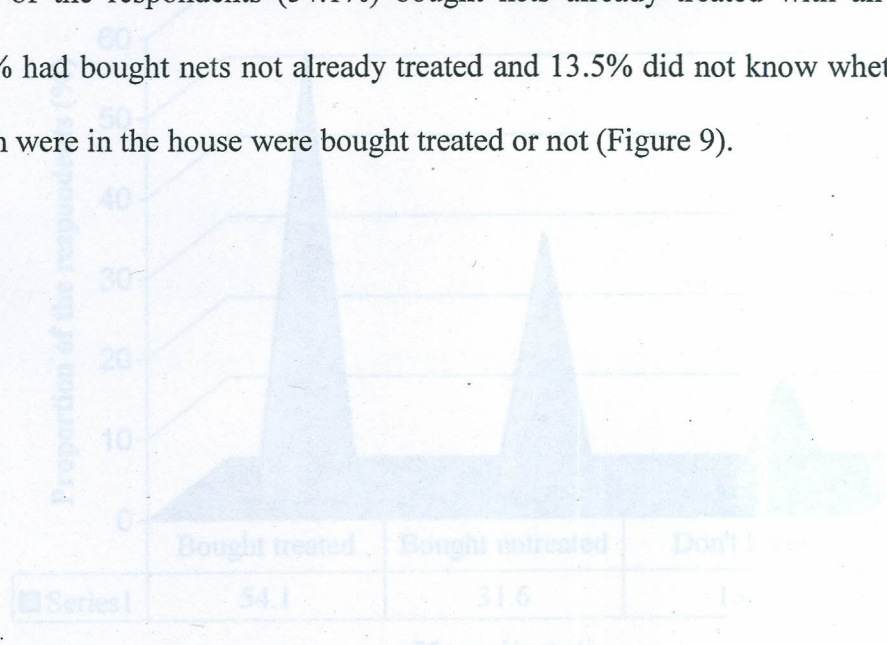
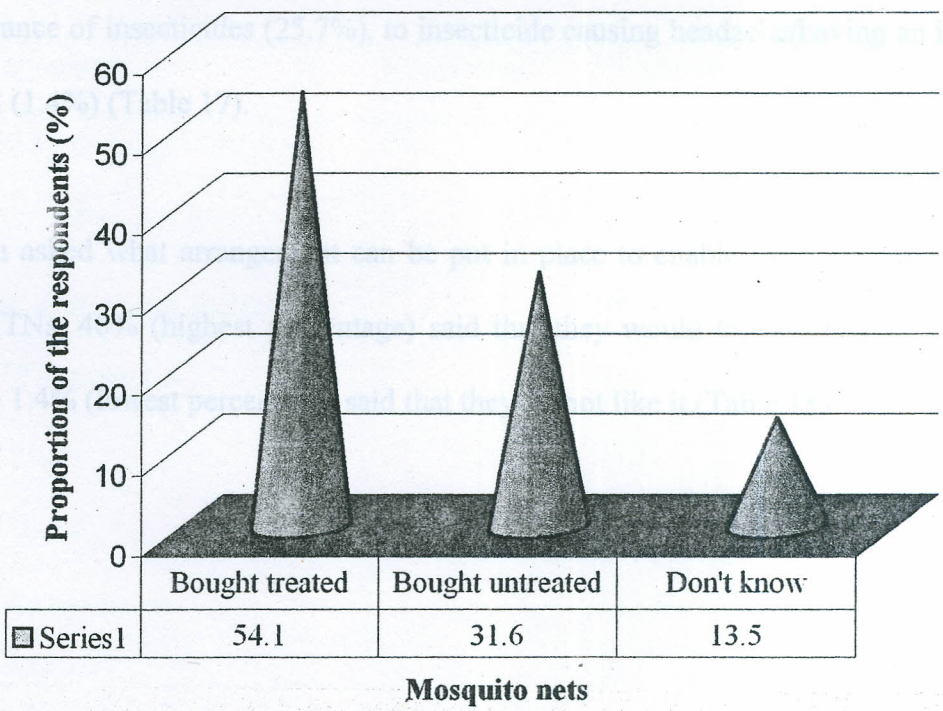


Table 16: Places where mosquito nets were obtained from

Places where nets were bought	Frequency	Proportion bought (%)
Local shops	96	72.1
Vendors	11	8.3
Promotion sites	5	3.8
Hospitals	3	2.3
Place of work (company)	1	0.8
Community worker	1	0.8
Local markets	1	0.8
Chemist	1	0.8
Given free from hospitals, M.P., relatives	7	5.3
Don't know	7	5.3

Figure 9: The condition of mosquito nets when bought.



A good number of mothers (84.2%) had at one time or another washed their nets. The frequency of net washing varied among respondents depending the reason for washing and how dirty the net was. About 30% washed them after six months, 22.3% washed them monthly, and 20.5% weekly, 14.3% after three months, and 15.2% gave other durations such as two weeks, three weeks, and two months. Respondents who washed their nets after three or six months did so for the purpose of treating or re-treating them as instructed by the seller. For mothers who washed their bed nets/ITNs after 3 and 6 months, washing them was highly related with treating or re-treating (χ^2 =12.742, df=1; p=0.000).

Many of the respondents (51.9%) had not treated/re-treated their bed nets/ITN. Out of those who treated/re-treated their nets, 98.5% did so in order to kill/keep mosquitoes away and to improve sleep (1.5%). The respondents who had not treated/re-treated their bed nets/ITNs, cited reasons ranging from having no idea/ ignorance of insecticides (25.7%), to insecticide causing headache/having an irritating smell (1.4%) (Table 17).

When asked what arrangement can be put in place to enable them treat/re-treat bed nets/ITNs, 40% (highest percentage) said that they would try and buy insecticides, while 1.4% (lowest percentage) said that they do not like it (Table 18).

Table 17: The reasons for non-treatment of mosquito nets

Reason	Frequency	Proportion of mothers (%)
Lack of money	11	15.7
Expensive	1	1.4
Not available in shops	11	15.7
Ignorance (Don't know it)	18	25.7
Don't know where to buy	2	2.9
Laziness	9	12.9
Lack of insecticide	7	1.0
Smell irritating/came headache	1	1.4
Duration not expired	10	14.3

Table 18 Arrangements, which can be put in place to enhance treatment of bed nets

Arrangement	Frequency	Proportion of respondents (%)
Would try and buy insecticide	28	40
Be given free	6	8.6
Be sold in the local shops	2	2.9
Be sold through MCH clinics	2	2.9
Don't know	17	24.3
Don't like it	1	11.4
Promotions be done	2	2.9
Do nothing	12	17.1

4.3 Promotion of insecticide treated nets use by the MCH clinics in malaria prevention among children under five years.

Majority of the respondents (71%) had not received any information on the use of bed net/ITN when at the MCH clinic. Only 24.5% got information through open lectures at this centres. Mothers (3.8%) were informed by nurses individually while 0.8% received information through other people such as female friends. Being informed on the use of bed nets/insecticide treated nets while at the MCH clinic was not related with the possession of a bed net/insecticide treated net ($\chi^2 = 5.435$, df=3; $p>0.05$ or $\chi^2 = 4.345$, df=3; $p>0.05$).

The study showed that only 50% of the clinics had bed net/ITN posters mounted at their premises. All the MCH clinics with bed net posters had them fixed both inside and outside the clinics. However, it was only in 50% of the clinics where the posters would easily be seen. This was as a result of them being fixed in hidden places where one would only struggle to see them or being unclear and faint. None of the healthcare providers used bed net/insecticide treated net posters to educate the mothers while at the MCH clinics. That meant that those who did not know how a bed net looks like remained ignorant because they would not identify the posters to be of bed nets/insecticide treated nets. Most women (63.8%) at the MCH clinics had never seen bed net/insecticide treated net posters. This was attributed to the reasons including lack of posters, poorly positioned posters and inability of mothers to read which made it difficult for them to identify the posters. Seeing bed net/insecticide treated net posters was related with the possession of insecticide treated nets ($\chi^2 = 7.995$, df=2; $p=0.018$).

4.4 Factors influencing the use and non-use of insecticide treated nets.

Mothers used insecticide treated nets because they were effective in repelling the nuisance biting of mosquitoes (96.8%), provide privacy (1.1%), gave warmth (1.1%), and prevented dirt/dust (1.1%).

Inability to possess a mosquito net/ITN was attributed to many reasons. Most of the respondents cited lack of money (78.1%), unavailability in local shops (0.8%), and other reasons (20.8%) such as shown in table 19. When asked what arrangements can be put in place to enable them possess a bed net/insecticide treated net, most of them (31.3%) said that they be given free, and others recommended for prices to be lowered/subsided (21.9%) (Table 20).

Table 19: Other reasons for inability to possess a bed net/insecticide treated nets

Reason	Frequency	Proportion of mothers (%)
Laziness/don't remember	36	11.7
No idea about them (Ignorance)	11	3.4
Don't know where to buy	1	0.4
Husbands unwillingness/drunk	2	0.8
Don't' stay at home	1	0.4
Large family	1	0.4
No mosquitoes	4	1.1
Not been bought	4	1.1
Not ready to buy	1	0.4
Don't know the cost	1	0.4
Ready/giving to buy	4	1.1

Table 20: Recommendations given for bed net/ITN possession.

Recommendation	Frequency	Proportion (%)
Sold though MCH clinics	6	2.3
Be availed in local shops	13	4.9
Put compulsory for postnatal and antenatal	2	0.8
Don't know	51	19.2
Educate people	1	0.4
Given on credit	1	0.4
Given free	82	31.3
Promote their use	23	8.7
Lower/subsidise prices	58	21.9
Going to buy	28	10.6

CHAPTER 5: DISCUSSION

It is clear from the existing literature that insecticide-treated nets can effectively reduce the burden of malaria globally, in Africa and Kenya .To meet the objectives of RBM, the targets set at Abuja summit in April 2000 and strategies set by the Kenyan government, a lot of work has to be done to make the ITNs affordable, widely available and most importantly appealing to the consumers especially the at-risk groups.

This study targeted mothers because they are the first people in the community who take the immediate care of children and design their sleeping formulae. During the first months/years of life, most mothers share the sleeping space with their children. The target audiences, for promotion may not necessarily be the same as the target group for ITN use (WHO, 2003)

ITNs should be provided to the pregnant women as early as possible and their use is encouraged throughout pregnancy and during postpartum period (RBM/WHO, 1999). Many women in Africa lack access to medical care and may have limited access to effective tools like ITNs especially in remote areas. However other target audience for promotional campaigns include: fathers, carers, religious leaders traditional healers, grand parents, community leaders, health workers, and traditional birth attendants among others. This study was therefore set to investigate the maternal knowledge and use of ITNs in malaria prevention among children under five years in Nyamira district.

5.1 The mothers' demographic characteristics

Findings from the study revealed a low likelihood of single, separated or divorced mothers using a bed net compared to those with stable marriages. Most single mothers depended either on their own mothers, fathers, or relatives who would not provide for all health requirements of their babies. For example in an interview a single mother said:

"I will try to convince my father to buy a bed net for me and my baby."

The above statement might not only show that some mothers depended on their parents for their basic provisions but also suggest that they did not have their own means of livelihood and that sometimes parents were not willing to provide some things because it was an added burden to them.

Education level was an important determinant of mothers' literacy level, occupation, and income, which in turn, determined bed net/ITNs use as previously documented by other authors (Rashed, *et al.,* 1999; Mac Cormack *et al.,* 1989). For instance the result showed that, those who completed or attended college had ITNs, sustained their use and re-treated them regularly while none of those who never attended school used ITNs. This is therefore a clear indication that the level of education was related to ITNs possession and use.

The study showed that majority of the mothers did not have stable occupations. Many of them were housekeepers and peasants. They relied on small-scale farming for subsistence. Some mothers did casual work to earn them some seasonal income for their upkeep. Very few had permanent jobs, for example teaching, office work of whom almost all used ITN for their children.

Respondents in occupations with stable income had a higher chance of possessing bed nets/ITNs compared to those in occupations with unstable income who had a lower chance of bed nets/ITNs possession. This supports what Mac Cormack *et al.,* (1989) reported that households with seasonal access to cash would not consider procurement of health maintaining items as a main concern.

A high percentage of mothers (93.5%) shared the sleeping space with their children. Those mothers who had more than one child below five years shared the sleeping space with the youngest while the others were left either with siblings or slept alone. The study found out that in a household where there was a net, it was likely that the mother shared it with the under five child. In a case where there was more than one child and the mother did not share the sleeping space with all of them then she shared a bed net with the youngest child. In cases where the children did not share the sleeping space with their parents because they were old enough and needed no attention, then the parents used the bed net alone. A mother with only one child under five years was more likely to have a bed net compared to those who had more children. This was because mothers had the anxiety of taking good care of their first-born children including using a bed net for them. Also those who had more than one child mentioned financial problems as the main reason for not using a bed net.

In a household where there was more than one net then there was a chance that children used a net. This finding is consistent with Chavasse *et al.,* (1999) who reported that children in a household having more than one net may have a chance of using a net. There were slightly more adults rather than children using bed nets. This finding agrees with that of Kachur *et al.,* (1999) and Aikins *et al.,* (1993) while it contradicted with Muthami *et al.,* (1999) who found out that there were high chances

of a net found in the household being used by children than by adults. Those mothers who used a net and not their children cited that the under five children did not like them and that it was too hot/warm for children to sleep under. However it was clear from the mothers that children under five years needed to use bed nets rather than any other member of the family.

Mothers whose household members slept on mats had the lowest chance of possessing a net compared to those members who either slept on bed or both beds and mats. If given a net, mothers said that they would find out means of using them or ensure that they have a bed for their children. The findings were related with those of Jones (2000).

5.2 The mothers' knowledge on malaria, vector management strategies and use of ITNs in malaria control.

5.2.1 The mothers knowledge on malaria and vector control strategies .

The mothers' literacy level was low as evidenced by the number that completed elementary education. This in one way or another affected mothers' knowledge on what malaria is, what causes or transmits it, its symptoms, and who are most vulnerable to the disease.

Most mothers (53.3%) said that malaria was just a disease, meaning that it covers a number of different diseases. Many others said that dirt, dirty compound, dirty food/utensils, unboiled water, uncooked food, lack of food, germs and so forth caused malaria. This was actually related to illiteracy and level of education. Therefore this

showed that most mothers were less knowledgeable of what malaria is, a finding, which corresponds with that of WHO (1989).

The local term used to refer to malaria was *esosera* (yellow substance vomited when one is sick). This meant that malaria was as a result of taking dirty water contaminated with algae (simple plant) in it. However, majority of the young generation did not know of the term. This findings support Kengeya-Kayondo *et al.*, (1994) and Ahorlu *et al.*, (1997) who have reported lack of specificity of local term used to refer to malaria. It must be noted that when people think of other causes of malaria other than mosquitoes, then the control measure considered are other than to control or reduce mosquitoes and their effect. This explains the reason why some mothers in the group discussion would say that to reduce malaria you take clean, boiled water, cooked food and use clean utensils. In such situations a lot of health information education and communication campaigns should be considered to remove misconception and beliefs on malaria and create demand for advocated control strategies.

Nevertheless, majority of the mothers (91.8%) associated malaria with mosquitoes bite. This was attributed to a lot of promotional campaigns through radios in vernacular and community meetings. Even though mothers had the knowledge of bed nets/ITNs, their usage still remained too low, as nets were not priority. As mentioned earlier the little money gotten went to food, school, clothing and nothing was set aside for medical care and effective tools of malaria control like use of bed nets.

It was clear from the study that most mothers had a good knowledge of the symptoms of malaria. They correctly identified the basic malaria symptoms as fever, headache, coldness, body/joint pain, vomiting, diarrhoea, and refusal to eat (loss of appetite). However, mothers could not mention any severe complication, which go with severe malaria such as coma, convulsions, severe anaemia, renal failure, hypoglycaemia, fluid/electrolyte imbalance, pulmonary oedema, hypovolaemic shock, hyperparasitaemia, malaria haemoglobinuria (coca cola coloured urine) and disseminated intravascular coagulopathy (DIC-spontaneous bleeding).

Good knowledge on malaria was associated with the fact that: partly at least the mother, the baby or any other member of the family had experienced malaria attack before and partly, they might have heard it from either the radio in vernacular, community meetings, church meetings or the press. You can reduce healthcare seeking constraints of the affected population by among other things increasing public awareness of malaria symptoms to encourage early reporting at health facilities and support for malaria control activities by using radio, press, community meetings, religious leaders, local language and so forth (WHO, 2001).

Most mothers who had nets and were attacked by malaria felt that the nets were not helping them and hence got discouraged from using them, as they made no difference. The problem is likely to be associated with poor usage of nets, going to bed late (after 10.00 p.m), torn nets, occasionally not using nets, some parts of the body being exposed (like hands and legs before going to bed) among other reasons.

Despite the fact that most women identified the basic malaria symptoms correctly, little did they know that those were actually malaria symptoms as malaria was a representative of any other disease. Very few women were knowledgeable on the most vulnerable groups to malaria. This was connected with their low level of literacy. Knowledge on most vulnerable groups was highly related with ITN possession. Mothers who knew that children under five years and pregnant women were the most vulnerable groups to malaria, had the highest chance of having/using a bed net/ITN for their children. There was a likelihood of families having a net and not using it on children because they did not understand the vulnerability of their children to malaria. Mothers whose children had previously suffered from malaria had the lowest chance of having used a bed net.

From the group discussion most women would not explain the factors behind the high malaria vulnerability of children under five years and pregnant women. This further reflected on their low level of literacy. Children under five years of age have not yet developed protective level of immunity because they have had a limited exposure to malaria. In areas of high transmission, young children are both at high risk of malaria infection and vulnerable to severe malaria disease when infected (WHO, 2003).

Modern methods of vector control were mainly used in the study area unlike the tradition ones. Kachur *et al.*, (1999) wrote that communities used both traditional and modern methods of vector control. The methods, which were used in the study area, included mosquito nets, mosquito repellents such as coils, sprays, others employed environmental management methods such as collecting tins, clearing bushes around the house, and draining stagnant water. Use of modern methods of vector control

might not be the only indication of the community's willingness to change their social norms but also being ready to use more effective methods of vector control like use of ITNs. However, there might be a negative influence of traditional means of repelling the vector on modern ones (Gyapong *et al.,* 1992).

Most women who did not use anything to protect themselves and their children from nuisance mosquito bites were willing to have mosquito bed nets/ITNs but were crippled with lack of money to acquire them. Those who used other methods other than mosquito nets felt that they were cheap and easily applied and made it difficult for them to purchase bed nets/ITNs. On the other hand those who used sprays and coils confessed that their effect was for a while, as the mosquitoes would come back upon disappearance of the smell from the room. This further suggested that the mothers were willing to adopt any new control strategies, which would be more effective, for example use of ITNs.

The amount of money used to buy the smallest tin of spray in the area and which would be used for a whole month was more than half of the cost of a mosquito net. Therefore buying it twice in a month meant spending more money than acquiring a mosquito net, which would be used many months. WHO/UNICEF, (2003a) have documented that ITNs are low-cost and highly effective way of reducing the incidence of malaria in people who sleep under them. The study showed that mosquito repellent users were not consistent in the application of spray and coils. Upon the repellent getting finished, they forgot to buy another until they heard of several mosquitoes making noise in the house. This also depended on whether there was money immediately or not.

5.2.2 Maternal use of insecticide treated nets in malaria prevention among children under five years.

The general coverage of mosquito nets and insecticide treated nets was very low. This meant that very few children were sleeping under bed nets and even fewer under insecticide treated nets. This is the same situation documented elsewhere (WHO/UNICEF, 2003a; Ahorlu *et al.*, 1997).

Majority of the mothers (57.9%) had washed their bed nets/ITNs before completing either three or six months, the required time when they are supposed to be washed, and treated/re-treated. From the study most mothers washed bed nets/ITNs because they were dirty. Despite the problem of getting dirty quickly many mothers preferred white coloured nets to blue, yellow, pink, and green colours. In response to low re-treatment rates of convectional ITNs WHO prompted industries to develop long-lasting insecticidal nets (LLINs) ready-to-use, factory pre-treated nets that require no further treatment during their expected lifespan of four to five years (WHO/UNICEF, 2003b). This technology obviates the need for re-treatment and reduces both human exposure and the risk of environmental contamination. LLINs resist washing (WHO/UNICEF, 2003b). LLINs are regarded as a major breakthrough in malaria prevention.

5.3 Promotion of insecticide-treated nets by the MCH clinics in malaria prevention among children under five years.

MCH clinics played a lesser role in promoting use of ITNs on children under five years of age. The study showed that only 28% of women had recieved the information on the use of ITNs while at the MCH clinics. The information was mostly communicated during the open lectures which were conducted only once in a week and at exactly 8.00a.m in the morning. That meant that only those who came on that day and at exactly 8.00a.m benefited from the lecture. Majority of the women came late and it was only a very small fraction of mothers who benefited from the whole lecture. Furthermore, the issue of ITNs was not raised every week as each week had its own topic to be handled. Some MCH clinics did not conduct any teaching sessions at all. In most MCH clinics nurses/health care providers came late when mothers were already tired and then rushed into their usual duties.

It was only 3.8% of the mothers who confessed to have heard individual messages on the use of bed nets/ITNs from the nurses. Most women were harassed and health care providers did not care about the mothers' problems, blaming them on their ignorance, lack of information and education. It is therefore necessary that the health care providers lead in the campaign against malaria not only by providing treatment and other MCH services but also by promoting the ITNs use.

Information, education, communication of malaria vector control strategies such as use of ITNs should be done through malaria posters, leaflets, private sector malaria messages, malaria advocacy videos, school heath programmes, calendars, NGO developments, radio messages and the media among others (ROK, 2001).

The study showed that only 50% of the clinics had posters communicating bed nets/ITNs use for children and pregnant mothers. Most of those posters were not positioned strategically to be read by women while waiting to be attended to or during the service. Most of them were hidden and not clear.

The study showed that the healthcare providers did not use bed net/ITN posters to inform/teach the mothers on use of bed nets/ITNs. This meant that majority of the women were ignorant, some did not know how to read and hence those who did not know how a bed net looked like, did not identify the posters, or imagine of their use. Majority of the women (63.8%) who attended the MCH clinic had never seen bed net/ITN posters. This was attributed to reasons including: lack of posters, hidden posters, poor positioning of posters and others did not know how to read making it difficult to identify the posters. Mothers seeing bed net/ITN posters was related to possession of insecticide treated nets.

5.4 Factors influencing the use and non-use of insecticide treated nets

Insecticide treated nets were mainly used to keep the mosquitoes away (98.5%) while 1.5% used them to improve sleep. There was no other reason found from the area in contrast to earlier reports (WHO, 2002a; Rashed *et al.,* 1997; Binka and Adongo, 1997; Richards *et al.,* 1993) that gave many other reasons why communities use ITNs. Many people see a bed net as a luxury and not a health maintaining item and therefore not prioritised as necessary.

Low coverage of nets was as a result of many factors. About 78% of the mothers did not use a net because of lack of money and 3.4% because nets were expensive to buy. The little money people got was used for food, school fees and other basic household needs leaving nothing for a bed net/ITN. WHO/UNICEF, (2003b) identified lack of money as a common cited reason for not possessing a net and that the price of a net represents a large proportion of the income of a poor household. There should be a focus on providing sustained subsidies targeted to the most vulnerable groups preferably through a system that uses public channels (for example at antenatal clinics) for delivery of subsidies but commercial distribution channels for delivery of the goods (WHO/UNICEF, 2003b).

Unavailability of bed nets/ITNs in the nearby shops and kiosks was another reason given for not possessing a net. Further more this made people spend money budgeted for a net. Some women reported either laziness or would not be able to remember/think about a bed net/ITN even when they knew them. Other mothers blamed their husbands of drunkenness such that they were unwilling to purchase bed nets and they also took all the money leaving the wife and children helpless.

The study found out that some women were totally ignorant of the existence of bed nets and ITNs. Other reasons cited for not having a net and are of importance included large families, lack of mosquitoes, lack of knowledge on cost, and being single therefore depended on parents or relatives. Most of the reasons cited for not possessing a net revealed willingness to have a bed net/ITN given opportunity and capability. Nyamira district has not benefited from any bed net project and for that

reason no household had a net given free apart from a few given at the district hospital and well wishers. From the group discussions, most members felt that there was need for an initiation of bed net/ITN project by the government or non-governmental organisation to have few benefit from free ITNs but many to be informed and motivated to acquire bed nets/ITNs on their own.

Most of the mothers (51.9%) had not treated/re-treated their nets. Ignorance of existence of insecticide came out strongly as the reason for not treating/re-treating the bed nets/ITN. Therefore there is a need for creating awareness of ITN and insecticide used for re-treatment. Some mothers said that the insecticide was not available in the local shops while others said that it was due to lack of money that they did not treat/re-treat their nets. In trying to investigate whether mother exactly new the prices of insecticides it was found out that many of them actually did not know the actual prices but had a feeling that insecticides were very expensive.

From the group discussion a businesswoman admitted that many sellers exaggerated the prices of ITNs and insecticides above the recommended ones so as to make more profit. There is therefore a need for more strict rules from the government and manufacturers on the sellers to avoid exploitation of ITNs and insecticides consumers. Barriers to increasing the supply and distribution of nets and insecticides include taxes and tariffs, regulatory issues and inadequate distributory systems (WHO/UNICEF, 2003b). Prices of ITNs and insecticides must be driven down by increasing competition, cutting taxes and tariffs, and targeting subsidies to the poorest and most vulnerable. Standard/uniform prices for ITNs and insecticides should be set and consumers informed on the prices and their rights (WHO, 2002b).

From the group discussion a businesswoman said:

> "Most shopkeepers and kiosk owners do not sell ITNs and insecticides because community members did not know them therefore they remained as dead stock on shelves withholding the money which is meant to expand the business".

The above statement indicates that ITNs were not available in the village shops and that the community members (inclusive of children under five years) were not using ITNs and insecticides for treating/re-treating.

Lack of insecticides, laziness, cost, irritating smell that caused headache to some, and lack of information on where to buy are other reasons why women would not treat/re-treat their bed nets/ITNs. About 13% of those who had not retreated their ITNs had not completed either three months or six months for them to be re-treated again. This was an indication that people were willing to use ITNs and insecticides and that more ITNs and insecticide can be bought with more strategic campaigns so as to meet the Kenyan, Abuja and RBM target of reducing the burden of malaria by the year 2010.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS.

6.1 Conclusions

i. There was very low bed net (33.8%) and ITN (23.8%) coverage in the area and even lower coverage of other alternative control strategies.

ii. The mothers' good knowledge on what was likely to cause (transmit) malaria did not influence the use of insecticide-treated nets. This was revealed by the low maternal use of insecticide treated nets in malaria prevention among children under five years.

iii. The majority of the mothers (59%) were less knowledgeable on the most vulnerable groups to malaria. Those who knew that children under five years were among the most vulnerable groups were more likely to have ITNs as compared to those who did not know.

iv. The mothers' level of education and occupation had significant relationships with insecticide-treated nets possession. It may be indirectly inferred that girls should be encouraged to pursue higher levels of education which will among other benefits help them know how to take care of their babies after completing school.

v. Lack of money (78.1%) was the main reason cited for not having a bed net/ITN. Buying a bed net /ITN was not a priority compared to buying food, paying school fees and acquiring other household needs.

vi. Lack of treatment/re-treatment of bed nets/ITNs was traced on ignorance of the existence and unavailability of insecticides in shops.

vii. MCH clinics played little role in promoting the use of ITNs in malaria prevention among children under fives years.

6.2 Operational recommendations.

i. A lot of health information, education and communication campaigns should be conducted in the area to remove the misconceptions and beliefs on malaria and create demand for advocated control strategies such as ITNs.

ii. Health information, education and communication campaigns to sensitise the mothers on the at risk-groups of malaria is essential so as to create awareness of who needed more protection in the community through use of ITNs. All the public health stakeholders can carry this out.

iii. There should be a focus on providing sustained subsidies targeted to the most vulnerable groups preferably through postnatal and antenatal (MCH) clinics for delivery of subsidies.

iv. Prices of ITNs and insecticides should be lowered by increasing competitions, cutting down taxes and tariffs and targeting subsidies to the poorest and most vulnerable communities.

v. Standard/uniform prices for ITNs and insecticides should be set and then consumers informed of those prices and their rights through radio, press campaigns, promotions, TBAs and so on. This should be accompanied with more strict rules from the government and manufacturers on the sellers to avoid exploitation of ITN and insecticides consumers.

vi. There is need for ITNs, which resist washing or be factory pre-treated so as there is no further treatment during their expected lifespan.

vii. MCH clinics should promote the use of bed nets/ITNs through leaflets and posters, which should be accurately positioned, and healthcare providers use them while serving the mothers.

viii. Healthcare providers at the MCH should lead in the campaign against malaria, not only by providing treatment and other MCH services but also by promoting effective vector control measures such as use of ITNs. The Ministry of Health under which MCH clinics operate should spearhead this effectively.

viii. As well mothers should be encouraged to start small money generating projects to help them save for health maintaining items like ITNs.

6.3 Suggestions for future research.

i. A further study should be carried out to determine the role of men/fathers in the use of insecticide-treated nets in the prevention of malaria among children under five years in the area.

ii. There is need for a study on appropriate use and maintenance of the already existing household insecticide treated nets in the area.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE/INTERVIEW GUIDE FOR MOTHERS AT THE MATERNAL CHILD HEALTH CLINIC.

SECTION 1

A. INTERVIEWER INSTRUCTIONS.

i. Interview sampled mothers at the maternal child clinic.

ii. Tick or write the appropriate answers as given by the respondents.

iii. Don't read out answers to the respondents.

iv. Include all answers not categorised.

v. Rank answers in the order they are mentioned.

vi. For those completing the questionnaire, please provide as much information as possible in the blank spaces or tick all the relevant answers as indicated.

B. IDENTIFICATION.

Division.....

Location .....

Sub location .....

Name of village .....

Clinic .....

Respondent No. .....

Interviewer Name .....

Date .....

Time started .....

Time ended. .....

C. INTRODUCTION.

I am Osero Justus from the section of Public Health and Epidemiology, Department of Zoology, Kenyatta University. I am trying to learn more about malaria problems here and I would like to ask you a few questions. I would wish that you participate in the study. However, you are free to decide if you want to participate or opt out. So do you want to participate in the study? **Yes 1 / No 2**

SECTION 2

DEMOGRAPHIC CHARACTERISTICS.

No.	Question.	Coding categories.	Skip to
Q 1	How old are you? (*Probe for best estimate. If 'other' specify).*	(In years) Below 15 1 16-20 2 21-30 3 31-40 4 41-50 5 Other 6	
Q2	What is your level of education? *(If 'other' specify)*	Not gone to school 1 Primary level 2 Secondary level 3 Post secondary 4 Other 5	
Q3	What is your marital status? *(Probe for the best response)*	Married 1 Separated 2 Single 3 Widowed 4 Cohabiting 5	
Q4	What is your present occupation? *(More than one answer possible. If 'other' specify).*	Housewife 1 Casual (day to day basis) 2 Business 3 Farming 4 Office 5	

		Other 6	
Q5	Who controls the household budget? *(If 'other' specify).*	Husband 1 Myself 2 Father 4 Mother 5 Other 6	
Q6	How old is the child you have brought to the clinic?	Age.	
Q7	Do you have other child (ren) below five years?	Yes 1 No 2	
Q8	How many children are they?	No	

SECTION 3

KNOWLEDGE AND ATTITUDE ON MALARIA.

Q9	What is malaria? *(Write verbatim in the space below)*		
Q10	What do you think causes malaria? *(More than one answer possible. if 'other' specify)*	Mosquitoes 1 Sprits/witchcraft 2 Stagnant water 3 Cold 4 Rain 5 Chewing sugarcane 6 Bushy environment 7 Cooking fat 8 Maize floor 9 God 10 Other 11	
Q11	What are the symptoms of malaria? *(More than one answer possible. If 'other' specify)*	Fever 1 Headache 2 Feeling cold 3 Shivering 4 Body/joint pain 5	

		Loss of appetite 6 Abdominal pain/vomiting 7 Other 8	
Q12	Who are most vulnerable to malaria? *(More than one answer possible. If 'other' specify)*	Children 1 Pregnant women 2 Aged 3 Don't know 4 All people 5 Other 6	
Q13	Has/have your child (ren) ever suffered from malaria infection?	Yes 1 No 2	 Q17
Q14	Where did you obtain malaria treatment? *(If 'other' specify)*	Hospital 1 Chemist 2 Traditional medicine 3 No where 4 Other 5	
Q15	Did you have any problem with getting malaria treatment for your child (ren)?	Yes 1 No 2	
Q16	If 'yes' which problems? *(If 'other' specify.)*	Lack of money 1 Distance to hospital 2 Poor infrastructure 3 Other 4	
Q17	How do you and your child (ren) protect yourselves from mosquito bites? *(More than one answer possible. If 'other' specify)*	Use mosquito repellent 1 Use bed nets 2 Use cloths 3 Do nothing 4 Other 5	Q18 Q27
Q18	Which type of mosquito repellents do you use? *(More than one answer possible. If 'other' specify)*	Mosquito coils 1 Creams 2 Mosquito sprays 3 Burning herbs 4 Other 5	

SECTION 4

SLEEPING PATTERN, USE AND NON- USE OF INSECTICIDE-TREATED NETS

Q19	Do you sleep with your child (ren)?	Yes 1 No 2	
Q20	Who do/does they/he sleep with? *(More than one answer possible. If 'other' specify)*	House help 1 Father 2 Siblings 3 Grandmother/father 4 Alone 5 Other 6	
Q21	How old is the person they/he sleep(s) with? *(If 'other' specify)*	Less 5 years 1 Over 5 years 2 Parents 3 Other 4	
Q22	Why do/does they/he sleep with....? *(Say rank given Q18 and Q19. if 'other' specify)*	Use/share a net 1 Share a bed/beddings 2 Can't sleep alone 3 Other 4	
Q23	What do you and your child (ren) sleep on? *(if 'other' specify)*	Beds 1 Hides/skins/mats 2 Other 3	Q24 Q25
Q24	Who sleep(s) on bed(s)? *(If 'other' specify)*	Parents 1 Visitors 2 Less 5 years 3 Older siblings 4 Other 5	
Q25	Who sleep on the mats/skins/hides? *(If 'other' specify)*	Parents 1 Visitors 2 Less 5 years 3 Older siblings 4 Other 5	
Q26	Do you have a bed net?	Yes 1	

		No 2	Q29
Q27	How many bed nets do you have?	No.	
Q28	Who uses a bed net? *(More than one answer possible according to no. given in Q27. If 'other' specify)*	Parents 1 Visitors 2 Less 5 years 3 Older siblings 4 Other 5	Q30
Q29	Do you have a bed net for your child (ren)?	Yes 1 No 2	Q33/36
Q30	Where was/were the bed net(s) bought? *(More than one answer possible. If 'other' specify)*	Local shop 1 Local vendors 2 Given free by .....specify 3 Other 4	
Q32	What type of bed net(s) is/are it/they? *(If 'other' specify)*	Size: small/medium/large 1 Shape: round/triangle/rectangle 2 Colour: white/blue/yellow 3 Other 4	
Q33	Have you heard about insecticide-treated net(s)?	Yes 1 No 2	Q48/49
Q34	Where did you get the information about using a bed net(s)/insecticide-treated net(s) from? *(More than one answer possible. If 'other' specify)*	Radio 1 Press 2 Clinic 3 Community leader 4 Religious leader 5 School 6 Health worker 7 Birth attendant 8 Other 9	
Q35	Was/were the net(s) bought treated with an insecticide?	Yes 1 No 2 Don't know 3	
Q36	Do you have insecticide treated net for your child (ren)?	Yes 1 No 2	Q48/49

Q37	Where was/were the treated net(s) bought? *(More than one answer possible. If 'other' specify)*	Local shop 1 Local vendors 2 Given free by ……specify 3 Other 4	
Q38	How much did it cost you? *(Say rank given in Q33)*	Ksh. ……. Ksh. ……. Ksh. ……. Ksh. …….	
Q39	Why are you using insecticide-treated net(s)? *(More than one answer possible. If 'other' specify)*	Avoid nuisance biting 1 Provide privacy 2 For decoration 3 Keep away rats/snakes 4 Provide warmth 5 Protect against dust/dirty 6	
Q40	Have you ever washed your bed net(s)/insecticide-treated net(s)?	Yes 1 No 2	Q42
Q41	How frequently do you wash bed net(s)/insecticide-treated net(s)? *(If 'other' specify)*	Weekly 1 Monthly 2 After 6 months 3 Other 4	
Q42	Have you ever treated/re-treated the mosquito net(s) with an insecticide since you got it?	Yes 1 No 2	Q46
Q43	How much did the insecticide cost? *(Probe the cost of insecticide in the area. If 'other' specify)*		
Q44	Why do you treat/retreat the mosquito net(s)? *(More than one answer possible. If 'other' specify)*	Kill mosquitoes 1 Improve sleep 2 Keep away other insects 3 Other 4	
Q45	After how long should insecticide-	Two weeks 1	

	treated net(s) be retreated?	One month 2 Six month 3 Other 4	
Q46	Why haven't you treated/retreated the bed net(s) *(More than one answer possible. If 'other' specify)*	Smell irritating 1 Child (ren) are allergic 2 Insecticide is costly 3 Are not in the shops 4 Other 5	
Q47	What arrangements do you think can be put in place to enable you treat/re-treat your net(s)? *(Write verbatim in the space below)*		Q50
Q48	Why are you not having/using a bed net/insecticide treated net for your child (ren)? *(More than one answer possible. If 'other' specify)*	Expensive 1 Too hot 2 Uncomfortable to sleep under 3 Afraid if fire hazards 4 Child don't like it 5 Get dirty quickly 6 Take time to erect/take down 7 Use coil/spray 8 Not available in shops 9 Other 10	
Q49	What arrangements do you think can be put in place to enable you have a bed net/insecticide treated net? *(More than one answer possible. If 'other' specify)*	Lower/subsidise prices 1 Avail them in local shops 2 Given free 3 Promote their use 4 Other 5	

SECTION 5

PROMOTION OF INSECTICIDE-TREATED NETS BY THE MATERNAL CHILD HEALTH CLINICS

Q50	Have you ever been informed about using bed net(s)/insecticide-treated net(s)for your child (ren) while at the child clinic?	Yes 1 No 2	Q52
Q51	Through which methods were you informed about using a bed net(s)/insecticide-treated net(s)? *(More than one answer possible. If 'other' specify)*	Picking leaflets 1 Posters at the clinic 2 By nurses 3 Open lectures at the clinic 4 Other 5	
Q52	Have you ever seen posters at the MCH clinic about use of bed net(s)/insecticide-treated net(s)?	Yes 1 No 2 Don't know 3	

THANK YOU.

APPENDIX 2

GUIDE FOR FOCUS GROUP DISCUSSIONS

A. Introduction.

I am Justus osero, from the section of public health and epidemiology, department of zoology, Kenyatta University. I am trying to learn more about malaria problems here and I would like that we share together in a discussion. I would like that you participate in the discussion. However you are free to decide if you want to participate or opt out.

B. QUESTIONS

1. How do people get infected with malaria? (Probe the following)
   (a) What is malaria?
   (b) What causes malaria?
   (c) What are the symptoms of malaria?
   (d) Who suffer most (most vulnerable) from malaria?

2. Do you think malaria is a problem for children under five years in village/community?

3. What do you think can be done to prevent malaria?

4. Assuming there is a bed net in the household, which members do you think are likely to use it?

5. What is your view about children below five sleeping under insecticide-treated nets? (Probe the following)
   (a) What is an insecticide-treated net?
   (b) Do you think children below five years in your village use ITNs?
   (c) Why do you think insecticide-treated nets are not being used?
   (d) Do you think it is important to use ITNs?

6. What problems are associated with the use of insecticide treated nets in the control of malaria in your community? (Probe for)
   - Cost
   - Availability
   - Attitude
   - Complication in use.

APPENDIX 3

CHECKLIST FOR THE PRESENCE OF BED NET POSTERS IN THE MATERNAL CHILD HEALTH CLINICS IN NYAMIRA DISTRICT

Tick appropriately.

Health centre	Position of the posters					
	Inside	Outside	Use by healthcare providers	Easily seen	Not easily seen	Not available
Nyamira						
Ting'a						
Ekerenyo						
Amatierio						
Ogango						
Nyamaiya						
Chepng'ombe						
Isoge						

APPENDIX 4

MATERNAL USE OF INSECTICIDE-TREATED NETS IN MALARIA PREVENTION AMONG CHILDREN UNDER FIVE YEARS IN NYAMIRA DISTRICT, KENYA.

BY

Osero Justus O.S. (B.Ed H/Sc and Tech.)

SUPERVISORS: Prof. Alloys S.S. Orago and DR. Michael F. Otieno of Kenyatta University.

AT THE ANNUAL POSTGRADUATE SCIENTIFIC CONFERENCE, DEPARTMENT OF ZOOLOGY, KENYATTA UNIVERSITY IN OCTOBER 2004.

ABSTRACT

Malaria continues to be a major public health problem in most countries in the tropics and subtropics. In search for sustainable malaria control measures, studies have shown that the use of insecticide-treated-bed-nets is an effective malaria control strategy. However, although a lot of progress and promotion is being made, the World Health Organization has reported a very low usage of ITNs by mothers with young children. This prompted for a cross-sectional study aimed at determining the mothers' knowledge and use of insecticide treated nets in the protection of children under five years from malaria in Nyamira district, Kenya. Data was collected from 400 mothers who had children under five years using an interview guide, focus group discussions and observation checklists. The data were then analysed using statistical package for social sciences (SPSS) and summarised using frequency tables and bar charts. Chi-square test and relative risk (RR) were used to determine the relationships between different variables and net acquisition and its use. Results from the study indicated

that the use of mosquito nets and insecticide treated nets were very low being determined at proportions of 33.3% and 23.8% respectively. This was attributed to lack of money to purchase them, unavailability in the nearby shops/kiosks, forgetting to purchase, drunk husbands unwilling to purchase the nets, ignorance, dependence on parents to provide them and use of other mosquito repellents. Also most mothers did not treat/retreat their nets using insecticides, which was due to ignorance and lack of the insecticide. Approximately 63.7% of mothers were unable to define what malaria was; as for them it could cover a number of diseases. However, 91.8% (367/400) of the respondents associated malaria with mosquitoes. It was clear from the study that mothers were knowledgeable on malaria symptoms such as headache (70%), fever (68.8%), cold (65%), body/joint pain (61.5%) and abdominal pain/ vomiting (0.5%). Their knowledge was associated with previous attacks and awareness created through radio tuned in the vernacular language. However 59% (236/400) of the mothers did not identify children under five years as one of the most vulnerable groups to malaria. The study showed that only 50% of the maternal child health clinics (MCH) had bed net/ITN posters mounted within their premises. In addition, health care providers in the MCH clinics did not inform and educate mothers on the use of insecticide treated nets for their children under five years. Fifty percent of the MCH clinics had bed net/ITN posters poorly positioned and hence, would not be easily seen and read. The majority of the women (63.8%) who attended MCH clinics had never seen bed net/ITN posters. This was all attributed to absence of posters, poor positioning of the posters and some mothers did not know how to read which made it difficult to identify the posters. These results will assist in increasing and sustaining ITNs coverage. This, in addition will be useful to policy makers and programme developers in implementing projects on malaria control using ITNs.

APPENDIX 5

CONSENT DOCUMENTS TO UNDERTAKE RESEARCH

Attached below, find consent documents to undertake research which include:

1. Research permit from the Ministry of Education, Science and Technology.
2. Research authorization letter from the Ministry of Education, Science and Technology.
3. Research authorization letter from the Nyamira District Commissioner.
4. Research authorization letter from the Nyamira Medical Officer of Health.

PAGE 2

PAGE 3

THIS IS TO CERTIFY THAT:

Research permit No. 13/001/33C 15

Prof./Dr./Mr./Mrs./Miss JUSTUS SAMUEL OSANO OSERO

Date of issue 18th July, 2003

Fee received Shs. 500

of (Address) KENYATTA UNIVERSITY
P.O. BOX 43844, NAIROBI

has been permitted to conduct research in

Location,

NYAMIRA District,

NYANZA Province,

on the topic MATERNAL KNOWLEDGE ATTITUDES AND USE OF INSECTICIDE TREATED NETS IN MALARIA PREVENTION AMONG CHILDREN UNDER FIVE YEARS OLD IN NYAMIRA

for a period ending 30th September xx 2003

National Council for Science & Technology
P.O. Box 30623, NAIROBI

Applicant's Signature

For: A. G. KAARIA
Permanent Secretary,
Office of the Prime Minister

DISTRICT, KENYA

EDUCATION

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

Telegrams: "EDUCATION", Nairobi
Telephone: Nairobi 334411
When replying please quote
Ref. No. MOEST 13/001/33C 155/2
and date

JOGOO HOUSE "B"
HARAMBEE AVENUE
P.O. Box 30040-00100
NAIROBI

18th July, 2003

DISTRICT COMMISSIONER
21 JUL 2003
12/14
NYAMIRA

Justus Samuel Osano Osera
Kenyatta University
P.O. BOX 43844
NAIROBI

Dear Sir

RE: RESEARCH AUTHORISATION

Following your application for authority to conduct research on 'Materna Knowledge, Attitudes and use of Insecticide Treated Nets in Malaria prevention among Children under five years old in Nyamira District, Kenya, I am pleased to inform you that you have been authorised to conduct research in Nyamira District for a period ending 30th September, 2003.

You are advised to report to the District Commissioner , the District Education Officer and the District Medical Officer of Health , Nyamira District before embarking on your research project.

You are further expected to deposit two copies of your research report to this Office upon completion of your research project.

Yours faithfully

A. G. KAARIA
FOR: PERMANENT SECRETARY/EDUCATION

CC
The District Commissioner
Nyamira

The District Education Officer
Nyamira

The District Medical Officer of Health
Nyamira

Nyamenge
PSE IND

OFFICE OF THE PRESIDENT

Telegrams: "DISTRICTER". Nyamira
Telephone: Nyamira 44085 and 44622
When replying please quote
Ref: No. ED.12/14/82
and date

DISTRICT COMMISSIONER
P.O. Box 2
NYAMIRA

22nd July, 2003

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION: -JUSTUS SAMUEL OSANO OSERO

The above named is a Student at Kenyatta University Studying Public Health and has been granted authority to carry out some research on Malaria in various Health Centres in our District.

The purpose of this letter is to request the general Public and particularly the concerned individuels and groups he will deal with to give him the necessary assistance.

NIMRLD NAMENGE
FOR: DISTRICT COMMISSIONER
NYAMIRA

NN/ak

MINISTRY OF HEALTH

Medical Officer of Health's Offi
P.O. Box 3,
NYAMIRA.

Ref: NYM/50/Vol.III/(22) 22nd July, 2003

To All Officers In-charge
GOK Rural Health Facilities,
NYAMIRA DISTRICT

RE: MR. JUSTUS OSIRO O.S.

Authority is hereby given to the above refered student studying MPH Programme at Kenyatta University to access relevent GOK Health Facilities for his research work. His field of research study will cover K.A.P. on IIMS based on information he will receive from your clients and patients.

Your co-operation is therefore solicited.

DISTRICT PUBLIC HEALTH OFFICER
NYAMIRA

Samuel C. Okuche
District Public Health Officer
for: MEDICAL OFFICER OF HEALTH
N Y A M I R A