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MASTER'S DISSERTATION

**Determinants of Long Lasting insecticide treated mosquito bednet
usage in Karongi District 2022**

A dissertation submitted to the University of Rwanda in partial fulfilment of the requirements
for the award of a Master of Science in Field Epidemiology Training Program
In the School of Public Health, College of Medicine and Health Sciences

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DECLARATION

I declare that this dissertation report entitled “ **Determinants of Long Lasting insecticide treated mosquito bednet usage in Karongi District 2022**” is a report on my original study. It was authored by me and was never before turned in for another academic assignment. Where references to all pertinent supporting material and resources have been given, the collaborative and cited contributions have been properly identified and acknowledged.

Date :22/06/2023

Signature

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DEDICATION

As my creator, source of life, wisdom, knowledge, and strength during this FETP Masters program and this research endeavor, I dedicate my work to God the Almighty. I also dedicate this work to my wife NYISABE Lailla, who prayed for me, encouraged me, and helped me every step of the way, as well as to my sons **SHIMIRWA Ganza Yvan** and **IGANZE Aime Aziel** and my daughter **ISHEJA Anaella Jana** also I thank the family of **NSHIMIYIMANA Kizito** for my daily support in this journey, My God richly bless you.

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ABSTRACT

Introduction Malaria is one of vector-borne disease caused by Plasmodium parasite, the use of LLINs as one of malaria core intervention for vector control and reduce malaria burden faced significant obstacles, and some prior studies revealed a discrepancy between LLINs ownership and actual use thus this study aimed to identify the determinant factors associated with LLINs usage in Karongi District.

Methodology :Cross-sectional household survey using multistage sampling designed to randomly select households from each village study was conducted.Descriptive statistic and logistic regression model used in analysis ,odd ratio with their corresponding 95% CI and P-values were used in results presentation .

Results

The results of this study indicate significant associations between LLINs usage and several key variables .Females have a significantly higher likelihood of LLINs usage compared to males (AOR =66.1,95%CI:3.85 -9.67,p=0.01),Marital status was also found to be a significant factor,with married individuals (AOR =4.03,95%CI: 1.75 – 9.31,p=0.01) and widow individuals (AOR=4.19,95%CI:1.34 – 13.13,p=0.01) ,Divorced individual showed a higher association but not statistically significant (AOR =2.01,95%CI:0.67 – 6.03,p=0.21),individuals residing in urban areas show a higher likelihood of LLINs usage compared to those in rural areas (AOR = 2.22,95%CI:1.37 – 3.6,p=0.01),having children underfive years demonstrated a higher likelihood of LLINs usage (AOR=2.92,95%CI:1.66 – 5.13,p=0.01) ,individual living in households with morethan two rooms had a higher likelihood of LLINs usage compared to those in households with one to two rooms (AOR =3.34,95%CI:1.63 – 6.86,p =0.01) furthermore,individuals who slept on a bed were significantly more likely to use LLINs compared to those sleeping on the floor (AOR = 4.99,95%CI:2.95 – 8.45,=0.01),The shape of the mosquito net also played a role with individuals using conical-shaped nets showing a higher likelihood of LLINs usage compared to those using rectangular-shaped nets (AOR =3.51, 95%CI :1.6 – 7.69,p=0.01)

Conclusion : This study identified several determinants of LLINs usage in Karongi District These finding provide valuable insights for designing targeted interventions to improve LLINs utilization among specific population groups. Strategies should focus on promoting LLINs usage among males,divorced individuals,individuals living in rural areas as well as, individuals without children underfive at their household

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LIST OF ACRONYMS AND ABBREVIATIONS

ANC	Antenatal Care
AOR	Adjusted Odds Ratio
CDC	Center for Disease Control
CHWS	Community Health Workers
CI	Confidence Interval
CMHS	College of Medicine and Health Sciences
COR	Crude Odds ratio
DH	District Hospital
DHS	Demographic Health Survey
FETP	Field Epidemiology Training Program
HH	Household
HMIS	Health Management Information System
LLINs	Long Lasting Insecticide Nets
PI	Principal Investigator
PMI	President Malaria initiative
RH	Referral Hospital
SISCOM	System d'Information Sanitaire Communautaire
UR	University of Rwanda
WHO:	World Health Organization

DEFINITION OF KEY TERMS

LLINs consistence use: Sleeping under an Insecticidal Treated bed Net every night

Factors: a condition, certainty, or impact that adds to ITN use.

ITN Utilization: the activity of making handy and successful utilization of Insecticide Treated Nets.

Household: A household is defined as a group of people living within one domicile who normally share meals together.

Long lasting Insecticidal Treated Mosquito bedNets: Nets treated with insecticide to kill or irritate mosquitoes and used as physical barriers.

LLINs Proper Use: The use of standardized LLINs with no holes, properly hanged (mounted) over the bed or sleeping area.

An adult: Any household member above 18years of age.

CHAPTER ONE :INTRODUCTION

1.1.Background

Malaria is one of the biggest threats caused by vector-borne disease caused by the Plasmodium parasite, In 2021 WHO estimated 247 million cases of malaria worldwide and estimated number of malaria deaths stood at 619000 however twenty –nine countries account for 96% of malaria cases globally in developing countries ,Africa accounts about 95% of malaria cases in the world and 5% of severemalaria death (1).

Despite improvements in the disease's management, malaria has returned in some regions where it is still prevalent such as African countries Nigeria 25%,Democratic republic of congo 12% Uganda 5% Cote d'Ivoire,Mozambique and Niger (4%) the main causes of malaria's resurgence and reintroduction are variations in human behaviour and a failure to use control measures consistently and effectively(1).

The nature and scope of the people at risk's behavioural response, either at the individual or collective levels, determine the effectiveness of malaria control strategies, people must be engaged and have a level of awareness and understanding malaria control interventions in order to adhere to them and use them thus to maintain high levels of malaria control(2), however the WHO Global Technical Strategy for Malaria 2016–2030 (2021) emphasizes the need for persons at risk to have access to and be aware of these malaria prevention and control strategies (3),The use of LLINs as one of malaria core intervention for vector control and reduce malaria burden by killing mosquitoes,repel mosquitoes,reduce number that enter into the house and attempt to feed on people insides by bite human(4) .

1.2.Problem statement

By 2020, 65% of sub-Saharan African households had at least one Long Lasting Insecticide nets (LLINs) up from 5% in 2000. the proportion of households with at least one LLINs for every two occupants increased from 1% in 2000 to 34% in 2020 and the proportion of people who had access to an LLINs in their home increased from 3% to 50% during the same time frame(1), Between 2000 and 2020, the percentage of people who slept under LLINs climbed significantly across the world (from 2% to 43%), among children under five years (from 3% to 49%), and among pregnant women (from 3% to 49%) (1), but since 2017, sub-Saharan African LLINs access and utilization indices have been falling down.

According to DHS 2019-2020, 66% of households in Rwanda have at least one Long lasting insecticide net, 51% of households have access on LLINs where households have access to LLINs when they possess a sufficient number of nets based on the World Health Organization's (WHO) recommendation of one net for every two people in malaria-prone areas, and when these nets are distributed or made available through various channels such as health facilities, community-based distribution programs, or mass campaigns (5) moreover 48% sleep under LLINs the night before the interview , 34% of households have enough LLINs to fully protect everyone inside the home from mosquito bites (6), these data shows a difference between ownership and use of LLINs, as well as between ownership and accessibility. The availability, acceptability, ownership, and frequent and efficient use of LLINs are crucial to the prevention of malaria infection (7,8), worldwide there is evidence that sleeping under LLINs is effective in reducing the incidence of malaria by offering personal protection lowering the bite rate through physical protection and its insecticidal effects(9).

In Karongi district according the LLINs need assessment conducted in June 2022 ,there is 221336 sleeping area and 159697 total number of LLINs .Among them 92027 of the nets were less than two years in community and 67964 are over two years thus the coverage of LLINs in this area is 72% with ratio of 1.4 LLINs per sleeping area .

LLINs consistent and effective use faced significant obstacles, and some prior studies revealed a discrepancy between LLINs ownership and actual use(10). Other studies, however reported misuses of LLINs but these studies did not support their assumption that bed nets are diverted for alternative purposes, they concluded that future empirical studies should aim to identify the determinants of effective use and misuse of malaria preventive and control measures(11,12). This study aimed to identify the determinant factors associated with LLINs usage in Karongi District.

1.3. Justification of the study

In terms of preventing malaria among residents of the Karongi district where malaria is endemic and constitute around 78% visiting health service either in community health workers or health facilities , this study will provide information in the field of public health. The results of this study will help stakeholders in health promotion, healthcare professionals and the Ministry of

Health identify the factors that influence residents of Karongi to consistently use long-lasting insecticidal treated nets. Additionally, the findings will help Karongi district health professionals and the ministry of health come up with solutions to the problems that undermine the usage of longlasting insecticidal-treated bednets in preventing malaria, which will lower malaria incidences among residents of Karongi.

2.Objectives

2.1. Main objective

To identify and examine the key factors influencing the consistency utilization of long-lasting insecticidal treated mosquito bednets in Karongi District during the year 2022, with the aim of improving the overall effectiveness of malaria prevention and control strategies in the District

2.2. Specific objectives

- ❖ To determine LLINs coverage rate in Karongi District
- ❖ To determine the proportion of households utilizing LLINs in Karongi District
- ❖ To determine the proportion of individual consistently use LLINs in Karongi District
- ❖ To identify the factors associated with households consistence use of LLINs in Karongi

2.3. Research Questions

- ❖ What is the Coverage rate of LLINs in Karongi District
- ❖ What is the proportion of households are using Long lasting insecticide bed nets in Karongi District?
- ❖ What is the proportion of individual consistently use LLINs in Karongi District.
- ❖ What are the factors associated with individual,community and household consistence use of LLINs in Karongi District ?

2.4.Organization of the study

Our thesis consisted of three additional chapters in addition to the general introduction, conclusion, and recommendations; The second chapter discusses the conceptual and theoretical underpinnings of the research; it defined semantic terminology and describes the theoretical context in which the research will carried out. The third chapter vovered the research methodology, which demonstrates the procedures and approaches utilized to complete this task and choose the study's instances.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

One of the primary methods of preventing malaria is the use of LLINs to protect individuals by killing or deterring mosquitoes (13) . To be successful, the population at risk must accept LLINs and LLINs must be affordable and used in accordance with regulation .

The majority of research in Africa and Asia have shown that using LLINs can significantly reduce anemia, reduce severe malaria sickness by 29%, and reduce occurrences of malaria by roughly 50% for individual users (14).

In highly endemic areas of Africa, LLINs have a mean preventive efficacy against malaria episodes of about 50%. In both high and low malaria transmission areas in Rwanda, the pregnant women's net has been found to protect women and their children from malaria (15).

2.2. Knowledge on malaria transmission and prevention

In Rwanda, there is a high level of general awareness of malaria, with around (41%) women exposed to messages about the disease, the majority of which come from radio. These women recognized fever as a symptom of malaria, and 87% knew that mosquito bites cause the disease, while 54% knew that an insecticide-treated bed net can prevent it (16). Perceptions Understanding who is aware of the causes and symptoms of malaria as well as how to use effective mosquito avoidance practices are key steps in finding and targeting vulnerable populations and ensuring the sustainability of malaria control efforts. Beliefs and attitudes about malaria are frequently ignored in malaria control efforts. The malaria program's failure to establish lasting control results from a failure to take into account knowledge, attitude, and practice concerning the disease (17). However, some people have misconceptions about the causes of malaria, such as consuming raw fruits, drinking filthy water, eating or drinking hot food, and eating sugar cane (18) . Understanding a person's health-seeking behavior and adoption of preventative measures requires understanding their attitude toward malaria as a disease. Some individuals think that malaria is deadly and hazardous, while others think that it's natural for it to occur during pregnancy (19).

2.3. Long Lasting Insecticide Net (LLINs) consistence use

2 billion insecticide-treated net have been shipped and distributed worldwide since 2004. According to the Malaria World Report, the creation and widespread use of these nets has led to the global efforts that have prevented more than 7 million cases of malaria worldwide, preventing 68% of cases in Africa since 2000. According to the most recent global malaria report, from 26 to 61% more individuals slept under insecticide-treated nets between 2010 and 2018. Each net normally protects two persons at once and lasts up to three years and twenty washes.(20). The availability, acceptance, ownership, regular usage, and effectiveness of LLINs are all essential to preventing malaria infection globally (21). LLINs use, however, faces significant social, economic, and cultural obstacles, and numerous studies have revealed a discrepancy between LLINs ownership and actual use. (22,23) Heat and discomfort were obstacles use of bed nets. Net misuse such as using them for building poultry pens, fishing boats, or agricultural structures (8) and in study conducted in Mbitu Kenya sleeping on floor decrease use of LLINs(24). In order to decrease the gap between bed net ownership and use, this study will also be helpful to study the factors that influence behavior in use of LLINs.

Programs for malaria prevention and control should take into account how people perceive and behave when it comes to the disease in order to control and eliminate malaria. Individual perceptions about the seriousness of malaria and related exposure encourage individuals to consistently and effectively use LLINs(25).

The Long lasting insecticidal net has crucial potential for malaria prevention, but LLINs are also useful against other insects and animals like flies, cockroaches, lice, fleas, scorpions, and so forth. People who sleep under insecticide-treated nets experience much fewer bites that cause malaria fever than those who do not(26).Long lasting insecticidal treated net consistence use is defined as sleeping under mosquito net every night however those who sleep under net most or some night defined as inconsistent use of LLINs(27).

2.4. Factors associated with the use of LLINs

As we know Long-Lasting Insecticidal Nets (LLINs) have been widely recognized as a crucial tool in malaria prevention, significantly reducing the burden of the disease in endemic regions. LLINs are effective in reducing mosquito bites and transmission of the Plasmodium parasite, which causes malaria. However, the successful implementation of LLINs relies not only on their distribution but also on factors that influence their utilization. Understanding these factors is essential for designing effective interventions to increase LLIN utilization rates.

Socioeconomic Factors: Socioeconomic status plays a significant role in LLIN utilization. Several studies have consistently shown that households with higher income, education levels, and better living conditions are more likely to use LLINs. Economic constraints can hinder the acquisition of LLINs, making them less accessible to lower-income populations. Additionally, education influences individuals' awareness of the benefits of LLINs and their proper use (28).

Perceived Benefits and Knowledge : Knowledge about malaria transmission and the protective benefits of LLINs is crucial. Individuals with a better understanding of malaria transmission are more likely to use LLINs consistently. Perceived vulnerability to malaria and the belief that LLINs are effective tools for prevention are also associated with higher usage rates(29) .

Household Size and Composition: Household dynamics influence LLIN utilization. Larger households with more family members are likely to have higher rates of LLIN usage due to the need to protect multiple individuals. Furthermore, the presence of pregnant women and young children increases the awareness of the importance of LLINs in protecting vulnerable groups (30).

Accessibility and Availability: Proximity to distribution points, ease of access to LLINs, and availability are critical factors. Households located farther from distribution points are less likely to obtain LLINs. Moreover, households with insufficient LLIN supplies are more likely to share nets, impacting their effectiveness(31).

The literature review highlights the multifaceted factors that influence LLIN utilization, providing insights for policymakers and public health practitioners to design comprehensive strategies that encourage consistent and effective LLIN use.

2.5.CONCEPTUAL FRAMEWORK

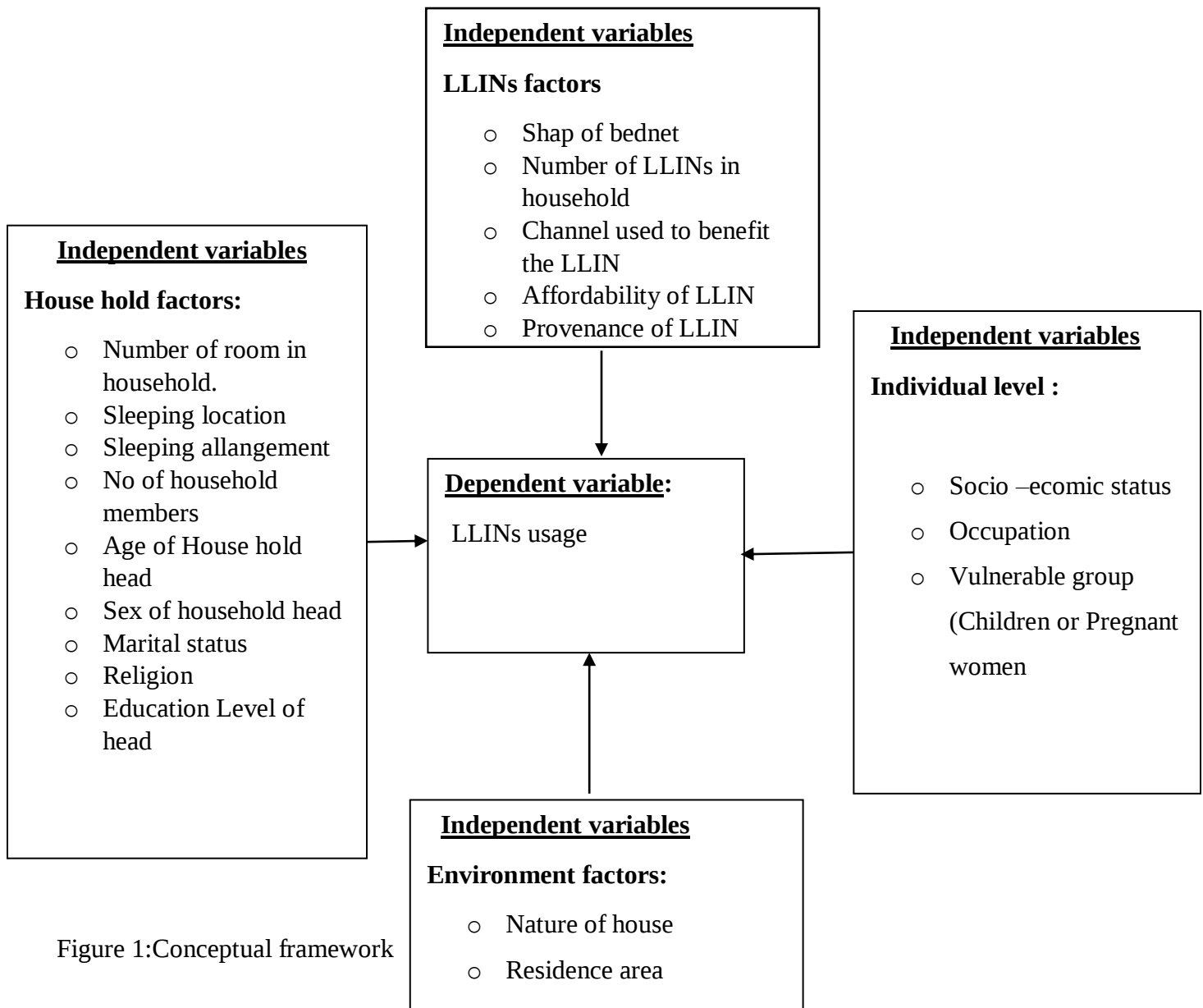


Figure 1:Conceptual framework

CHAPTER THREE :RESEARCH METHODOLOGY

3.1.Study design

The study design is cross sectional study design

3.2.Study setting



Figure 2: Study setting

This study was conducted in Karongi District, one of the seven District of Western Province of Rwanda, divided into 13 administrative sectors, subdivided into 88 cells and 538 villages ,Karongi District has also three hospitals namely Mugonero District Hospital ,Kirinda District Hospital and Kibuye Referral Hospital.

Karongi District stretches over an area of 993km² with a total population of 331,571 ,females 175,684 this population is distributed into 77000 households and is among the district with high density in Rwanda 334 person per square kilometer with population growth rate of 1.7% the majority of population in Karongi is youth 80% aged less than 40 years old where about 54% of the population is aged 19 years or younger and 5% represent 65 years and above ,agriculture and livestock farming remain the key economic activities ,schooling rate still low where 30.3% of peoples have access to primary schools (32,33). The geographic coordinate of Karongi ,latitude is – 2.1296 and longitude is 29.3617.

3.3. Study population

The study population is population based household survey and individual where head of household administrated structured question during this survey in Karongi district.

3.4. Sample size determination

The sample size calculation use kish leslie (1965) formula used in cross section study as the following:

$$n = \frac{Z^2 \cdot P \cdot q}{d^2}$$

n: The required sample size

Z: Value corresponding to 95% confidence interval for a standard normal distribution curve =1.96

P: Proportion of LLINs ownership in Karongi District is estimated at 51% according recent DHS

q :1-P

d: maximum acceptable sampling error :0.05

Design effect 2 and 5% of non-response rate to give sample size of 806 households

$$n = 2 \frac{(1.96)^2 \cdot 0.51(1-0.51)}{(0.05)^2} = 806$$

3.5. Sampling unit

Study unit was household in selected cluster referring on list of District household Ubudehe socio – economic categories of house hold in Karongi District .

3.6. Sampling procedures

Multi stage cluster sampling design to systematic randomly select households from each village using Ubudehe list for individual data collection so we conducted the study on sector level where we consider sector as cluster 6 /13 sector have been selected systematically randomly that in each sector ,we selected systematically randomly 2 cells witch in each 2 villages have been selected randomly then in each village 68 households has been selected randomly and all individual abover 18 years in selected households .

Inclusion criteria is the head of household aged above 18 years who accepted free oral informed consent and resident in Karongi district and this person must be in good health status and confidentially allowing individual to provide the response.

Exclusion criteria is household where head of household has mental health problem and unable to provide coherent response or head of household refuse to participate in study by refusing to accept the informed consent have been excluded also those who not resident in Karongi has been excluded in this study.

3.7.Variable collected

3.7.1.Dependent Variable

Usage of LLINs (Consistence use) where in this study mosquito bed net consistence use defined as a categorical variable with two possible value ,sleeping under bed net every night (Consistence use) and those most , some nights or rarely /never in week (incostence use)(27).

3.7.2.Independent Variables

Household factors: Number of room in household , Sleeping area ,Sleeping allangement, Number of household members, Number of persons per bednets,Number of children underfive years in household,Age of household head ,Sex of head of household ,Marital status of head of household ,Religion ,Education Level of head of household ,LLINs Possession

Environments information: Nature of house,residence

Individual factors : Ubudehe categories ,occupation, Vulnerable group (Children or Pregnant women) ,Chanel of receiving LLINs.

LLINs factors : Number of LLINs in household, Shape of Long Lasting Insecticidal bednet

3.8.Data collection techniques and instruments

For surveys the structured questionnaire was developed and written in English and translate in Kinyarwanda.It has been used for data collection, and was used by trained data collectors to capture information in household, the researcher with the data collectors moved through each sector for introduction to local leader before entering in household.

The house hold has been selected referring on list of District ubudehe social categories in village administrated the questionnaire to head of household or spouse in selected household by ask using this structured questionnaire contained open ended question to collect quantitative information from the respondents and also we collect information by observing state of LLINs in household. Data collector before intering in household first meet in charge of village or community health worker to be introduce himself and to oriented to the household selected in that village .

3.9.Methodology of response to the objectives

3.9.1.Showing how to respond different objectives

Table 1: table showing how to respond different objectives

Objective	Interview question	Indicator	Numerator	Denominator
To determine LLINS Coverage rate in Karongi District	Does your household have any Mosquito nets?	Proportion of LLINs reported	Total number of LLINS Reported in household	Total space used for sleeping in the household
To determine the proportion of households using LLINs in Karongi District	Did any one sleep under the mosquito net Last night in this house hold?	proportion of LLINs in households used	Number of LLINs slept in the night prior the survey	Total number of LLINS Reported in household
To determine the proportion of individual consistence use of LLINs in Karongi District	How frequent do you tuck in the LLINs	Proportion of individual consistence use LLINs consistently	Number of individuals that use LLINs: Every day and every night /All Night, Most/Some night Rarely/Never	Total number of LLINS Reported in household

To identify the factors associated with consistence use of LLINs in Karongi District.	How frequent do you tuck in the LLINs ?	Associated factors with statically significant	Dependant variable is Slept under LLINs Categorised in consistency or non consistency use	Independent Variables : Household factors level ,Individual level factors ,Community or Leadership factors Environment factors
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3.10. Data management and data analysis

Data has been collected using online kobotool box then data have been cleaned using excelsheet for further data analysis using Stata version 14. In order to describe the parameters linked to consistent usage of long-lasting insecticidal bednets, descriptive statistics as well as univariate, bivariate, and multivariate logistic regression statistical models are utilized , odd ration with their corresponding confidence interval of 95% used in results presentation ,P.value was fixed at 0.05, The results present in form of tables, frequencies and charts or graphs,during data analysis coverage rate will be calculated based on total sample size however LLINS utilization will be calculated based on population reported to have LLINs thus consistence use LLINS and its factors associated.

3.10.1 Recruitment of study participants

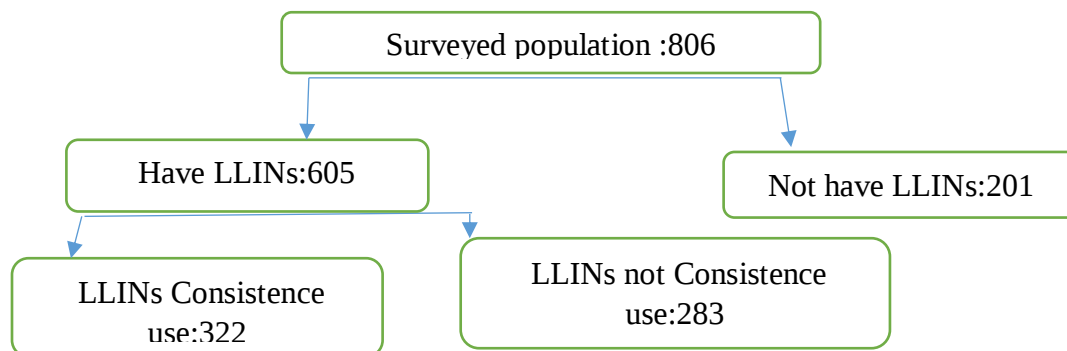


Figure 3:Recruitment of study participants

Above table sought the total population surveyed in our study where 806 constituted our population, where we found 605 population who hold LLINs that interested in our study to determine the factors associated with LLINs consistency use. Also this population has used to determine the coverage of households holding LLINs considering total surveyed population as denominator however 201 not have LLINs in their households didn't used anywhere in determination of factors associated.

3.11.Quality control

In order to assess the validity and reliability of the instruments, the questionnaire was pre-tested by the researcher in a sector outside the scope of our study. After the tools were pre-trained, some changes were made to the questionnaire by rephrasing or adding new questions. With the aim of enabling them to repeatedly ask the same questions and also be able to gather all the information required from the respondents without compromising the data collection process, data collectors have received training on the instruments to be used in data collection.

3.12.Ethical consideration

The University of Rwanda College of Medicine and Health Sciences (Institution Review Board) has granted its ethical approval Ref :CMHS/IRB/127/2023 on 20th/02/2023. Authorities in the research areas have given their consent for the collection of data, and every study participant consented prior to the actual survey.

CHAPTER FOUR: RESULTS

4.1.Characteristics of individuals for households in Karongi District

The following finding provide of socio-demographic characteristics of the sample population and their LLINs usage behavior ,the table shows the number of individuals who consistently used LLINs (always used LLINs when sleeping),the number of individuals who inconsistently used LLINs(did not always use LLINs when sleeping),and the total number of individuals in the sample.

Generally our participant are 605 with mean age of 38.8 the majority were female 394(65.1%) and married represent 463(76.5%). The most common age group was 29 – 39 years old 201 (33.2%) followed by 18 – 28 years 163 (26.9 %) and most common socio – economic status was Ubudehe Category II 295 (48.8%),followed by Ubudehe Category III 224 (37%) ,main occupation was farmer 298 (49%) followed by self employed 278 (46%),the dominante religion was protestant 189 (44.1%) followed by Adventist 189 (31.2%) and catholic 149 (24.6 %). More individual lived in rural areas 328 (54.2%) than urban areas 277 (45.8%).The majority of individual did not have pregnant 519 (85.8 %) or children underfive years 426 (70.4%) in their household.

Majority of households had more than two rooms507 (83.8%) and individuals slept on a bed are 447 (73.9%). The most common place to obtain LLINs was the community 359 (59.3%),followed by health centers 230 (38%) ,finally the most common channel through which individuals received LLINs was mass campaign distributions 335 (59%),followed by ANC service 131 (22%) moreover in Karongi District we find the coverage rate of LLINs is 75% and utilization of Long lasting insecticidal bednet is at 78% however consistence use is 58 %.

Table 2 : Characteristics of individuals in households in Karongi District

Variables	Frequency	Percentage
Socio-demographic characteristics		
Gender		
Female	394	65.1%
Male	211	34.9%
Age_group category		
18-28 years	163	26.9%
29-39 years	201	33.2%
40-50 years	100	16.5%
51-60Years	56	9.3%

61-70Years	57	9.4%
71+ years	28	4.6%
Marital status		
Divorced	35	5.8%
Married	463	76.5%
Single	73	12.1%
Widow	34	5.6%
Residence (Sector)		
Bwishyura	115	19.0%
Gishyita	97	16.0%
Mubuga	94	15.5%
Murambi	76	12.6%
Murundi	104	17.2%
Rubengera	119	19.7%
Socio -economic status		
Ubudehe Category I	86	14.2%
Ubudehe Category II	295	48.8%
Ubudehe Category III	224	37.0%
Education level		
Non educated	99	16.4%
Primary	262	43.3%
Secondary	180	29.8%
High school	64	10.6%
Religion		
Adventist	189	31.2%
Catholic	149	24.6%
Protestant	267	44.1%
Occupation		
Farmer	298	49.3%
Civil servant	29	4.8%
Self employed	278	46.0%
Community status		
Rural area	328	54.2%
Urban	277	45.8%
Pregnant women		
Yes	86	14.2%
No	519	85.8%
Having children under five years		
Yes	179	29.6%
No	426	70.4%
Household structure		
House of mud	210	34.7%
House of cement	395	65.3%
Number of Rooms in households		
1-2Rooms	98	16.2%

> 2rooms	507	83.8%
Sleeping location		
Bed	447	73.9%
Floor	158	26.1%
Sleeping arrangement		
One on bed	211	34.9%
Two on bed	350	57.9%
More than two in th..	44	7.3%
Provenance to acquire LLINs		
Community	359	59.3%
Health center	230	38.0%
Market	16	2.6%
Channel to benefit the LLINs		
ANC Service	131	21.7%
Masse campaign dist..	355	58.7%
Vaccination service	103	17.0%
Other	16	2.6%
Affordability of LLINs		
LLINs bought	16	2.6%
LLINs freely given	589	97.4%
Size member of HH		
1-2 Occupants	37	6.1%
3-5 Occupants	394	65.1%
6+ Occupants	174	28.8%
Number of Mosquitonets in households		
1-2 mosquito	459	75.9%
3+ mosquito	146	24.1%
Shape of mosquito bednet		
Conical	122	20.2%
Rectangle	483	79.8%

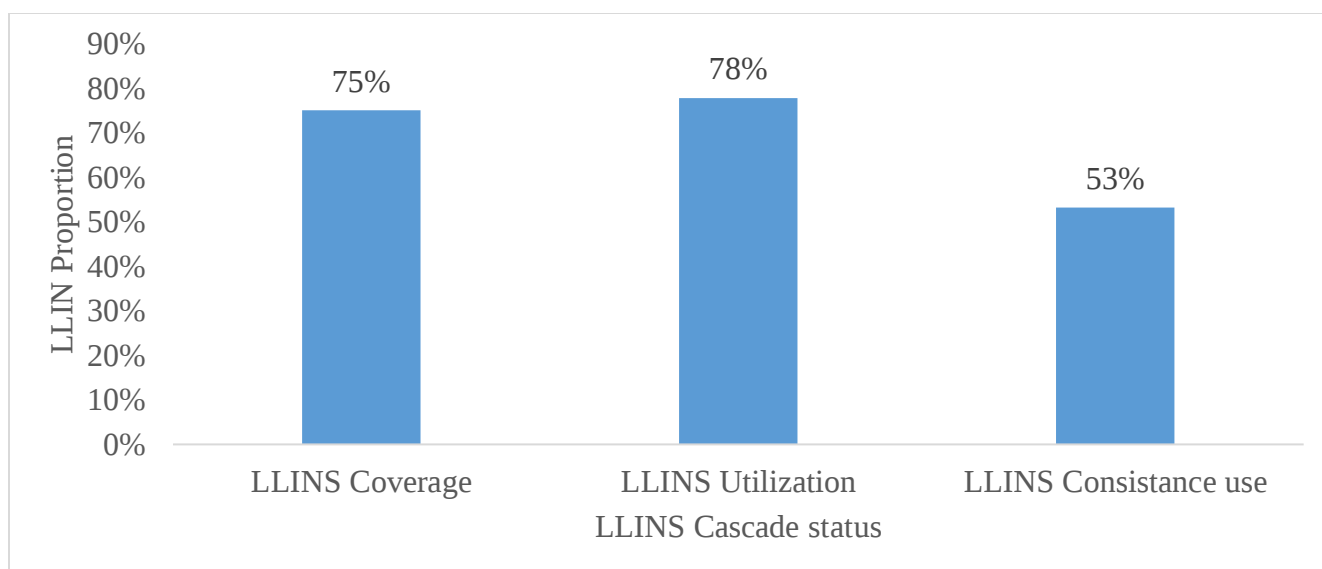


Figure 4: LLINs Coverage rate ,Proportion of households using LLINs and individual consistently use LLINs in Karongi District.

4.2. Long lasting insecticide nets coverage rate in Karongi District

The LLINs coverage rate in Karongi District is 75%. This indicates the percentage of households in the district that have access to Long-Lasting Insecticidal Nets (LLINs). It is a measure of the reach of LLINs distribution programs and efforts to ensure that a significant portion of the population is protected against malaria.

4.3.The proportion of households using Long lasting insecticide nets in Karongi District

The proportion of households using LLINs in Karongi District is 78%. This metric provides insights into the effectiveness of LLINs distribution and utilization efforts. It indicates the percentage of households that actually utilize the LLINs they have received, reflecting the level of acceptance and adoption within the community.

4.4 .The proportion of individual consistent use of long lasting insecticidale nets in Karongi District

The proportion of individuals consistently using LLINs in Karongi District is 53%. This measurement assesses the adherence to LLINs usage among individuals who have access to LLINs. It highlights the extent to which LLINs are being used consistently and correctly, which is crucial for maximizing their potential in preventing malaria transmission.

4.5. Factors associated with consistence use of LLINs in Karongi District

4.5.1. Bivariate analysis using logistic regression

4.5.1.1. Individual factors associated with LLINs consistence use

In bivariate analysis our results sought that socio – economic status using ubudehe Cath I as reference group which means that the results for ubudehe Category II and Category III are present relative to category I ,the data shows that peoples in ubudehe category II and III are morelikely to use LLINs consistently compared to those in category I ,the odd ration for ubudehe cath II and cath III are 3.77 and 1.29 times respectively with their (95% CI, 1.75 – 4.93) ,(95%CI,2.2 – 6.45) the P.value for both are less than 0.05 which indicates that the differences between these group are statically significant.

Occupation in this study used farmers as the references group ,the results show that self-employed individuals have higher odd ration of long lasting bednet consistence use compared to farmers with COR of 1.85(95%CI,1.33 – 2.57) and P.value of 0.01 however there is no statically significant difference between civil servants and farmers as the P.value for civil servant is greater than 0.05.

Pregnant women the data shows that pregnant women have COR of 1.78(95%CI,1.1 – 2.86) and P.value of 0.02 of LLINS consistence use compared to non pregnant women .

Children underfive years : the study used children overfive years as reference group where the results show that children underfive years have an OR of 4.81 with (95%CI ,3.21 – 7.2) and P.value 0.02 of LLINs consistence use compared to children abovefive years .

Table 3: Individual factors associated with LLINs usage

Variables	LLINs usage		COR	Bivariate		
	Consistent	Inconsistences		95% CI		p-value
	n=(%)	n=(%)		Lower	Upper	
Socio -economic status						
Ubudehe						
Category I	25 (29.07%)	61 (70.93%)	Ref			
Ubudehe						
Category II	161 (54.58%)	134 (45.42%)	2.93	1.75	4.93	0.01
Ubudehe						
Category III	136 (60.71%)	88 (39.29%)	3.77	2.20	6.45	0.01
Occupation						
Farmer	136 (45.64%)	162 (54.36%)	Ref			

Civil servant	17 (58.62%)	12 (41.38%)	1.69	0.78	3.66	0.19
Self employed	169 (60.79%)	109 (39.21%)	1.85	1.33	2.57	0.01
Pregnant women						
Yes	56 (65.12%)	30 (34.88%)	1.78	1.10	2.86	0.02
No	266 (51.25%)	253 (48.75%)	Ref			
Having Children under 5 YO						
Yes	140 (78.21%)	39 (21.79%)	4.81	3.21	7.20	0.01
No	182 (42.72%)	244 (57.28%)	Ref			

COR:Crud odd ration,CI:Confidence Interval ,Ref :Reference

4.5.1.2. Demographic characteristic of household associated factors with LLINs usage

These results show the relationship between various demographic and household characteristics and bednet usage.

Considering number of Rooms in household the odds ration is 4.69 time higher among households with more than 2 rooms compared to those with 1- 2 rooms (COR= 4.69 ,95%CI: 2.84 - 7.72,p= 0.01),the odd of consistence use of LLINs among households with cement house was 2.82(95%CI:2 – 3.99) times higher than those with mud house, sleeping location have 5.75 times higher among those who slept on a bed compared to those who slept on the floor (COR=5.75 ,95%CI:3.8 - 8.72,p= 0.01) ,following household occupants the odd ration of consistence using bednets were 2.43 time more among households with 3 – 5 occupants compared to those with 1 – 2 occupants (COR=2.43 ,95% CI:1.19 - 4.97,p=0.02) and the odd ration bednet consistence were 2.69 times more among households with 6 or more occupants compared to those with 1 – 2 occupants COR =2.69 ,95%CI:1.27 - 5.69,p=0.01) ,for marital status the odds of consistence use bednets were 3.39 time more among divorced individuals compared to single individuals (COR =3.39 ,95%CI:1.35 - 8.48,p=0.01) ,the odds of consistence use bednet were 7.71 time higher among married individuals compared to single individuals (COR =7.71,95%CI:4.04 - 14.71,p=0.01) moreover the bednet consistence use were 5.08 times higher among widowed individuals compared to single individuals (COR =5.08,95%CI:2.04 - 12.68,p=0.01),bednets consistence use were 5 times higher among female individuals compared to male individual (COR=5,95%CI:3.47 - 7.2,p=0.01

According religion there was no significant association between bednet consistence use and individual who identify as catholic or Protestant compared to Adventist.

Considering education level the odd ration of bednet consistence use were 2.42 time higher among individuals with a high schools compared to non –educated individual (COR=2.42,95%CI:1.27 - 4.62,p=0.01) there was no association between bednet consistence use among individuals with primary education but the association is observed among individual who attended secondary education with (COR=2.4,95%CI:1.45 - 3.96,p=0.01).

Table 4 : Demographic and household factors associated with LLINs consistence use

Variables	LLINs usage		COR	Bivariate		
	Consistent	Inconsistences		95% CI		p-value
	n=(%)	n=(%)		Lower	Upper	
Gender						
Female	262 (66.5%)	132 (33.5%)	5.00	3.47	7.20	< 0.0001
Male	60 (28.44%)	151 (71.56%)	Ref			
Age categories						
18-28 years	112 (68.71%)	51 (31.29%)	3.95	2.09	7.49	0.01
29-39 years	108 (53.73%)	93 (46.27%)	2.09	1.13	3.86	0.02
40-50 years	39 (39%)	61 (61%)	1.15	0.58	2.27	0.69
51-60Years	20 (35.71%)	36 (64.29%)	Ref			
61-70Years	28 (49.12%)	29 (50.88%)	1.74	0.82	3.69	0.15
71+ years	15 (53.57%)	13 (46.43%)	2.08	0.83	5.22	0.12
Marital status						
Divorced	14 (40%)	21 (60%)	3.39	1.35	8.48	< 0.0001
Married	279 (60.26%)	184 (39.74%)	7.71	4.04	14.71	< 0.0001
Single	12 (16.44%)	61 (83.56%)	Ref			
Widow	17 (50%)	17 (50%)	5.08	2.04	12.68	0.01
Residence (Sector)						
Bwishyura	52 (45.22%)	63 (54.78%)	2.31	1.23	4.33	0.01
Gishyita	60 (61.86%)	37 (38.14%)	4.54	2.36	8.74	0.01
Mubuga	69 (73.4%)	25 (26.6%)	7.73	3.89	15.34	0.01
Murambi	20 (26.32%)	56 (73.68%)				
Murundi	54 (51.92%)	50 (48.08%)	3.02	1.60	5.73	0.01
Rubengera	67 (56.3%)	52 (43.7%)	3.61	1.93	6.75	0.01
Education_Level						
Non educated	42 (42.42%)	57 (57.58%)	Ref			
Primary	124 (47.33%)	138 (52.67%)	2.42	1.27	4.62	< 0.0001

Secondary	115 (63.89%)	65 (36.11%)	1.22	0.76	1.94	0.41
High school	41 (64.06%)	23 (35.94%)	2.40	1.45	3.96	< 0.0001
Religion						
Adventist	95 (50.26%)	94 (49.74%)	Ref			
Catholic	85 (57.05%)	64 (42.95%)	1.31	0.85	2.02	0.22
Protestant	142 (53.18%)	125 (46.82%)	1.12	0.77	1.63	0.54
Residence area						
Rural area	134 (40.85%)	194 (59.15%)	Ref			
Urban	188 (67.87%)	89 (32.13%)	3.06	2.19	4.27	< 0.0001
Household structure						
House of mud	77 (36.67%)	133 (63.33%)	Ref			
House of cement	245 (62.03%)	150 (37.97%)	2.82	2.00	3.99	< 0.0001
Number of Rooms in households						
1-2 rooms	23 (23.47%)	75 (76.53%)	Ref			
> 2 rooms	299 (58.97%)	208 (41.03%)	4.69	2.84	7.72	0.01
Size member of HH						
1-2 Occupants	12 (32.43%)	25 (67.57%)	Ref			
3-5 Occupants	212 (53.81%)	182 (46.19%)	2.43	1.19	4.97	0.02
6+ Occupants	98 (56.32%)	76 (43.68%)	2.69	1.27	5.69	< 0.0001
Number of Mosquitonets in households						
1-2 mosquito	225 (49.02%)	234 (50.98%)	Ref			
3+ mosquito	97 (66.44%)	49 (33.56%)	2.07	1.40	3.05	< 0.0001
Sleeping Frames						
Bed	285 (63.76%)	162 (36.24%)	5.75	3.80	8.72	0.01
Floor	37 (23.42%)	121 (76.58%)	Ref			
Sleeping arrangement						
One on bed	135 (63.98%)	76 (36.02%)	Reference			
Two on bed	147 (42%)	203 (58%)	2.45	0.06	0.52	< 0.0001
More than two in th..	40 (90.91%)	4 (9.09%)	0.18	1.72	3.49	< 0.0001

COR:Crud odd ration,CI:Confidence Interval ,Ref :Reference

Channel received LLINs this study used masse campaign distribution as the reference group ,the results show that individuals who received LLINs through vaccination services have significantly higher odd of LLINs through mass campaign distribution with an OR of 36.34 and a P.value less than 0.05 ,the OR for ANC service is also statically significant with an OR of 1.79 and a P.value of 0.01 ,however the OR for those who received LLINs through other chanel is not statically significant with a p.value of 0.22.

4.5.1.3.Long Lasting Insecticidal Bednet Factors

Table 5:Long Lasting Insecticidal Bednet Factors

Variables	LLINs usage		COR	Bivariate		
	Consistent	Inconsistences		95% CI		p-value
	n=(%)	n=(%)		Lower	Upper	
Channel used to benefit the LLIN						
Vaccination service	99 (96.12%)	4 (3.88%)	36.34	13.07	100.99	< 0.0001
ANC Service	72 (54.96%)	59 (45.04%)	1.79	1.19	2.69	0.01
Masse campaign distribution	151 (40.7%)	220 (59.3%)	Ref			
Affordability of LLIN						
LLINS bought	9 (56.25%)	7 (43.75%)	Ref			
LLINS freely given	313 (53.14%)	276 (46.86%)	1.13	0.42	3.08	0.81
Period of Holding LLINs in HH						
Between one month – 12 months	148 (75.13%)	49 (24.87%)	Ref			
12 months – 36 months	174 (42.65%)	234 (57.35%)	4.06	2.78	5.93	< 0.0001
Shape of mosquito net						
Conical	111 (90.98%)	11 (9.02%)	13.01	6.82	24.80	0.01
Rectangle	211 (43.69%)	272 (56.31%)	Ref			
Provenance of LLIN						
Community	144 (40.11%)	215 (59.89%)	4.14	2.88	5.93	< 0.0001
Health center	169 (73.48%)	61 (26.52%)	Ref			
Market	9 (56.25%)	7 (43.75%)	2.15	0.77	6.04	0.14

COR:Crud odd ration,CI:Confidence Interval ,Ref :Reference

4.6. Multi - variate analysis using logistic regression

As this study aimed to identify the factors associated with consistence use of Long lasting insecticidal treated mosquito bednets in Karongi District in 2022,the results of multivariate analysis are presented in table and variable analysed include gender,marital status ,community

status ,presence of children underfive years,number of rooms in households,sleeping location and shape of mosquito bednet .

Gender was found to be significantly associated with consistent use of long lasting insecticidale treated bednets where female had 6.1times higher odd ration of consistent use compared to males (AOR = 6.1,95%CI:3.85 – 9.67,p=<0.0001),Marital status was also found to be significantly associated with consistence use where married individuals had 4.03 times more odds of consistence use of LLINS compared to single individuals (AOR =4.03,95%CI:1.75 – 9.31,p=0.01) ,widowed individuals had 4.19times higher odd ration LLINs of consistence use compared to single individuals (AOR = 4.19,95%CI:1.34 – 13.13,p=0.01).

However ,association between divorced individuals and consistence use of LLINs was not statistically significant (AOR = 2.01,95%CI:0.67 – 6.03,p=0.21).

Community status was also found to be significantly associated with LLINs consistence use where individual living in urban area had 2.22 times morelikely consistence use LLINs compared to those living in rural area (AOR =2.22,95%CI:1.37 – 3.6,p=0.01). so presence of children underfive years was also significantly associated with LLINs consistence use,where individuals with children under five years had 2.92 time morelikely LLINs consistence use compared to those without children under five years (AOR =2.92,95%CI:1.66 – 5.13,p =0.01).

Number of rooms in households was found to be significantly associated with LLINs consistence use ,where individuals living in households with more than two rooms had 3.34 time morelikely LLINs consistence use compared to those living in households with one or two rooms(AOR=3.34,95%CI:1.63 – 6.86,p=0.01).Sleeping location was also found to be significantly associated with LLINs consistence use ,where individuals sleeping in beds had 4.99 times morelikely LLINs consistence use compared to those sleeping on the floor

(AOR =3.51,95%CI: 1.6 – 7.69,p=0.01).finally ,the shape of mosquito net was found to be significantly associated with LLINs consistence use ,where individuals using conical mosquito bednets had 3.51 times morelikely LLINs consistence use compared to those are using rectangular mosquito bednets (AOR = 3.51,95%CI:1.6 -7.69,p=<0.0001).

Table 6 :Factors associated with households LLINs usage

Variables	Mult variate		p-value
	95% CI		
	.AOR	.(Lower Upper)	
Gender			
Female	6.1	(3.85 - 9.67)	<0.0001
Male	Ref		
Marital status			
Single	Ref		
Divorced	2.01	(0.67 - 6.03)	0.21
Married	4.03	(1.75 - 9.31)	0.01
Widowed	4.19	(1.34 - 13.13)	0.01
Residence area			
Rural area	Ref		
Urban	2.22	(1.37 - 3.6)	< 0.0001
Having Children under 5YO			
No	Ref		
Yes	2.92	(1.66 - 5.13)	0.01
Number of Rooms in households			
1-2Rooms	Ref		
> 2rooms	3.34	(1.63 - 6.86)	0.01
Sleeping Location			
Bed	4.99	(2.95 - 8.45)	0.01
Floor	Ref		
Shape of mosquito net			
Conical	3.51	(1.6 - 7.69)	< 0.0001
Rectangle	Ref		
AOR:Adjust odd ration,CI:Confidence Interval ,Ref :Reference			

CHAPTER FIVE:DISCUSSION

Interestingly ,the study reported a coverage rate of 75% for LLINs and utilization rate of 78%,which indicates that the majority of participants had access to and use LLINs.However,the consistency of use was reported to be 58%,suggesting that there may be room for improving in encouraging regular and consistent use of LLINs.

The bivariate analysis explored several factors that may influence the consistency of LLINs use among study participants. Results showed that socio –economics status ,occupation ,pregnancy status and age of children in the household were all associated with LLINs consistence use.

The results suggested that individuals in Ubudehe Category II and Category III were more likely to use LLINs Consistently than those in Category I.the odd ration for Ubudehe Category II was 2.93,and for Category III it was 3.77,both with statically significant with p-values (less than 0.05).these findings are consistent with previous studies that have demonstrated the association between socio – economic status and LLINs use(34) ,this is also likely due to the fact that people in these categories are more educated and are likely to have a better understanding of the importance of protection against malaria.

In terms of occupation ,self- employed individuals were found to have higher odds of consistent LLINs use compared to farmers,with an odds ration of 1.85 and statistically significant p-value of 0.01. this finding is consistent with previous research that has suggested that individuals in more flexible and non- routine work may have better access to and use of preventive health services (35). According pregnancy status,the study found that pregnant women had higher odds of consistent LLINs use compared to non –pregnant women this may be attributed to their knowledge of the benefits of LLINs utilization and the risk of having malaria in pregnancy such as anaemia,low birth weight and abortion this make pregnant women use consistently LLINs(36) with an odds ration of 1.78 and a statistically significant p-value of 0.02.This finding is consistent with the recommendations of the World Health Organization ,which emphasizes the importance of LLINs use during pregnancy for preventing malaria infection in both the mother and the unborn child (37).At end study found that individuals who received LLINs through vaccination service or ANC services had higher odds of consistent LLINs use compared to those who received LLINs through other channels ,this is likely due to the fact that those receiving LLINs through this channel also received more information on the importance of the LLINs.The

odds ratio for vaccination services was 36.34, and ANC services it was 1.79, both with statistically significant p-values (less than 0.05). This finding highlights the importance of integrating LLINs distribution into routine health services, such as vaccination and ANC, to increase access and use of LLINs (38).

This bivariate analysis provides valuable insights into the factors associated with consistent LLINs use in the study population.

Multivariate analysis conducted in this study identified factors that were significantly associated with consistent use of long-lasting insecticidal treated mosquito bednets. This study found that females had 6.1 times higher odds of consistent use compared to males, which is in line with previous studies (39,40). Marital status was also found to be a significant predictor of consistent use of LLINs, with married and widowed individuals having higher odds of consistent use than single individuals. This finding is supported by a study conducted in Nigeria (41,42) that found marital status to be a predictor of LLINs use.

Residence area was also found to be significantly associated with LLINs consistent use, with individuals living in urban areas having higher odds of consistent use compared to those living in rural areas. This finding is related to a study conducted in Ethiopia and Nigeria (40,43) that found urban residents to have higher LLINs use compared to rural residents. Presence of children under five years was also a significant predictor of LLINs consistent use, with individuals with children under five years having higher odds of consistent use compared to those without.

The number of rooms in households was found to be significantly associated with LLINs consistent use, with individuals living in households with more than two rooms having higher odds of consistent use compared to those living in households with one or two rooms. This finding is comparable with the results of a study conducted in Tanzania (44)(45) that found a positive association with household size, number of rooms in household and LLINs use. Sleeping location was also found to be significantly associated with LLINs consistent use, with individuals sleeping in beds having higher odds of consistent use compared to those sleeping on the floor. This finding is in line with a study conducted in Uganda (46) that found a positive association between sleeping location and LLINs use. Also, there is other research conducted in Kenya that found that sleeping on the floor decreases the use of LLINs and increases the risk of malaria in children under five years (24). Finally, the shape of mosquito net was found to be significantly associated with LLINs consistent use, with individuals using conical mosquito bednets having higher odds

ration of consistent use compared to those using rectangular mosquito bednets. This finding is supported by study conducted in Tanzania(44) that found conical nets to be associated with higher LLINs use compared to rectangular nets, this may be supported by idea that conical mosquito bednet is easy to be hanged in small space than other shape also conical is easy to be manipulate on the bed .

5.1. Conclusion

This study highlights the importance of considering various socio –demographic factors when designing and implementing LLINs distribution programs. The study provides evidence- based recommendations for improving LLINs use among different population groups in Karongi district

5.2. Recommendation

This study detailed components related with usage of LLINs among the population residents in Karongi District .in perspective on the disclosures from the assessment going with recommendation ought to be considered:

- ❖ Strategies to promote the use of LLINs should take into account gender differences and focus on targeting males specifically .
- ❖ Health promotion interventions should target unmarried individuals to increase the consistence use of LLINs.
- ❖ Intervention to promote the use of LLINs should be tailored to the needs of rural communities where the use of LLINs is lower than urban areas.
- ❖ Program should prioritize households with young children in promoting the use of LLINs
- ❖ LLINs distribution programs should take into account household size and provide enough nets to cover all sleeping spaces.
- ❖ Health promotion message should emphasize the importance of using bednets instead of sleeping on the floor.
- ❖ Health authorities should consider promoting conical mosquito bednets over rectangular nets as the former are associated with higher consistence use.

5.3.Study limitation

Semi-structured questionnaires were employed to collect data, but there was a chance that the interviewers' bias might affect the information's quality and content. But this was managed by remaining impartial and objective throughout the interview.

5.4.Further research

Further research could focus on identifying barriers to consistence use of LLINs and developing strategies to address these challenges in order to improve overall malaria prevention and control efforts in Karongi District.

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APPENDICES

Ethical clearance letter



CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 20th/02/2023
Ref: CMHS/IRB/127/2023

TWAGIRIMANA Gabriel
Field Epidemiology Training Program (FLTP)
School of Public Health, CMHS, UR

Dear TWAGIRIMANA Gabriel

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled
"Determinants of insecticidal treated mosquito bed nets usage in Karongi Districts."

Having reviewed your application and been satisfied with your protocol, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

Prof Stefan JANSEN
Ag Chairperson Institutional Review Board,
College of Medicine and Health Sciences/UR

Cc:

- Principal, College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR

Permission of data collection

REPUBLIC OF RWANDA

Date: 31st March, 2023



WESTERN PROVINCE

KARONGI DISTRICT

PO BOX 23 KIBUYE

E-mail: karongidistrict@karongi.gov.rw

Ref. No.1323..../0301/03

To: TWAGIRIMANA Gabriel

University of Rwanda (UR)

Tel : 0788469937.

RE: PERMISSION TO COLLECT RESEARCH DATA.

Reference is made to your letter dated 07th March, 2023 requesting the authorization to collect research data in different Sectors of Karongi District,

Reference is also made to the University of Rwanda's request letter No.001/UR-CMHS/SPH/23 dated 17th January, 2023;

Referring also to Rwanda Biomedical Centre's recommendation letter granting the permission to access research data dated 10th February, 2023;

I would like to inform you that you are granted a permission to collect data in the Sectors mentioned on attachment.

MUKARUTESI Vestine

Mayor of Karongi District

Cc:

- The Chairperson of District Council
- The District Executive Committee Members (All)
- The DGs of Hospitals (all)
- The Executive Secretaries of Bwishyura, Gishyita, Mubuga, Murambi, Murundi and Rubengera Sectors.



Study Questionnaire

Determinants of insecticidal treated mosquito bednet usage in Karongi

District :2018 – 2022

IDENTIFICATION OF INTERVIEWER

Questionnaire No

Household No :.....

InterviewerVillages:

Cell:.....Sector.....District.....

Date of Birth/...../.....

Data collection date :/...../.....MM/DD/YYYY

House hold factors:

1.Sex of head of household: Male

Female

2.Age of head of household:

3.Marital status of head of household

1.Single

2.Married

3. Divorced

4.Widowed

4.Ubudehe Cathegory of household

Ubudehe Category I

Ubudehe Category II

Ubudehe Category III

Ubudehe Category IV

5.What is the level of education for head of household

No formal education

Primary

Secondary

High school

6.What is your occupation for head of household

Former

Civil servant

Self employed

Others

7.Religion/Beliefs for head of household

Catholic

Adventist

Protestant

Islam

Others

8.Community Status

Rural area

Urban

9. Have you Pregnant women in the house hold

Yes

No

10. Have you children under five years

Yes

No

11. How many rooms in this household are used for sleeping:

12 How is the sleeping area Located

1. Bed

2 .Floor

13. How sleeping is allanged

1.One on bed

2.Two on bed

3.More than two in the bed

15.Nature of house

Higher

Rukarakara idahomye kubikuta

Inzu ihomye kubikuta na cement hasi ndetse ni idali

16. Does your household have any Mosquito nets?

Yes

No

17. If “Yes “ where have you get it

Health center

Community

Market

Pharmacy

18. State the Channel have you receive the LLIN

ANC Service

Vaccination service

Masse campaign distribution

Other

19. How have you get this mosquito net?

LLINS Bought

LLINS Freely given

20. Number of House occupants :

21. How many mosquito net does your household have

22. How many period ago did your household has this mosquito net:

1. Less than one month

2. Between one month – 12 months

3. 12 months – 36 months

4. More than 36 months.

Knowledge, Attitude and practice of respond to LLINs

23. Are these mosquito net hanged properly?

1. Yes

2. No

24. If No why this mosquito net is not hanged

1. Low mosquito activity in the area

2. Lack of suitable Place to hang the net

3. Fear of chemical irritation

4. Bad smelling of LLINs

5. No Reason

25. Did any one sleep under the mosquito net Last night in this house hold?

1. Yes
2. No

26. What the main reason this net was not used in the last night

1. Too Hot
2. Don't like net shape /Color /size
3. Unable to hang net
4. Slept outdoors
5. No Mosquitoes /Malaria

27. State the shape of the mosquito net you have.

1. Rectangle
2. No choice Preferred shape
2. Conical

28. When LLINs is used in this household/ Period of net usage

1. Dry season
2. Rain season
3. Throughout the year

29. How frequent do you tuck in the LLINs

1. Every day and every night /All Night
2. Most/Some night
3. Rarely/Never

RESEARCH BUDGET

S/N	ITEM	UNITY	UNIT PRICE	TOTAL COST
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1	Data collection	10 Persons	17800/Days*5	890,000
2	Purchase Mineral water	2 carton	5500	11000
3	Land tablet and Computer	10	3000	300 000
4	Transport	10 Persons	25,000/Days*5	1250 000
5	Training of data collectors	2Days	17800*10*2	356,000
6	Communication &Internet	10	10000	100,000
7	Lame of Papers	6	6000	36 000
8	Printing format	360	50	18000
9	Photocopy	360	50	18000
	Total			2979000

TIME FRAME

ACTIVITY	START DATE	END DATE	DURATION	RESPONSIBLE
Ethical Approval requirement	06/01/2023	20/01/2023	14Days	IRB
Field data collection	21/01/2023	28/02/2023	38 Days	Researcher
Data entry and data cleaning	01/03/2023	25/03/2023	25	Researcher
Data analysis	26/03/2023	15/04/2023	19	Statician
Writing research report Presentation of the research findings	16/04/2023	16/05/2023	30	Researcher
Presentation of research findings	17 -31 May 2023			researcher