DETERMINANTS OF IMMUNIZATION COVERAGE AMONG CHILDREN AGED 12 - 23 MONTHS IN NAROK SOUTH, NAROK COUNTY-KENYA

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DECLARATION AND APPROVAL

Declaration by the Student

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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DEDICATION

I dedicate my thesis to my wife Agnes my children (Ryan, Tiffanie) and my mother (Mary) for giving me ample time to complete the thesis.

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ABSTRACT

Childhood immunization remains one of the fundamental components of primary health care and one of the most cost-effective public health initiatives. Further to that, averting and eliminating vaccine preventable morbidities in the world. As a result, a few children aged 12 to 23 months in Kenya performed below average in respect to immunization coverage among completely immunized children. Procrastination of immunizations would upsurge the menace for inoculation avertible morbidities in the community. In light of that, the information obtained from this study would provide assistance to policymakers formulate sound strategies to increase immunization coverage from 57%-90%. The broad objective of the research was to determine factors influencing low vaccination coverage between children of ages 12 to 23 months in Narok South sub-county, Narok County in Kenya. This was to contribute in the reduction of morbidity and mortality caused by infectious diseases of public health importance related to vaccine-preventable disease. Methods: This was a cross-sectional descriptive research study. The researcher combined two methods, that was quantitative and qualitative. An organized questionnaire was used to capture data on social demographic factors, maternal health care utilization, and knowledge. Key informative Interviews and Focus Group Discussions were used to capture qualitative data on 454 mothers/caretakers with children aged between 12-23 months reached in Narok South sub-county. Results: The total number of mothers/caregivers who were interviewed were 454, with a response of 100%. Results of immunization coverage; BCG 73%, OPV1 59%, OPV2 51%, OPV3 49%, Penta1 58%, Penta2 51%, Penta3 50%, Measles 54% and Fully Immunized Children 47%. Further to that, 47% of the children in the sub-county were fully immunized and 53%, partially immunized 29% and 24% unimmunized. The SD mean for mothers/caregivers and children 31.4 and 17.0 respectively and over 70% of the mothers/caregivers had no formal education. There were significant association predictors with immunization coverage included maternal education (X^2 =11.75, df=4 *p* value<0.02), distance to health facility (x^2 =62.30, df=2 *p* value <0.00), also, there was strong significant association with childbirth ranking (OR =1.218, p value<0.04). Bivariate analysis, there was an association with mothers/caregivers' who had more than one visits with fully immunized children ($\chi 2$=13.54, df =2 and p value <0.001), source of the immunization information OR=0.75 and p value <0.02 and, ultimately, there was association between mother's/caregiver place of delivery with non-fully immunized children (X^2=74.40, df=1 *p* value<0.01). Predictors of non-fully immunized children in the study population were; place of delivery, family size, education level, source of income, none attendance of Antenatal clinics, distance to the health facility, source of the vaccination information was associated with incomplete fully immunized children. Conclusion: The immunization coverage for the fully immunized children in the sub county was very low 47%, compared to national 77%. Key players in the immunization sector should identify children who are at risk, deploy reach every child strategy, encourage pregnant mothers to attend ANC. In addition, expand outreach services, increase funds allocation to health sector and build more health facilities to improve immunization coverage.

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LIST OF ABBREVIATIONS AND ACRONYMS

ANC	**:**	Ante Natal Care
BCG	**:**	Bacillus Calmette Guerin
CHEW	**:**	Community Health Extension Workers
CHMT	**:**	County Health Management Team
CHV	**:**	Community Health Volunteers
CI	**:**	Confidence Interval
DHIS2	**:**	District Health Information System
DTP3	**:**	Diphtheria Tetanus Pertussis
DVI	**:**	Division of Vaccines and Immunization
EPI	**:**	Expanded Programme Immunization
FGD	**:**	Focus Group Discussion
FIC	**:**	Fully Children Immunized
GIVS	**:**	Global Immunization Vision and Strategy.
HBR	**:**	Home-based Records
HCW	**:**	Health Care Workers
IM	**:**	Intramuscular
IQR	**:**	Interquartile Range
IPV	**:**	Inactivated Polio Vaccine
KDHS	**:**	Kenya National Demographic and Health Survey
KII	**:**	Key informant interview
MCH	**:**	Maternal Child Health
MCV	**:**	Measles Vaccine Coverage
MDG	**:**	Millennium Development Goals
MKU	**:**	Mount Kenya University

MOH	**:**	Ministry of Health
NACOSTI	**:**	National Council of Science & Technology
OPV	**:**	Oral Polio Vaccine
PCV10	**:**	Pneumococcal Conjugate Vaccine
PNC	**:**	Post-natal Care
SCHMT	**:**	Sub County Health Management Team
SD	**:**	Standard deviation
SDG	**:**	Sustainable development goals
SI	**:**	Sampling Interval
TT	**:**	Tetanus toxoid
UNICEF	**:**	United Nations Children's Fund
VPD	**:**	Vaccine-preventable Disease
WHO	**:**	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Per the World Health Organization (WHO), immunization is the most significant working way of averting and controlling life-threatening childhood illness, disability, and death, of which it is the most viable way. In addition, the WHO rates vaccination as one of the most effective and efficient involvements by a significant possible impact on health outcomes in the world (WHO 2014).

Sustainable Development Goal (SDG) number three stipulates supporting the exploration and advance of inoculations and drugs or medications for the transmissible and non-transmissible diseases that mostly distress low-income countries. It further supports access to reasonable essential drugs and inoculations, in congruent with the Declaration from Doha on the Trade-Related Aspects of Intellectual Property Rights (TRIPS) arrangement and Public Health, which upholds the right of low-income countries to practice the provisions in the Agreement on TRIPS concerning suppleness to defend public health and deliver accessible drugs for all. In 2014, the World Health Organization (WHO) disseminated that vaccination can avert two to three million deaths every year, so it is crucial to use the vaccines regularly. Furthermore, immunization has led to the eradication of smallpox globally (World Health Organization 2014).

Additionally, as the countries continued to monitor the progress effects of vaccination, the globe was edging quicker than before in eliminating polio, even though three unsettled polio rampant among nations: Pakistan, Nigeria, and Afghanistan. Further, measles, a leading children killer, deteriorated by 80% globally between 2000 and 2017, averting approximately 21.1 million mortalities. Also, as of March 2019, even though 13

nations have successfully eradicated maternal and neonatal tetanus, morbidity with a case fatality rate of 70% to 100 % amongst babies is still being reported.

A World Bank survey showed that numerous conflicts, low investment in national vaccination programs, unavailable inoculations, and increased morbidity have contributed to the interruption of health systems and averted the maintainable delivery of immunization services. Near one in five and approximately 4 million of the under-vaccinated infants live in fragile conditions and nations pretentious by war. These children are exceedingly susceptible to morbidity outbreaks in those countries. In Yemen, for instance, children contributed over 58% of the added than one million people pretentious by a cholera outbreak in 2017 alone (World Bank 2017).

In 2018, nine nations had 50% or fewer on Diphtheria Pertussis Tetanus (DTP3) coverage of which many of these nations are still fragile or affected by adversities; examples include South Sudan, Somalia, Equatorial Guinea, Chad, Guinea, Ukraine, Central African Republic, Samoa, and Syrian Arab countries. Globally, in 2018, 2 out of 5 children were unimmunized for DTP3 resided in around four republics; Nigeria, Indonesia, Pakistan, and India. Notably, densely inhabited emerging countries contribute meaningfully to the number of unimmunized children regardless of accomplishing comparatively massive vaccination coverage, as demonstrated by India accommodating 2.6 million of the under-immunized even by 89% coverage of a troop of roughly 23 million living children. A lot has gone to support global vaccination levels will require a robust emphasis on the nations wherever the highest statistics of unimmunized children reside by safeguarding those nations where children are most expected to miss out on vaccination are not deserted.

Even though there was support from UNICEF on collective energies through partners and nations, immunizations have become harmless and further reachable than initially,

low-income countries continued to face the challenge of funding. Furthermore, the cost of fully immunizing children (FIC) in developing nations was just $18 per child, downcast from the United States of America $24.5 in 2013. The growing number of republics currently contribute to the pneumococcal conjugate vaccine (PCV10) in more than 139 countries as of 2018 and rotavirus vaccine (97 countries as of 2018) in their vaccination programs. Consequently, it contributes to protection against pneumonia and diarrhea morbidities. Broadly, the underused inoculations, such as those against Japanese encephalitis and yellow fever, have also grown to an extent. Nevertheless, while developing countries have mostly been able to reduce coverage challenges by plugging in support from GAVI (UNICEF 2014).

We are doing more than preventing morbidity, mortality, and saving lives by immunizing children. Morbidity and mortality owed to vaccine-preventable morbidities costed Sub-Saharan Africa US$13 billion per year, according to WHO administrative data, funding that might have been used to strengthen health infrastructure and build financial prudence (WHO 2014).

In addition, the worldwide data on immunization in 2017 indicated that approximately 123 million children globally were given the advocated three dosages of Diphtheria-Tetanus-Pertussis (DTP), which specifies the effective happenings of the Expanded Program on Immunization (EPI) (UNICEF July 2018).

Further, there needs to cover a substantial necessity for inoculations, as per the World Health Organization (WHO) and UNICEF. This was publicized from 2011-2020 as the Period of Inoculation (World Health Organization 2012). Furthermore, by forecasting the impact of immunization on mortality, it is estimated that more than 23 million vaccine-preventable diseases deaths would be averted if vaccination is administered between 2011 and 2020 (GAVI, 2014).

Progress has been made since 2014; unfortunately, the number of missed opportunities is estimated to be 18.7 million children were unreached with established vaccination services, for instance, penta3, OPV3, and measles vaccines (WHO, 2014). In addition, efforts to have widespread vaccination in the 1980s saw augmented vaccination coverage hitting 70% internationally for the measles and pentavalent inoculations by the culmination of the year 1990. Nevertheless, there has been inactivity in vaccination coverage leading to mortalities owing to avertible morbidities worldwide.

The fully immunized child is the infant who has been given one dosage of BCG, three dosages of oral polio vaccine (OPV), three dosages of Diphtheria-Tetanus-Pertussis (DPT), and one dosage of measles as per the Division of Vaccine & Immunization Kenya immunization schedule. The number of infants approximated to be vaccinated with Diphtheria-Tetanus-Pertussis (DTP3) containing vaccine is 112 million (84%) (WHO 2013).

In sub-Sahara Africa, immunization coverage continued to be a challenge, with countries reporting low immunization coverages, notably Ethiopia, the Democratic Republic of Congo, and Nigeria. These countries have the most unimmunized children in the region, and hence they are prone to vaccine-related morbidities and mortalities. So far, as per Global Vaccine Action Plan (GVAP) 2011-2020, which had already highlighted vital issues to be corrected for the immunization coverage to be increased. In addition, there was a prerequisite to classifying obstacles to immunization vaccines distribution and guarantee answerability vie yearly reporting of measurable corrective activities engaged to progress vaccination agendas for countries undergoing sluggishness in coverage. These unexploited chances poorly affect unvaccinated children, hence defenseless against vaccine-related diseases in the countries and the future cohorts of children (Subaiya et al., 2015).

Despite the achievements made by Africa members states in terms of vaccination coverage, numerous countries are still faced with challenges. Notably, poor health systems, insufficient vaccination structure, inadequate inter-sectoral partnership, and poor synchronization for delivering inoculations to the children who prerequisite them most are some of the significant challenges facing African countries. Additionally, insufficient funding for vaccination programs & strategies for monetary sustainability and rampant deficiencies of inoculations are some of the other hindrances. Even though a few countries have accomplished to decrease the inequality challenges, less or none education levels, poor earnings, sophisticated delivery of country populations in rural areas, the disappointment of community outreach to produce maintainable requests, etc. have resulted in lower levels of vaccination coverage between and within populations in most countries.

Further, under-immunization amongst children in Malawi has received little consideration. Just between 2010 and 2016, the percentage of full immunized children beforehand, their first birthday declined from 81% to 76% in Malawi. In the same vein, the Expanded immunization on Immunization (EPI) was started in 1974 by World Health Organization to avert diseases and mortality that are preventable and related to vaccines in the world. In the current decade, progressively dependent globe, pulling together against vaccine-preventable morbidities of public health standing and preparing for the likely advent of diseases with pandemic possible will contribute suggestively to enlightening worldwide health and security.

Immunization in numerous emerging countries, immunization services do not cover the poorest and utmost omitted residents. In addition, a study carried out in New York showed that even if immunization services are accessible, a considerable number of

mothers/caregivers do not complete the immunization schedule as prescribed in the immunization guide (Waisbord *et al.,* 2005).

Further, the Division of vaccine and immunization unit in Kenya was started in 1980, with its mandate to vaccination against killers' preventable mortality and mortality, namely; Diphtheria, Tuberculosis, Tetanus Measles Whooping Cough, and Polio. However, there have been many improvements by introducing new inoculations into routine immunization services like; Rota virus, PCV10, inactivated polio vaccine, measles, and rubella vaccines.

According to the Kenya National Demographic and Health Survey (KDHS 2014), Kenya has below-average immunization coverage among children.

Despite the fact that only a little amount of national funding was available for routine immunization programs in Kenya. Moreover, money that was available to manage polio and measles, as well as to introduce new vaccines, have been used to meet their vital needs.

However, the usage of vaccination services necessitates buy-in from the targeted public or communities; it implied that for vaccination services to be utilized in the community, the obligation should be very vivid and thoughtful of the benefits of immunization amongst community adherents, a willingness for essential services like inoculation by the vaccination posts, and participation in addressing access obstacles to vaccination services (Kidane *et al.*,2003). As a result, the primary goal of this study was to identify factors affecting low immunization coverage among children aged 12 to 23 months in Narok South Sub-County, Narok County, Kenya.

1.2 Problem statement

According to WHO (2008), children of ages below five have died from vaccine avertable morbidities. As per the world, the total number of under one child who missed out Diphtheria-Tetanus-Pertussis (DTP3) was 21.8 million in the year 2013 as compared to 22.8 million in 2012. According to WHO (2008), overall, the number of children below five years old who died from vaccine avertable morbidities was 1.5 million. (WHO, 2008). According to WHO (2014), the worldwide database vaccination data for July 2014 depicts that close to 70% of children who missed DPT3 reside in ten nations explicitly; Kenya, Ethiopia, Mexico, Pakistan, Indonesia, South Africa, Nigeria, Democratic Republic of Congo and India. As per the World Health Organization (WHO), 5.2 million children who died were of ages between one to 59 months, of which 29% died from vaccine-preventable diseases (VPD).

Deaths reported in Kenya 2014 according to District Health Information Software (DHIS2) deaths for under one year related to vaccine-preventable diseases (VPDs) were 7,083, and Narok South had 48 deaths. Notwithstanding, enhancement of country approximations, various sub-counties in Kenya report low immunization coverage. For instance, the fully immunized children (FIC) as per KDHS was 68% in the country, Narok county 59.5%, and Narok South Sub County was 57%. (KDHS, 2014).

Nonetheless, the strong-minded efforts by the government to improve immunization services in the country, albeit, a large proportion of children remain unimmunized in the area of study (43%). Moreover, if we want to control and contain vaccine-preventable diseases, there is a need to target a vaccination coverage of over 95% in the entire country. In this regard, establishing factors determining immunization low coverage among children 12-23 months in Narok South sub-county Narok in Kenya informs better health policies.

1.3 Objectives of the Study

1.3.1 Broad Objective

To establish factors influencing low immunization coverage among children aged between 12-23 months in Narok South sub county, Narok County in Kenya.

1.3.2 Specific Objectives

1. To establish the extent status of immunization coverage in Narok South sub-county for children aged 12-23 months
2. To determine socio-demographic factors affecting vaccination coverage services among mothers/caregivers of children 12-23 months.
3. To determine the role of mothers/caregivers in utilization of maternal health care and its association with immunization of children aged 12-23 months.
4. To assess the knowledge of mothers/caregivers of children aged 12-23 months regarding to immunization in Narok South sub county.

1.4 Research Questions

1. What was the status of immunization coverage in Narok South sub-county for children aged 12-23 months?
2. What was the socio-demographic factors affecting immunization coverage services among mothers/caregivers of children 12-23 months?
3. How does mothers/caregivers' health care utilization influence immunization coverage?
4. What was the association of mother/caregivers of 12-23 months knowledge with immunization coverage in Narok South Sub- County?

1.5 Justification

Immunization has been proven to be effective in the reduction of morbidity and mortality. Further, fewer studies have been published in Kenya on determinants of low immunization coverage, but none in the Narok South sub-county. Further to that, the sub-

county has insufficient health facilities that were anticipated to oblige the population in the sub-county. As such, communities travel for long-distance to seek health services, treatment as well as immunization services. The percentage of the population who can access health facilities within a radius of 5 KM to access health facility reduced from 70% to 65% to seek health services (Narok County Integrated Development Plan,2018) Further to that, over the years slanted budget allocation has resulted in unequal availability of health facilities and health services. Even with the few facilities available in the County, they are largely under-resourced and inaccessible to many people (Narok County Integrated Development Plan, 2018. Every year more than 10 million children in low- and middle-income countries die before they reached their 5th birthday. Most died because they do not access effective interventions that would combat common and preventable childhood illnesses, WHO 2015.

So, Narok South Sub-county was picked, because fully immunized children FIC, 57% (KDHS 2014), which was below WHO recommended 90%. As a result, the findings of this study were utilized to benefit policymakers design strategies for improving immunization coverage to 90% of the WHO's target for reducing morbidity and mortality.

1.6 significance of the study

The study adds to the body of knowledge on immunization coverage in the Narok south sub-county into the literature. Further, mothers/caregivers' recommendations to the study will raise their importance on the need to immunize their children timely. In addition, to policymakers, recommendations will provide tangible solutions to scale up immunization coverage in hardship areas like Narok county, to improve the health of children as well as reduce vaccine-preventable diseases/mortalities.

1.7 Scope of the study

The study focused on the determinants of low immunization coverage status among children aged 12 - 23 months in Narok South Sub County, Narok county.

1.8 Limitations of the Study

From the results, the children who had cards were only 39%, while those who recalled were more, this meant that the coverage was very low. The data needed to be checked against the facility records (which was not mentioned in the data set). In the study area, most households had no evidence of Home-Based Records (HBR), the vaccines with two or three doses (such as Penta) are less likely to be remembered than those with a single dose (e.g., Bacillus Calmette–Guérin) and so the dropout rate of Pentavalent vaccine was more likely to be overestimated in the study population.

1.9 Delimitation of the Study

The findings from the study in the four wards stood not to be comprehensive for the entire Narok South sub-county, although overviews were made for Narok South sub-county explicitly.

1.10 Assumptions of the study

The assumption was that, the participants were to furnish the investigator with authentic answers to the questions during the data gathering in the study population.

1.11 Operational Definition of Key Terms

Immunization- is the process by which an individual develops immune or resistant to an infectious disease typically through vaccine administration. Vaccines

stimulate the body's own immune system to protect the individual from subsequent infection or illness (WHO 2014).

Caregiver - a person who provides direct care (as for children)

Drop-out- The number of children beginning the immunization program is compared with the amount that completes it. Two dropout rate metrics are regularly employed, dropout rate between first dose of pentavalent (Penta1) vaccine and single dose of measles vaccine

Coverage of immunization- The degree to which section organizational statistics collect the number of doses transported to the target population for a specific antigen.

Vaccine- Is used activates an individual's immune system to produce immunity to a specific disease, protecting the individual from that disease.

Vaccine preventable diseases - Any disease which occur due to lack of immunization with available vaccines that can prevent disease.

Unimmunized- Those children who had received zero inoculation up to their first birthday

Partially immunization- Those children who had missed only one inoculation out of the eight main inoculations during immunization.

Fully immunized -As per World Health Organization (WHO) direction, a child is said to fully immunized when all immunizations the child has been given the following antigens Bacillus Calmette-Guerin (BCG) inoculation to avert tuberculosis at birth; three doses each of polio and pentavalent Haemophilus influenza type B (Hib), (diphtheria-tetanus-pertussis-hepatitis B (Hep),) vaccines, PCV10 at 6, 10 and 14 weeks of age; and a vaccination against measles at 9 months of age.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter will cover a review of the existing empirical and theoretical literature, it will also provide a conceptual framework.

2.1 Empirical Literature

2.1.1 Introduction to Expanded Program on Immunization (EPI) targeted vaccines

Globally, there has been Considerable improvement through immunization coverage since establishing the World Health Organization (WHO) Expanded Programme on Immunization in 1974. In order to confirm access to the Polio vaccine (Pol), DTP, Bacille Calmette-Guérin vaccine (BCG), and Measles Coverage Vaccine, a growing number of vaccinations and doses have been launched globally to curb the morbidities and mortalities. A few of these inoculations are subsequently suggested on the first birthday; this has made it extra difficult for vaccination programs, which focus on children throughout the first year of life.

As per WHO worldwide, approximately 13 million children have never been given somewhat immunization; these un-immunized children and millions of more under-immunized children are found in all nations, but most of them live in a small number of countries that are affected by conflict, poverty, and fragility.

Despite the efforts made in the world on immunization, the continent continued to face challenges in terms of coverage. Further, in 2018 approximately 19.4 million children globally were uncovered with established vaccination services such as three doses of Diphtheria Tetanus Pertussis (DTP) inoculation. Further, approximately 60% of these children resided in ten nations, namely; Brazil, India, Nigeria, Angola, the Democratic

Republic of the Congo, Indonesia, Viet Nam, Pakistan, Ethiopia, and the Philippines (World Health Organization 2014)

According to UNICEF 2014, by vaccinating children against vaccine-preventable diseases, we keep them healthy and alive. As per United Nations Children Fund, the utmost way of preventing infectious diseases and mortalities is through immunization, and it is the most successful investment by public health. In the same breath, through 2018, approximately 86% of children in the continent (116.3 million children) were given three doses of diphtheria-tetanus-pertussis (DTP3) inoculation, preventing children against vaccine-related morbidities that might have led to severe disease and disability. So, through 2018, 129 countries obligated at least 90% coverage of diphtheria-tetanus-pertussis inoculation (UNICEF, 2014).

On the same note, the most proven effective and efficient way of preventing vaccine-related morbidities and mortalities was through vaccination using the recommended antigens by World Health Organization (Andre *et al.*,2008). Further to that, Rescheduling or partial in the acceptance of specific inoculation or missed immunizations partakes thoughtful community health consequences for vaccine-related disease outbreaks, diseases, and deaths. The main objective of the vaccines and vaccination in Kenya is to lessen morbidity, disability, and mortality due to life-threatening infections from vaccine-preventable diseases.

Further, in Kenya, the Division of Vaccines and Immunization emphasized the achievements of a high rate of vaccination coverage over routine vaccination as the primary focus for monitoring, eliminating, and eradicating vaccine-preventable diseases. If the country achieved over 90 % vaccination coverage, the vaccine-related disease was to reduce considerably.

According to World Health Organization (WHO) 2012, almost one in five infants (approximately 22.6 million children) missed out on essential vaccines. Where immunization coverage is low, it compromises gains in other areas of health for both mother and child. The low-middle-income countries continue to experience low immunization coverage, and the children are most vulnerable who need immunization to be alive and healthy. Vaccines are distributed free of charge in Kenya via outreaches, health posts, and health facilities across the country to prevent vaccination-related diseases (WHO, 2012).

A study done by Kenya Demographic Health Survey 2014 (KDHS, 2014) reveals that two out of three children are approximated to be fully immunized. At the same time, we appreciate the milestones achieved but the government and key stakeholders dealing with immunization. It should not stop until all the missed opportunities have been reached (KDHS, 2014). According to the World Health Organization (WHO), health ministers from 194 countries have adopted a new agreement on solidification vaccination to achieve the GVAP goals. The resolution urges countries to strengthen the governance and leadership of national vaccination programs and develop and influence mechanisms for monitoring and monitoring progress.

Further, it was noteworthy that Kenya's Expanded Programme on Immunization (KEPI) had thrived in covering rural and urban children. Besides that, the status has remained unmoved since 1998. Equally, rural and urban children remained likewise affected through the decreasing inclination till 2003 and the succeeding improvement from 2003-2008. In addition, the condition by caregiver's or mother's level of education was dissimilar. Around significant variances in DTP3 coverage by the mother's education and more ever, children of caregivers/ mothers minus formal or little knowledge of education

had lesser coverage and remained affected more harshly throughout the weaker performance period of the vaccination's plans.

Further to that, the country had presented numerous new antigens anchored in the routine vaccination calendar. The newly introduced antigens include; Penta in 2002, pneumococcal vaccine (PCV10) in 2011, measles second dose 2014, and Inactivated Polio Vaccine (IPV) in 2015. In addition, there was the proposal to announce (measles and rubella virus vaccine MR) and Human papillomavirus (HPV) in 2017 as part of energies intended to avert diseases and deaths from vaccine avertable morbidities the county.

In Kenya, healthcare facilities at the sub-county level offered vaccination in the health facilities on routine vaccination. So, mothers/caregivers who take their children to the vaccination posts for essential vaccination services are educated by health care providers on vaccination information on the type of vaccines, observing the vaccine schedule or calendar, and follow-up recommendations on vaccinations. Nonetheless, a few caregivers/mothers don't take their children back on vaccination calendars, hence posing a danger of contamination (Kariuki *et al*., 2012).

Despite all the efforts that have been put by many countries in Africa, the consistency of vaccination program data has inopportunely remained a challenge in many Global Alliance for Vaccines and Immunizations (GAVI) maintained countries that are primarily low-income countries, including Kenya (Ozawa *et al.*,2016).

Regarding vaccination, most studies congruent that the most affordable public health strategies save millions of lives (Levine et al., 2011) and defend countless children from disease and disability. In addition, as a result of this, more than 10 million children in developing countries perish annually because of accessibility of operative strategies such as vaccination that might prevent and avert juvenile morbidities (Zaidi *et al*., 2014).

2.1.2 Childhood Immunization Schedule in Kenya

Table 1: KEPI Immunization Guide

No.	Vaccine dose	Age of the child	Dosage	Route
1	BCG OPV birth dose (trivalent)	At birth or at first contact-within the first two weeks of life)	2 drops 0.05 ml	Intradermal Oral
2	OPV1 DPT_HepB+Hib1 PCV10-1	At six weeks of life or at first contact	2 drops 0.5ml 0.5ml	Oral Normally the vaccine is injected through IM on upper left leg Normally the vaccine is injected through IM on upper right leg
3	OPV2 DPT_HepB+Hib2 PCV10-2	At 10 weeks or 4 weeks after OPV1 and DPT_HepB+Hib1	2 drops 0.5ml 0.5ml	Oral Normally the vaccine is injected through IM on upper left leg Normally the vaccine is injected through IM on upper right leg.
4	OPV3 DPT_HepB+Hib3 PCV10-3	At 14 weeks or 4 weeks after OPV2 and DPT_HepB+Hib2	2 drops 0.5ml 0.5ml	Oral Normally the vaccine is injected through IM on upper left leg Normally the vaccine is injected through IM on upper right leg
5	Measles 1st dose	At 9 months or first contact after 9 months	0.5ml	Subcutaneous into the right upper arm (deltoid muscle)
6	Yellow fever	At 9 months or first contact after 9 months in four special sub-counties	0.5ml	Subcutaneous into the left upper arm (deltoid muscle)

Source: KEPI immunization guide

Vaccine-preventable diseases remain a burden in low-middle countries, especially Kenya. Moreover, the department of immunization and vaccines, Ministry of Health (MOH) in Kenya suggest that, by the age of nine months, children should be issued with BCG, three dosages of oral polio vaccine (OPV), three dosages of Diphtheria-Tetanus-Pertussis (DPT) and one dosage of measles as per the Division of Vaccine & Immunization Kenya immunization schedule (Table 1).

2.1.3 Classification of vaccines

Vaccines are generally classified into two live attenuated and inactive vaccines.

2.1.3.1 Live attenuated vaccines

Live vaccines are made using 'wild' viruses or bacteria that have been weakened beforehand; then, they are encompassed in the vaccine. Subsequently, in vaccination, the weakened vaccine viruses or bacteria reproduce in the immunized individual. Of importance, a moderately slight amount of virus or bacteria could be issued to excite an immune response. Live weakened inoculations never contaminate a disease to a human being (Siegrist, 2008). Examples include vaccines to avert rotavirus and chickenpox and measles, mumps, and rubella. Such vaccines also include measles and rubella (MR), a rotavirus vaccine.

2.1.3.2 Inactivated vaccines

In most cases, incapacitated inoculations are conducted with wild viruses or microbes that have been produced in a laboratory culture. In addition, the toxin, protein, or polysaccharide (sugar) part derived from viruses or bacteria was inactivated before being used in the inoculation. Hepatitis A and B, influenza, rabies, and oral polio vaccinations

are all examples of inactivated vaccines now in use around the world. After vaccination, the inoculation antigens do not grow in the immunized individual or maybe the source of the disease to a human. This implies that this type of inoculation is safe for the human body, even those with weakened protected system responses. An individual with a weakened immune system response might not progress the similar defense after vaccination as a healthy person (Siegrist et al., 2008). In addition, for example of inactivated vaccine given to the children is the one to prevent polio oral polio vaccine (OPV).

2.1.4 Socio-demographic Factors

The children and maternal health care services are equally prudent for the children's health results, and vaccines also help in averting morbidities and deaths. Most studies have cited that social demographic factors influence low immunization coverage. Some of the social demographic factors that affect immunization that is widely documented in different literature sources are; the age of the mother/caregiver, maternal education, employment, socio-economic status, parity, and distance to health facilities.

Despite the fact that research has revealed its findings on childhood vaccination coverage and related repercussions, few of them have made recommendations about the socio-demographic parameters associated with immunization coverage of children.

Furthermore, children of mothers/caregivers of children who started lower school were two times more likely to be properly immunized, according to a research study conducted in Ambo woreda Ethiopia by Bela chew et al.,2011. Further to that, people who completed high school are likely to be five times more likely to complete vaccines than those who did not attend any school at all.

A research study done in Wanago Southern Ethiopia by Tadesse *et al.*,2008 which revealed that once-a-month pay as the only influence linked to defaulting from immunization mothers or guardians with monthly wages of the family of 44-88 United States, Dollar (USD) stood at 81.1% has lesser chances of defaulting children than mothers (Tadesse *et al*., 2008).

In addition, research conducted in Ethiopia established an association relationship with guardians /mothers' socio-demographic factors with the vaccination status of the children. Moreover, the analysis findings showed that education, marital status, educational status, and occupation displayed statistical significance on the aforementioned determinants (Gizachew. *et al*.,2015).

Furthermore, (Mesfin *et al*., 2015) also carried out a study that showed the socio-demographic characteristics of the respondents; the study showed that the religion of guardians has a significant association with child vaccination incompletion, which is consistent with other studies finding on the area.

2.1.5 Immunization Service Access and Quality

A study executed in Khartoum State Sudan indicated that trekking time to the nearby place of immunization significantly predisposed the correct immunization status of the children in the country. (Ibnouf *et al*., 2007). A research article in Nigeria showed that mother/caregiver's children have good access to health facilities. Further, the study also showed that mothers/caregivers who used less than half an hour to reach the nearby vaccination health post/health facilities stood three times more likely to receive all the antigens than those who walked more than 30 minutes to vaccination post (Raheem *et al*.,2011). A survey in the East Pokot sub-county, Kenya, showed a strong association between distance to immunization posts and the incompleteness of immunization.

Further, the study showed that most health facilities are 18 times further conceivably to have their children completely vaccinated than individuals who travel for more than an hour to a vaccinating post (Kiptoo *et al*., 2015).

Although, other studies in Kenya by Kamau et al., 2001 and Okunga et al., 2015 have contrasted that distance was not significantly associated with immunization coverage.

2.1.6 Maternal Health Care Utilization

Many studies have indicated there was an association of maternal services utilization with immunization coverage status. A study carried out in Gondar town, Northwest of Ethiopia (Gizachew., *et al*.,2015) indicated that effects corresponding to maternal Tetanus Toxoid (TT) vaccination, Ante-Natal clinic visits as well as the place of birth of the child displayed statistically strong associated with the dependent variable by Pearson chi-square test analysis ($p<0.00$). Further to that, another study carried out in Kenya, Mwingi sub-county indicated that the main socio-demographic factors that influenced the optimization of Maternal Child Health (MCH) services in the sub-county were mother's level of education, age of the mother, monthly household source of income, occupation as well the parity of the mother (Nzioki *et al*., 2014).

Research conducted in Nigeria showed that health facility deliveries were associated with high immunization coverage of children and have indicated correlated with access to maternal and child health services (Chidiebere *et al*., 2014).

Furthermore, a study conducted in Kenya's western region found that there was a significance between a mother's place of delivery and immunization coverage. As a result, the study discovered that the likelihood of a child being vaccinated was significantly higher for children born in health facilities than for those delivered at home. (Wanjala *et al*., 2014).

Furthermore, in Ethiopia, Mosiour *et al.*, 2010 carried out a study which showed that mothers who had attended health facilities for Ante-natal clinic, their children were more likely to be fully immunized.

So far, another study carried out in Ethiopia reflected that maternal health care utilization factors Ante Natal Services (ANC) and maternal delivery place showed statistically significant association on multivariate analysis. On the same note, Mothers who had skipped appointments in a given health facility for Ante Natal Services (ANC) are more likely not to finish vaccination antigens as compared to those who attended Ante Natal Services (Mesfin *et al*., 2015).

%. Further to that, other several studies with corresponding results are from Nigeria (Adedire *et al.*,2016), Ethiopia (Etana *et al*.,2012), and Zimbabwe (Rosi et al.,2015) where they indicated that there was an association between fully immunized children with numerous indices of maternal health care utilization (health facility deliveries, attending Antenatal services, post-natal services, and family planning uptake).

Another research study from Ethiopia with similar corresponding findings indicated that mothers who delivered at home have higher odds of defaulting or having incomplete fully immunized children (Mohamud *et al*., 2014).

Further to that, research conducted in Nepal showed that those mothers with further with three or more children alive tended to believe that they are more experienced. So, when it comes to matters of raising children and management of maternal related issues, as per the research findings they seem not to optimize services linked to maternal health as related to those who had less than three children, who tend to utilize the indices of maternal health (Raj *et al.*, 2012).

Additionally, research conducted in Wongo in Ethiopia also exhibited that, there was a significant association between mothers/caregivers who attended Pots-Natal Care

services after they have delivered in a health facility, consequently, the utilization rate was higher and completion of vaccination of children with a p-value of less than 0.05. Further, those mothers who did not utilize or complete the PNC services after the delivery were six times likely to default from the immunization services (Tadesse *et al*., 2008).

2.1.7 Socio-economic/ demographic factors

The issue of socio-culture may affect immunization in a negative way, where mothers/caregivers in rural setups do not believe in taking their children for immunization services. One of the researchers with a corresponding study displayed that cultural practices of a community may impact their demand for immunizations particularly in most rural societies where cultural interaction influences health-seeking behaviour according to (Calderon-ortis *et al.*, 1996). In Kenya, a study done in East Pokot showed that culture has impacted depressingly on immunization coverage in the study population, especially the nomadic style of living where pastoralists move from one area to another searching for green pastures thus hindering mothers/guardians from accompanying their children for immunization services in the nearest vaccination posts (Kiptoo *et al*., 2015).

Additionally, the research has presented that children who are born to a household that observes pastoralist as a manner of living are 11 more times not to have their children completely immunized. Consequently, more than 80% of children who were born at home who did not receive complete vaccination doses, the place of delivery was found to be one of the influences that impact complete vaccination as per the study carried out in Kenya, East Pokot sub-county (Kiptoo *et al*., 2015).

Further to that, a research carried out in Uganda displayed that children who were born from families with white-collar occupations are more likely to have higher coverage of

fully immunized children (FIC) compared to those working from agriculture sector, services or sales, according (Bbaale, *et al*.,2013)

In addition, another study on socio-culture determinants showed that mothers/caregivers whose attendance in school was low or none (OR 0.14, CI 0.06–0.32) findings using bivariate analysis were more likely not to complete the immunization for their children (Monguno *et al*.,2013).

2.1.8 Attitude and Knowledge on Vaccine Preventable Diseases and Vaccination

Research executed in Ethiopia exhibited that, various factors were presented by the mothers for incomplete vaccination of their children. These include not being cognizant of whether to return for second and 3rd immunization, absenteeism of vaccinators or no vaccine/supplies, mother was sick/busy/travel, vaccination time is inconvenient, child ill-health at the time of immunization, long-distance walking, distress of side effect (Mesfin *et al.*,2015).

Further to that, a research executed in Tshwane district South Africa, displayed that knowledge of vaccine-preventable diseases (VPDs) was lower equally for caregivers/mothers whose children are fully immunized and mothers whose children were not fully immunized. On the other hand, inadequate knowledge pertaining to vaccinations did not seem not to have contributed to lower vaccination coverage in the study area (Makgomo *et al*.,2018).

Wide-reaching, a study in Pakistan concerning children vaccination exhibited that effective vaccination rest on parents' optimistic attitude and information (Nisar et al., 2010).

2.1.9 Summary and Research Gaps

Overall, the researcher had to review myriad literature from different studies to appreciate the gaps that were identified. As such, knowledge of mothers/caregivers on the importance of immunizing children to avert vaccine-preventable diseases, factors on low immunization coverage as well as the relationship between maternal utilization services with immunization coverage status.

Studies conducted by myriad researchers on factors on low immunization coverage on various publications are; (Mesfin 2015 *et al.*, Ethiopia), (Asfaw, et al., 2016 Ethiopia), India (Sahoo *et al.,* 2012), Uganda (Bbaale *et al.,* 2013), (Kassahun 2015 et al.,) and (Ethiopia, Koku et al.,2019). Further to that, studies that were carried out in Kenya by myriad researchers on factors associated with low immunization coverage;(Kiptoo *et al*., 2015 (East Pokot-Baringo County), Owino et al., (2009 Kenya), Maina *et al.,*2013 (Nakuru Kenya) and Okunga *et al.,* 2016 (Busia county).

Though other studies in Kenya by Kamau et al., 2001 and Okunga et al., 2015 have revealed conversely findings, that distance was not significantly linked to immunization coverage. Further, inversely, distance to the health facility which was a substitute measure of access affected immunization coverage in 2006 in Kenya (Kamau *et al.,* 2006).

Further to that, In Ethiopia, Mohammed et al.,2013 found out that education's mother/caregiver has no relationship with immunization status. The studies carried out in Kenya were limited, in light of this, results from the findings would enrich the literature on determinants of low immunization coverage among children aged 12-23 months in the study area.

These investigations were carried out in Nairobi, Nakuru, and other peri-

urban locations where situations may differ from those in neglected areas like Narok C

ounty. Finally, the study henceforth was to demonstrate explicitly on determinants of low immunization coverage among children aged 12-23 months in the study area.

2.2 Theoretical Framework

In order to succeed in terms of immunization programs, there was a need to moderate the level of vaccine commitment in the community, and thus significant determination has been capitalized in establishing determinants that affect and forecast purposes of vaccines acceptance. Further, demographic information like age, gender, age groups education, and occupation. The researcher used Health Belief Model (HBM) by (Becker *et al*., 1974) to review the knowledge of mother's/caregivers, perceived susceptibility (poor knowledge of mother's/caregivers on the benefit of immunization). Further, the perceived benefits of immunization to children in the community were good health free from vaccine-preventable diseases. In addition, perceived severity by mothers'/caregivers to their children getting sick. Finally, the perceived barriers by mothers/caregivers to immunization were accessibility, rescheduling of appointments, distance to the health facilities.

According to the research executed by, Becker *et al*., 1974 on Health Belief Model (HBM), where it has been used in many areas such as sickness symptoms, screening for prevention, and getting immunizations, (Sahoo et al., 2012).

The fundamental perception of Health Belief Model was that theories about a disease, and tactics to decrease the incidence of diseases in a population, establish well-being behaviour.

In regards to Health Belief Model which has four key mechanisms; supposed vulnerability to and supposed harshness of the disease and apparent barriers and seeming

assistances of precautionary tactics to be used for instance immunization against disease, as per the research carried out by (Babalola *et al.*, 2009).

According to this study, the Health Belief Model was used to clarify the reasons why we can have a high dropout in routine vaccination in the health facilities or communities.

The influences considered to be encompassed were supposed vulnerability of children by mothers/caregivers, apparent harshness when children become ill after vaccination, the community tend to perceive vaccines cause more harm than help (Maina *et al*., 2013).

2.9 Conceptual framework

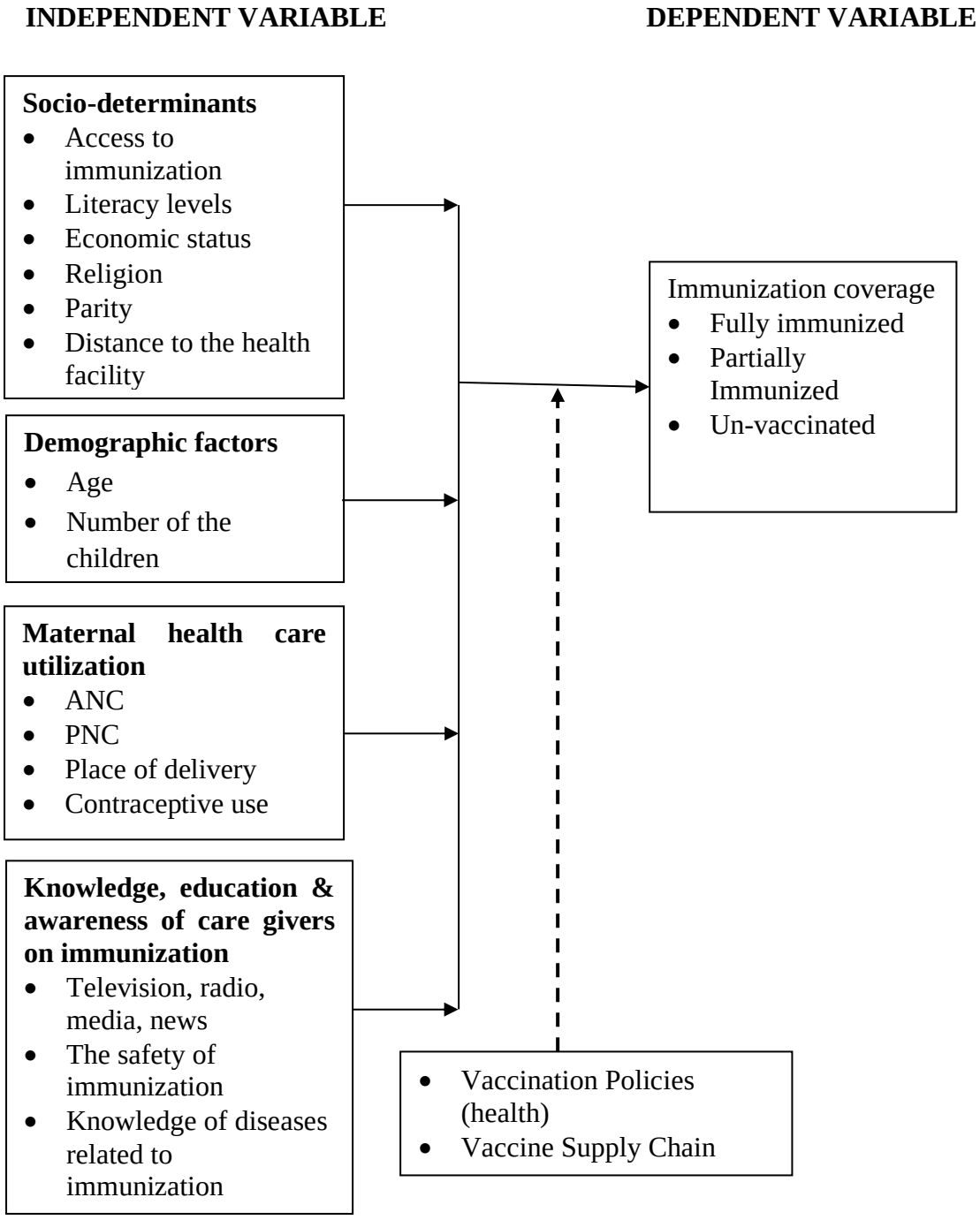

Figure 1: Conceptual Framework

Source: Researcher (2018)

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The following section covers design, sampling, data collection, pilot testing and processes for data analysis and presentation.

3.1 Research study design

The researcher employed cross-sectional descriptive study, in which data was collected using both qualitative and quantitative methodologies. The socio demographic characteristics, maternal health care utilization, and knowledge were all captured using a well-organized and prepared questionnaire.

Further, in the Narok South sub-county, 454 mothers/caregivers with children aged 12 to 23 months were interviewed using key informant interviews (KII) and focus group discussions (FGD) to collect qualitative data. In addition, the design proved useful in determining the factors that contributed to low immunization coverage among children aged 12-23 months in the study region.

3.2 Study location

Narok South sub-county is situated in Narok county bordering Narok North to the North, Bomet county to the west, Kajiado to the east, and Tanzania to the south. The Narok County lies between latitude 0° 50’ and 1° 50′ south and longitude 35° 28′ east. It’s mainly inhabited by Kalenjin and Maasai and the major economic activity in the area is farming and cattle rearing. The residents mainly plant wheat and maize in the area for commercial.

Organizationally, the South Sub-County has six wards, five divisions, 24 locations, and 75 sublocations. The total number of health facilities in the area is 42 across the sub-county. The sub-county was picked for study because the sub-county has the lowest fully immunized coverage (57%) among the six sub-counties in Narok County. The Sub-county has several Challenges in health including sanitation-related diseases, high maternal, neonatal, and child mortalities from preventable conditions, high teenage pregnancies, increasing numbers of persons newly infected with HIV, and increasing threats from non-communicable diseases.

Further, the most common diseases in order of prevalence are; upper respiratory tract infection (27%), skin diseases (13 %), diarrhea (10 %), malaria (9.5 %), and pneumonia (6 %) among other conditions. Finally, the infant mortality rate (IMR) stands at 39/1000 live births, and children under five mortality rates is 52/1000, additionally, crude birth rate CBR) approximately 11 per 1,000 live births and population growth
rate of 3.6%.

3.3 Target Population

The study population involved households with children between 12 to 23 months during the study period (cohort birth). Further to that, Children aged below 11 months & children above 24 months' age was excluded from the study, as well children whose parents/guardians were not willing to participate in the study.

3.4 Sampling procedure and techniques

The researcher deployed a multistage sampling, then simple random sampling followed. First of all, four out of six wards were selected randomly, and the following wards were

selected: Mulot, Sogoo, Naroosura/Majomoto, and Loita with children aged between 12-23 months.

Further to that, 21 sub-locations (enumerations areas) were selected in the four wards as per the projected 2009 census. The researcher used the Population Proportionate to size (PPS) sampling technique to pick the number of households cross-examined in the lowest administrative unit (sub-location). The designed questionnaire was used to gather data from mothers/caretakers in their respective households.

The distribution was done as follows; under Mulot ward, the following sublocations were picked; Mulot, Kuto, Enelerai, Rongena, Ilmotiok, Sagamian, Tendwet Sogoo and Nkaroni). Further, under Ololulunga ward the following sub-locations were selected; Nkakori, Lemeck, Olkiriane, Ololulunga, Melelo, Oloshapani and Ereteti. The other was Naroosura/Maji moto ward; Maji Moto, Elengata Enterit, and Naroosura sub-locations were selected. Lastly, under Loita ward, the following sub-locations were selected to be included in the study; Entasekera, Olmesutie, and Morijo loita. Then transcribe a corresponding number beside the first community listed on the Cluster identification form, that assisted in administering questionnaires in which the cumulative population equals or exceeds the cluster population.

Additionally, the sampling interval was an essential concept in identifying clusters, where it was worked out using the formulae below;

$$\text{Sampling interval (SI)} = \frac{\text{entire population to be studied}}{\text{30 clusters}}.$$

So, the sampling interval was determined by dividing the surveyed target population (15,200) by the number of clusters (30). Further, the sampling interval of 507 was used to systematically select wards from the sampling frame. The first sub-location was selected at random using a computer excel generated random number, and it was less or

equal to the sampling interval, where the random sampling interval was (357). Then, identity the first village in which cluster one was located. This was done by identifying the starting village in the list where the cumulative population was not expected to exceed or equal a random number. For the second cluster, sub-location was determined by adding a number that identified the previous cluster's location and sampling interval. Below are how the clusters are going to be computed.

i. Cluster 1 population =357 (random number)
ii. Cluster 2 population =357 + 507=864 (random number + sampling interval)
iii. Cluster 3 population =864 + 507= 1371 (number for cluster 2 + sampling interval)
iv. Cluster 4 population =1371 + 507= 1878 (number for cluster 3 + sampling interval)

Where the following wards were selected plus their populations that formed sampling frame has been illustrated in the appendix 1 as per of reference.

Eventually, the same process was repeated until 30 clusters are reached in the populations, as illustrated in Figure 2.

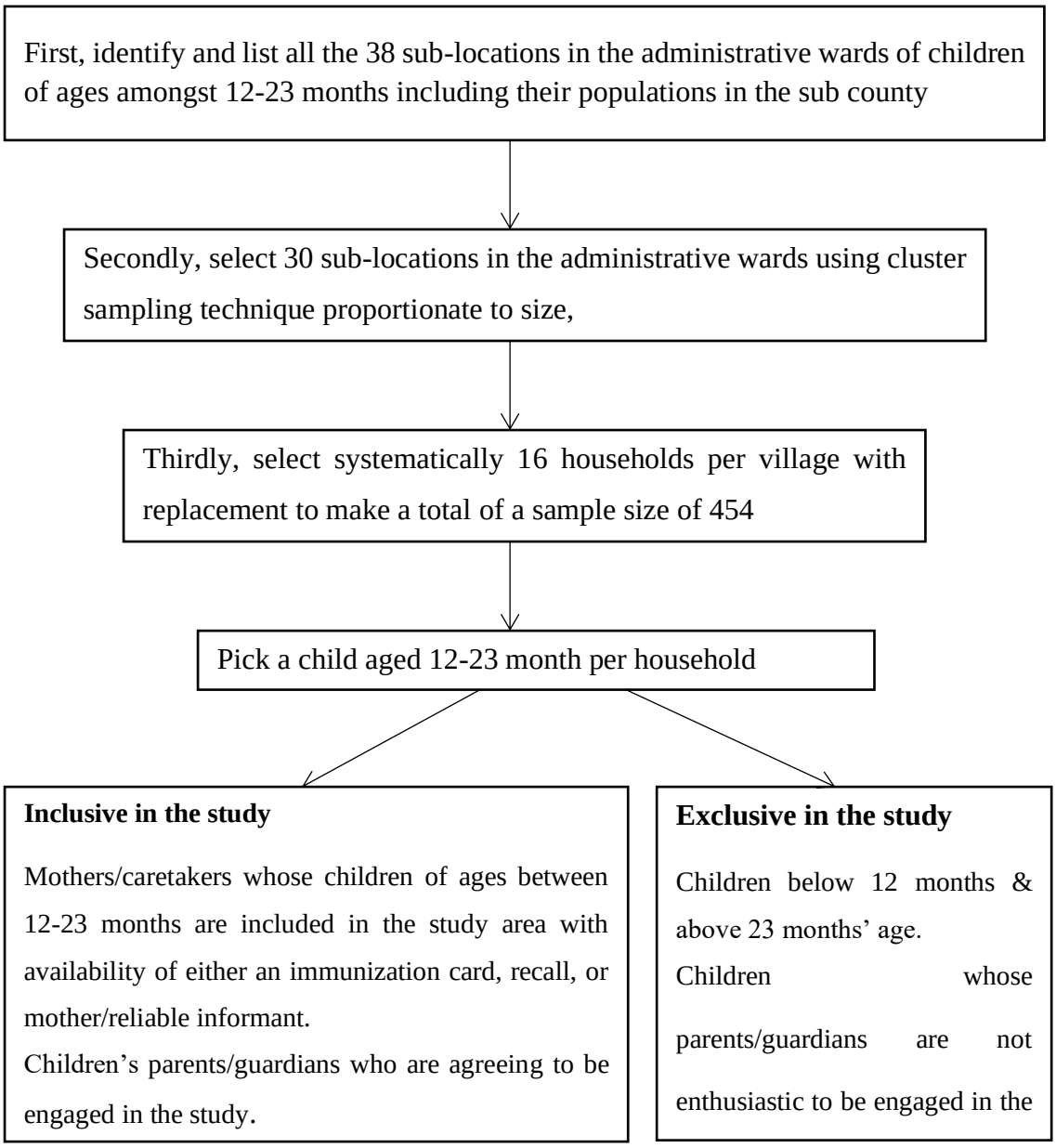

Figure 2: Schematic Sampling Technique Presentation

3.5 Sample population

Target population was 372,157 (Narok South) according to projected Kenya National Bureau of Statistics (2016), and the under one-year old were 4.6% (15,200). The sample size was arrived as follows, as per Kenya Demographic and Health Survey (KDHS) 2014, Narok South fully immunized children is 57%.

p = the proportion of the target population estimated to have a characteristic being measured taken as 57% (*proportion of completely immunized children as per KDHS 2014)*

z = Standard normal deviation which is 1.96 at 95 % level of confidence.

P= prevalence of immunization 57%

q = 1 – p = 1-0.73 = 0.27

d = Desired precision is +/- 0.05

DE = Design effect =1.5

The sample size was determined using the formulae below

$$n = \frac{Z^2 \text{ x } p \text{ x } (1-p)}{d^2}$$

$\frac{1.96^2 \text{ x } 0.57\text{x } (1-0.57)}{0.05^2} = 377$ plus 20% non-response

= 454

Sample size =377 children

The researcher added 20% non-response proportion to the already determined sample size to give the total number of 454 children aged 12-23 months involved in the study. As per (World Health Organization 2005) modified immunization coverage cluster survey, which recommends that the minimum cluster for surveys is 30 villages.

Therefore, the sample size of 415 children was given as; children in each cluster =sample size ÷ number of clusters, 454÷ 30= 15.1, therefore 16 children per cluster of 454 sample size.

Table 2: Distribution of sample size children per sublocations

Wards	Sub-location (cluster)	Children sampled
Loita	Entasekera	14
	Morijo	15
	Olmesutie	16
	Total	45
Maji Moto/Naroosura	Elangata Enterit	15
	Maji Moto	16
	Naroosura	32
	Total	63
Mulot	Enelerai	16
	Ilmotiok	31
	Kuto	16
	Mulot	16
	Nkaroni	31
	Rongena	15
	Sagamanian	16
	Sogoo	31
	Tendwet	15
	Total	187
Ololulung'a	Ereteti	16
	Lemeck	15
	Melelo	14
	Nkorinkori	13
	Oleshapani	70
	Olkiraine	16
	Ololulung'a	15
	Total	159
	Total sample size	454

Source: Researcher (2019)

The researcher divided the (sublocation) into four sections (clusters/lots), then selected one section randomly using a random number table. Then, select the central section of the sublocation where the first household to be sampled was to start. Further, the spinning of a bottle was used to identify the direction by the tip. Selected the first household as per the direction to start the survey using the random tables. After completing the survey

in the first household, the researcher exited and turned right to the second house by skipping two households. Further to that, the exercise was conducted until all eligible children were sampled in enumeration centers in the cluster (sublocation). The exercise was repeated in all the selected 22 sublocations until the sample size (454) was reached.

3.6 Construction of research instruments

A structured questionnaire was developed as well Key Interview Information (KII) and Focus Group Guide (FGD). A system was developed to assist in data entry of data gathered from the study population using EPI Info 7. The dataset generated from the system was exported to other formats for in-depth analysis, synthesis and dissemination of findings.

3.7 Testing for validity and reliability of data collection tools

The process of pre-test of the research tools, i.e questionnaires for rationality for use in the field was performed in a highway located in another sub-county within the County. Questions which were ambiguous were rephrased following the pretesting results. Further to that, appropriate modifications was done to the questionnaire just to ensure that it capture all the relevant and applicable information.

3.8 Data collection tools

Before starting the data collection exercise, the researcher had to select four research assistants to assist in data collection. Each of the four RAs were assigned a cluster (ward) to assist in collection of data within the assigned clusters. The research assistants were trained on proper recording the data into the questionnaire. The data was collected for over a period of three months given that the standard return date is often in a month's

time but for a few cases required close monitoring. The questionnaire was administered to eligible mothers/caregivers by first seeking their consent in the households of the children of ages between 12-23 months. Data based on socio-demographic characteristics and vaccination history of the children was fetched from the eligible mothers/caregivers.

3.9 Data analysis techniques and procedures

First was created an electronic database for entering data from the questionnaires using Epi Info 7. The data entry was done on two different computers for accuracy purposes. As soon as data was entered into the system, backups were created to avoid loss of data. In addition, cleaning of data was done to check on the accuracy, and completeness of the data. Quantitative data from structured questions for example from closed-ended questions were coded. The Characteristics of the study population were summarized, and proportions tabulated. Most importantly, after the dataset was cleaned, it was subjected to analysis by initially doing frequency to check whether all questionnaires had been entered into the system.

Further, data analysis was done using STATA 15.1. Descriptive statistics, bivariate, multivariate analysis, and logistic regression were done using STATA15.1. Furthermore, using a p value of less than 0.05, the chi-square test was utilized to establish the relationship between variables.

Further to that, the researcher used key informants' interviews to collect information about the ideas and insights from selected health care providers in Sub County. Related to the Key Informants interview (KII), participants were drawn from health care providers who worked under immunization services in the sub-county. The members included; sub-county medical officer, sub-county public health nurse, public health officers, Sub County, and maternal, newborn, and child health (MNCH) officer-in-

charge. The team comprised 15 health care providers working in the sub-county and a few sampled health facilities. In addition, a focus group discussion (FGDs) team was also constituted and the membership was selected from opinion leaders and mothers/caregivers of children aged between 12 to 23 months. The focus group discussion (FGD) tool was developed to gather socio-demographic factors, socio-economic, reproductive health care utilization, reasons for non-complete concerning immunization and knowledge on vaccine-preventable diseases information from selected mothers/caregivers. Furthermore, the six focus group discussions that targeted mothers/caregivers of children of ages 12 to 23 months were all achieved. Each focus group discussion comprised 8-12 participants who consented to participate in the discussion. In addition, each focus group discussion session took about 30 minutes. Qualitative data from each focus group discussion was transcribed and analysed descriptively using NVIVO version 9 and were triangulated with quantitative data.

3.10 Ethical Considerations

This research was approved by the Mount Kenya University Research and Ethics Review Committee. Furthermore, consent was requested and gotten from the participants before administering the questionnaire in the households. In addition, no names were written on the questionnaires instead, the researcher used codes to maintain confidentiality. Additionally, the researcher requested for permission from the Narok County Health Management and county administration before collecting data. In addition, the informed consent was obtained from respondents before administering the questionnaires, key informants & focus group discussion. All questionnaires that were administered to households were treated with confidentiality by not indicating the names of the respondents.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.0 Introduction

Chapter 4 presents the findings of the study which are discussed thematically in line with the study objectives.

4.1 General characteristics of the study population

As per the researcher, 454 mothers/caregivers completed interviews for both household surveys and immunization questionnaires in five wards of Narok South Sub County. The overall household response rate was 100% across all the wards in the study area.

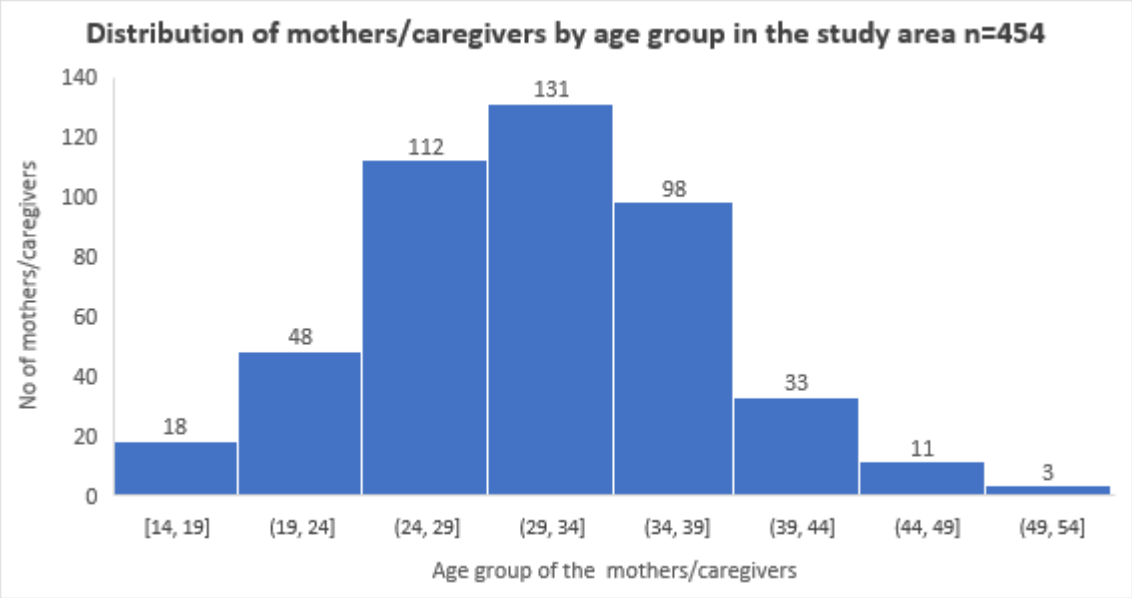

Figure 3: Distribution of mothers/caregivers by age group in the study area

As illustrated in figure 3 the ages of the mothers/caregivers were normally distributed with a standard deviation of 6.6 and a mean age of 31 years. The majority of the mothers/caregivers between 29 to 34 years with 131 and the least were above 49 years

who only three mothers/caregivers. Further, the median age was 31.4 years (interquartile range [IQR]: (27-36) and the range was 14-50 years.

In addition, the total number of children sampled during the period of the review was 454, with a mean of age 17 months, Standard Deviation (SD) ±3.15, range (12-23 months), the range 12-23 months, and the median age was 17 months (interquartile range [IQR]: (12-23). There was no association between age groups and immunization coverage $\chi 2$ =3.6195, df=4, and p-value >0.460.

4.2 The status of immunization coverage in Narok South subcounty

In respect to immunization status, fully immunized children were 213 (47%) followed by the partially immunized number of children with 131 (29%) and the least were unvaccinated children with 110 (24%) as shown in the pie chart below (figure 4). This implied that 241 (53%) mothers/caregivers had not taken their children for subsequent doses (figure 4).

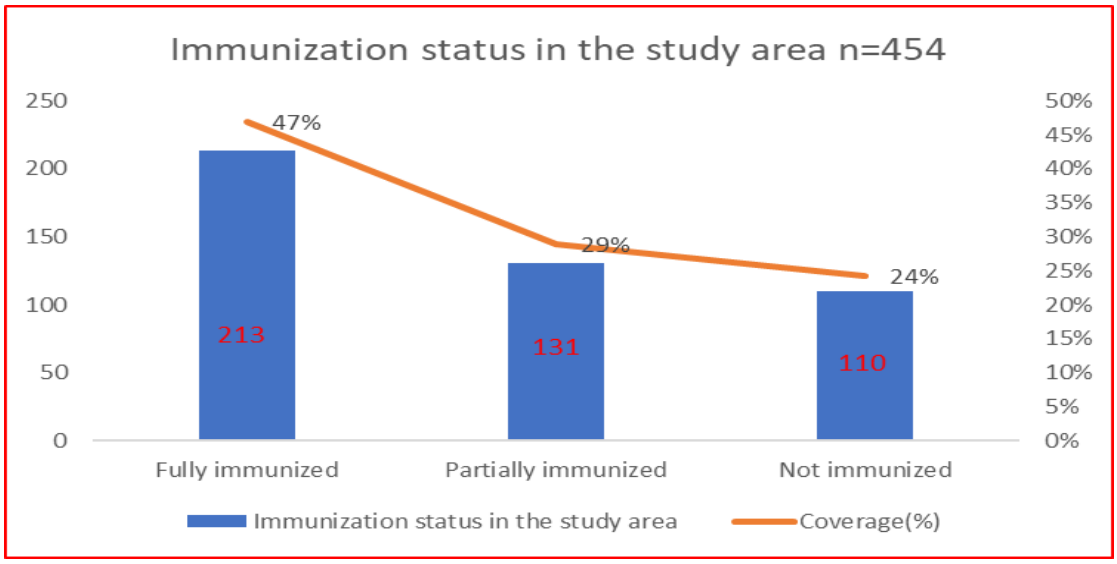

Figure 4: The immunization status of children 12-23 months in the study area

Vaccination coverage results as per Narok South sub-county (figure 5) showed BCG coverage was 73% (CI 51%-56%), OPV1 59% (CI 48%-50%), OPV2 51% (CI 41%-44%), OPV3 49% (CI 31%-35%), Penta1 58%, Penta2 51%, Penta3 50%, MCV1 54%, and Penta PCV1 58%, PCV2 50%, PCV3 50%, and FIC 47%, as illustrated in the graph below. As illustrated in the graph below, BCG 73% was the highest coverage, while fully immunized children (FIC) were the lowest at 47%, as illustrated in the graph below.

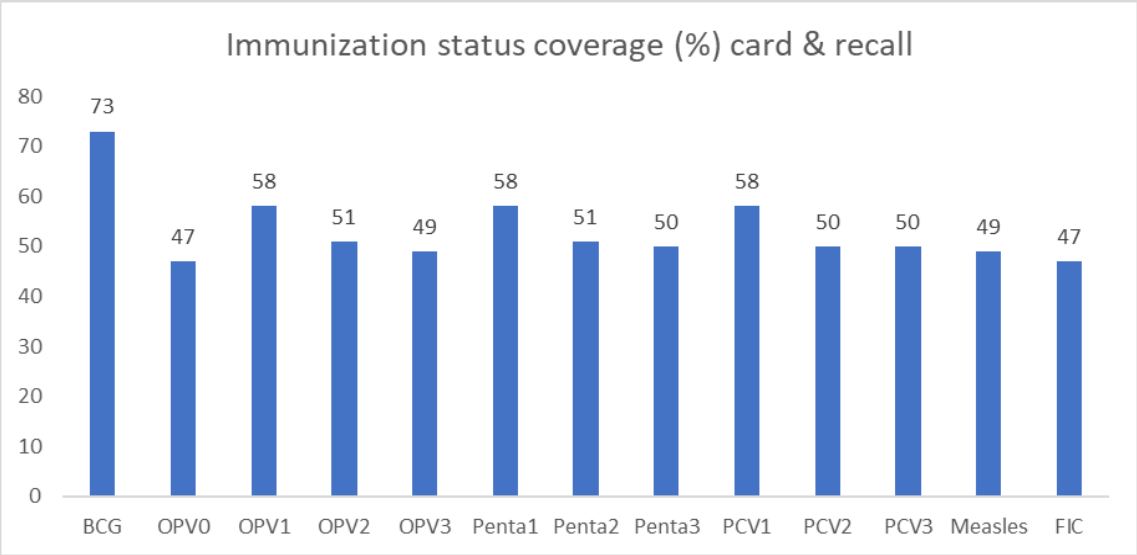

Figure 5 : Immunization status in the study area by card & recall

4.3 Immunization status coverage by card in the study area

In relation to immunization by card only, BCG coverage was 73%, OPV1 65%, OPV2 64%, OPV3 63%, Penta1 66%, Penta 2 64%, Penta3 63%, PCV1 66%, PCV2 64%, PCV3 63% MCV 60% and FIC 59% as illustrated in the graph below. Generally, the BCG coverage was high with 73% and the least was FIC with 59%.

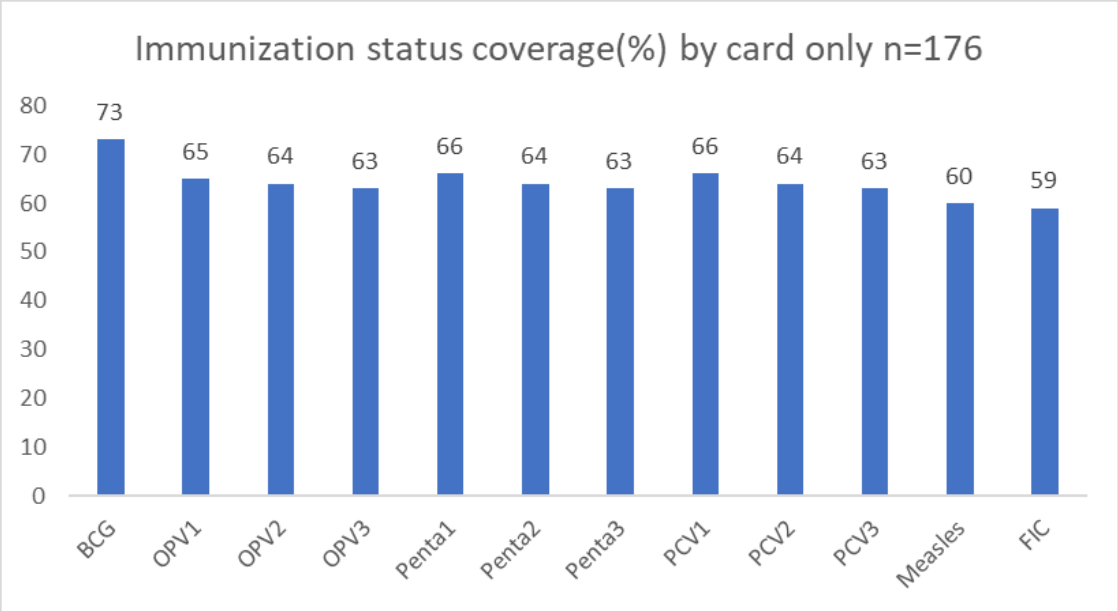

Figure 6: Immunization status in the study area by card

4.4 Immunization dropout rate status in the study area

High dropout rate was observed across all the immunization strata, as illustrated in figure 7. The dropout rate of Penta 1 to Penta 3 was (14.33%), OPV1 to OPV 3 (17.5%) and BCG to MCV was 25.8%. The highest dropout rate was observed in BCG to measles vaccine coverage with 25.8%, followed by OPV1 to OPV3 with 17.5%, then Penta1 - Penta3 (14.3%) and the least was penta1 to measles with 13.8%.

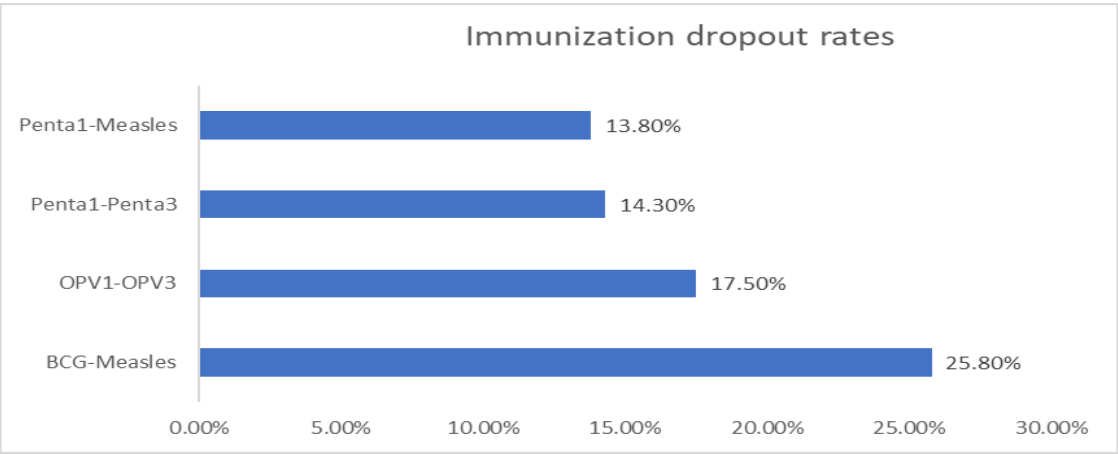

Figure 7 : Vaccination drop-out rates for the study population

One of the questions asked to KII was "What are some of the reasons attributed to the inadequate immunization status of children?" One of the KII (Epi nurse Sub-County Health Management Team members) said, *"Stock-outs of antigens (i.e., Bacterium of Calmette Guerin (BCG), Measles & Rubella, and Oral Polio Vaccine), stock-outs of immunization devices, missed opportunities, lack of defaulter tracking mechanisms at health facilities, and cold chain breakdown" (KII, EPI Nurse).*

Table 3: Mother's socio-demographic characteristics with immunization status

Variables	N=454 Categories	Fully immunized			Partially/Un immunize children			OR	P value
		Coverag	LCI	UCI	Coverag	LCI	UCI		
Age of mothers /caregivers	15-19 yrs	4.69%	2.27%	8.46%	3.32%	1.44%	6.44%	0.959	0.75
	20-29 yrs	32.86%	26.60%	39.61%	37.34%	31.22%	43.78%		
	30-39 yrs	53.52%	46.58%	60.36%	47.72%	41.27%	54.23%		
	40-49 yrs	8.45%	5.09%	13.03	10.79%	7.17%	15.41		
	over 50 yrs	0.47%	0.01%	2.59%	0.83%	0.10%	2.97%		
Education level	None	8.45%	5.09%	13.03%	58.09%	51.59%	64.39%	4.737	0.00
	Primary	7.51%	4.35%	11.91%	27.39%	21.86%	33.48%		
	Secondary	72.30%	65.77%	78.20%	7.88%	4.81%	12.04%		
	College/university	11.74%	7.74%	16.84%	6.64%	3.84%	10.56%		
source of wealth	Business	31.46%	25.28%	38.15%	19.09%	14.33%	24.63%	0.693	0.00
	Farming	28.64%	22.67%	35.21%	39.42%	33.21%	45.90%		
	formal employment	14.55%	10.11%	20.02%	5.39%	2.90%	9.05%		
	Housewife	4.23%	1.95%	7.87%	7.47%	4.49%	11.55%		
	Pastoralism	19.25%	14.18%	25.19%	26.56%	21.09%	32.61%		
	Student	1.88%	0.51%	4.74%	2.07%	0.68%	4.77%		
Religion	R. Catholics	21.60%	16.27%	27.73%	27.39%	21.86%	33.48%	1.042	0.67
	Protestants	56.34%	49.39%	63.10%	50.62%	44.13%	57.10%		
	Islam	7.04%	3.99%	11.35%	4.98%	2.60%	8.54%		
	None	15.02%	10.51%	20.54%	17.01%	12.49%	22.36%		
Marital status	Divorce	1.41%	0.29%	4.06%	2.07%	0.68%	4.77%	1.034	0.77
	Married monogamou	83.57%	77.90%	88.28%	83.82%	78.55%	88.23%		
	Separated	0.94%	0.11%	3.35%	4.15%	2.01%	7.50%		
	Single	6.57%	3.64%	10.78%	5.81%	3.21%	9.55%		
	Widow	7.51%	4.35%	11.91%	4.15%	2.01%	7.50%		

Source: Field Data (2019)

4.5 Socio-demographic of mothers/caregivers

A total of 432 (95%) mothers and 22 (5%) fathers of children aged 12-23 months were interviewed during the study period. Further, the average mean age for mothers/caregivers was 31.4 years. Mothers/caregivers aged between 30 to 39 years had the highest immunization coverage, with 229 (53.5%). As per the marital status, most of interviewees indicated that they were married and their children's fully immunized status was at 84% with the least being those mothers/caregivers already separated with less than 1% (FIC). Further, there was no relationship between marital status with immunization coverage (OR=1.034002, p-value >0.7712). There was no association of mothers/caregivers' age groups with immunization coverage (OR= 0.959, p-value >0.7467).

In regards to religion, there was no association between religion with immunization coverage (OR=1.042457, p-value >0.667). On the other hand, maternal education and socioeconomic status had significant associations between them with the proportion of fully immunized children (OR=4.74, p-value <0.02 and OR =0.69, p-value <0.001 respectively).

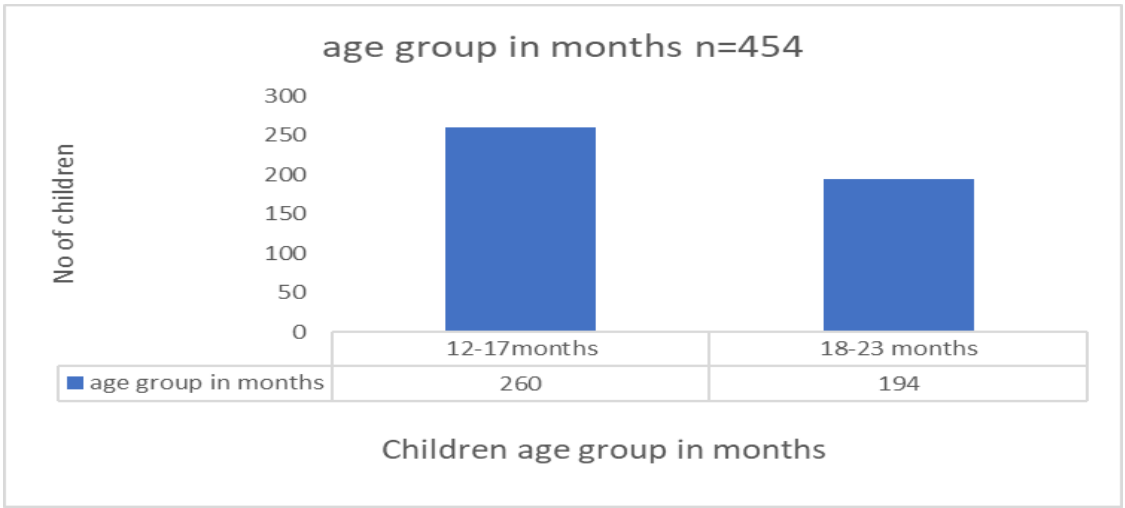

Figure 8: Distribution of age group in months for children 12-23 months

4.6 Relationship of mothers/caregivers' education and immunization status

Regarding the mothers/caregiver's education level (as per table 2), the majority of the mothers/caregivers (215, 47%) had not gone to school, followed by primary educated ones at 107 (24%) and the least in proportion were the university-educated (62, 14%). Of which, fully immunized children for mothers/caregivers with no education was low as compared to the educated ones. There was a significant association between education level, where mothers/caregivers with nil or primary-only education are strongly associated with non-fully immunized children coverage ($\chi 2$=11.7483, df=4 and p-value <0.002).

The majority of the respondents in the households were largely female (95%). As displayed in figure 10, mothers/caregivers whose age groups were between 30-39 years had the highest proportion of fully immunized children (229, 50%), followed by mothers/caregivers in the age range of 20-29 years (160, 44%). In respect to age group, there was no association between maternal age groups with immunization coverage ($\chi 2$=0.959, df=4 and p-value >0.75).

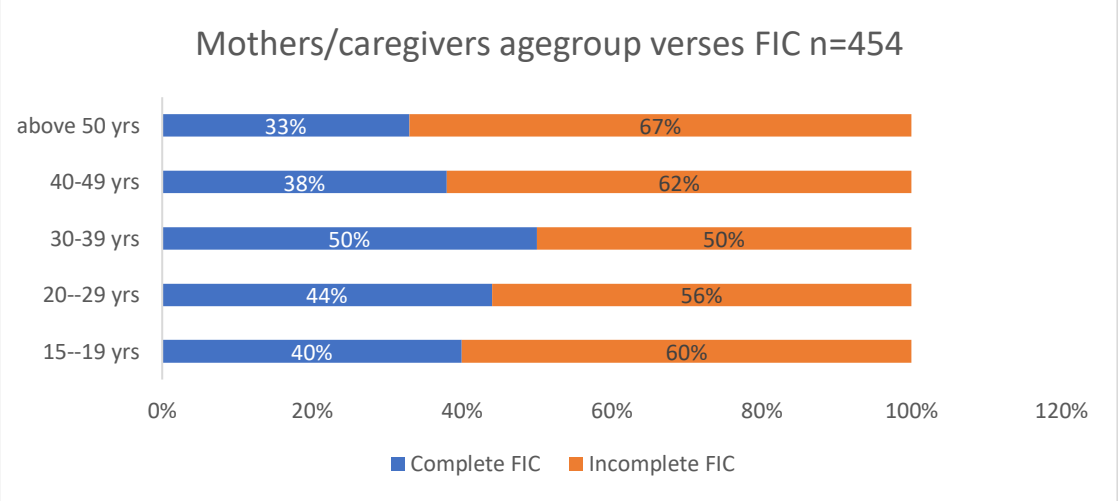

Figure 9 : Mothers/caregivers age group's association with immunization status

Association of mothers/caregivers of children aged 12-23 months against full immunization. In terms of religion, the majority (242, 53%) of the mothers/caregivers were protestants, then Catholics with 112 (25%) and the least was Islam religion with 32(7%). There was no association between religion with immunization coverage ($\chi 2$=1.042, df= 3 and p value= 0.67.

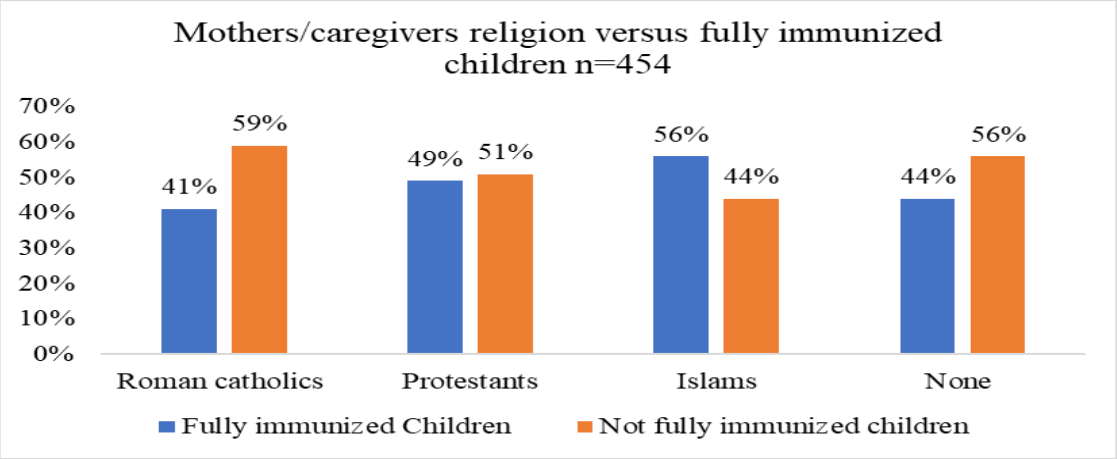

Figure 10: Relationship of mothers/caregiver's region with immunization status

As illustrated in figure 11, majority 34.4% were farmers, followed by business (24.9 %), then nomadic pastoralists with 23.1% and the least was students with 2%. There was significant association between source of wealth with immunization coverage (χ^2 =25.19, df=5 and p<0.00).

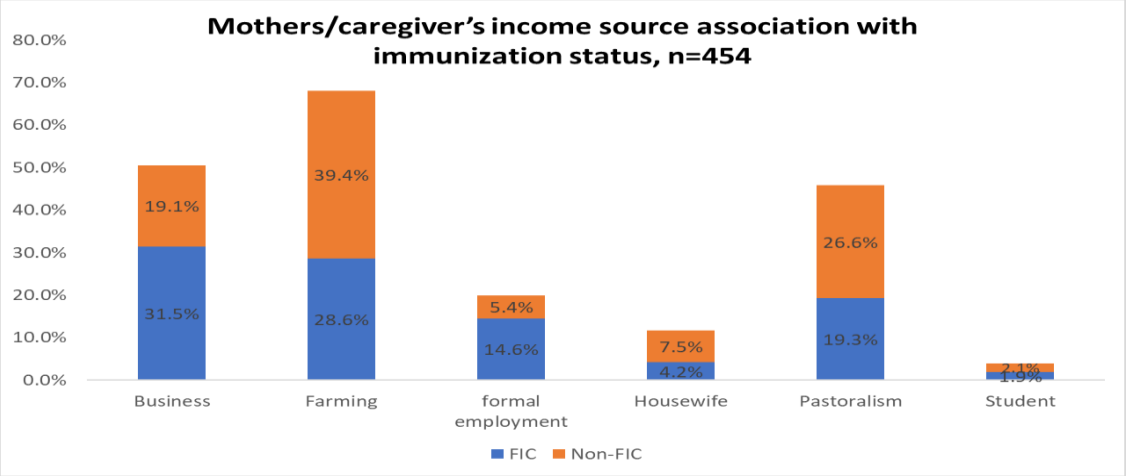

Figure 11: Caregiver's income source association with immunization status

Related to marital status, more than three-quarters of the mothers/caregivers ,370 (81%) were married, followed by single 34 and divorce been the least as per the respondents, as demonstrated in figure 14. There was no significant association between marital status and immunization coverage (χ^2 =1.034, df=5 and p value> 0.77).

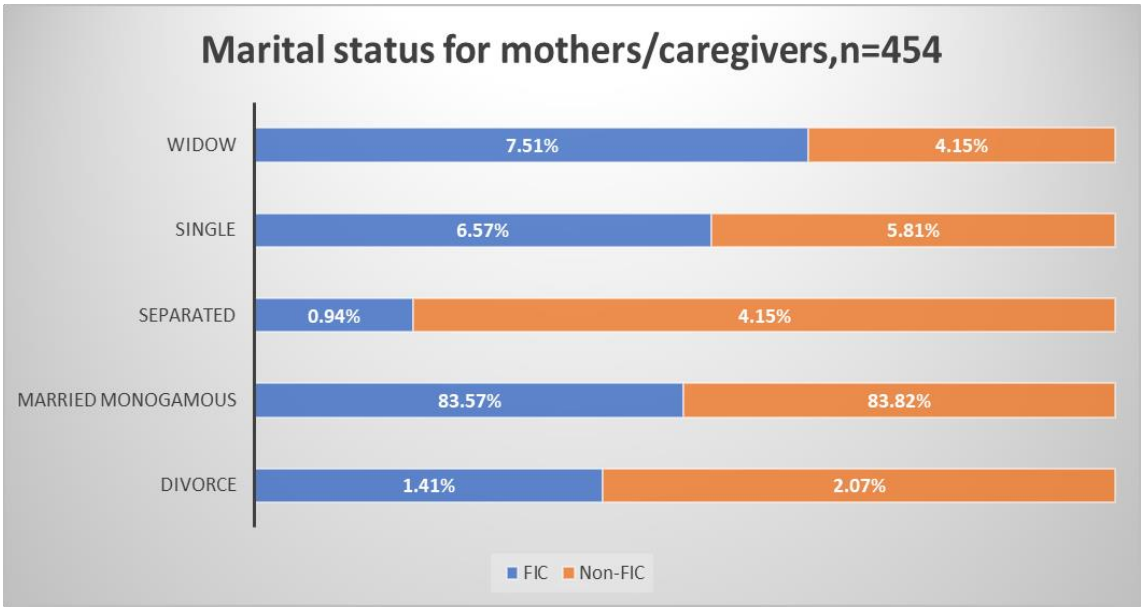

Figure 12: Marital status for mothers/caregivers

Table 4: Children socio-demographic characteristics with immunization status

Variables	N=454 Categories	Fully immunized Coverage	LCL	UCL	Partially/Un immunized children Coverage	LCL	UCL	OR	P value
Sex of children	Females	51.17%	44.25%	58.06%	53.53%	47.01%	59.95%	0.912	0.616
	Males	48.83%	41.94%	55.75%	46.47%	40.05%	52.99%		
Birth ranking	1st	10.85%	7.00%	15.83%	12.08%	8.24%	16.89%	1.218	0.0411
	2rd	27.83%	21.91%	34.38%	33.33%	27.40%	39.68%		
	3rd	28.77%	22.78%	35.37%	32.92%	27.01%	39.25%		
	4th	32.55%	26.29%	39.50%	21.67%	16.63%	27.42%		
Size of the family	1	17.84%	12.95%	23.65%	16.60%	12.13%	21.91%	0.984	0.8994
	2	43.19%	36.44%	50.14%	42.32%	36.01%	48.83%		
	3	35.68%	29.25%	42.51%	40.25%	34.00%	46.74%		
	4	3.29%	1.33%	6.65%	0.83%	0.10%	2.97%		
Age group in months	12-17 months	61.03%	54.13%	67.62%	53.94%	47.43%	60.36%	0.748	0.127
	18-24 months	38.97%	32.38%	45.87%	46.06%	39.64%	52.57%		

Source: Field Data (2019)

4.6 Socio-demographic characteristics of the index child

The total number of eligible children who were sampled during the study period was 454, of which 232 (51%) were female, 49% (222) were from rural areas. The majority of children (61%) were aged between 12-27 months and the rest were 18-24 months. Further to that, there was no association between the sex of the child with immunization coverage ($\chi 2=0.2511$, df=1 and p-value > 0.616).

As shown in figure 11, regarding the birth ranking of the children in the households, the majority of 400 (88%) were ranked two or above and least 52 (12%). There was a

significant association between childbirth ranking with immunization coverage $\chi 2=1.218$, df=3 and p-value 0.0411.

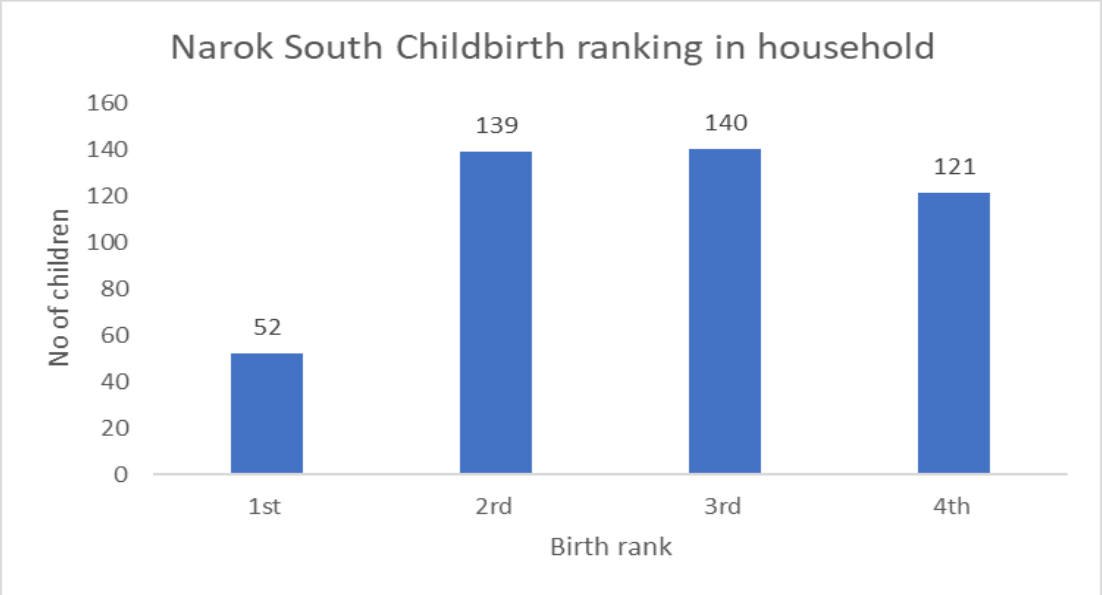

Figure 13 : Association childbirth rank with immunization status

4.7 Maternal health care utilization

Table 5: Mothers/caregivers maternal health utilization services with FIC

Variables	Categories	Fully immunized			Partially/Un immunized children			OR	p value
		Coverage	LCL	UCL	Coverage	LCL	UCL		
ANC visits	No	21.6%	15.8 %	28.4 %	26.2%	20.4%	32.5%	1.286	0.292
	Yes	78.4%	71.6 %	84.2 %	73.9%	67.5%	79.6%		
Parity	One Child	13.6%	9.3%	19.0 %	13.3%	9.3%	18.2%	1.050	0.801
	Two children	53.1%	46.1 %	59.9 %	45.2%	38.8%	51.8%		
	Three children	28.2%	22.2 %	34.7 %	39.4%	33.2%	45.9%		
	Four children	5.2%	2.6%	9.1%	2.1%	0.7%	4.8%		
place of delivery	Health facility	56.8%	49.9 %	63.6 %	17.8%	13.2%	23.3%	6.056	0.000
	Home	43.2%	36.4 %	50.1 %	82.2%	76.7%	86.8%		
PNC visit	No	53.3%	46.3 %	60.2 %	72.3%	66.1%	77.9%	2.283	0.000
	Yes	46.7%	39.8 %	53.7 %	72.3%	22.1%	33.9%		
ANC visits	1-time	66.3%	58.4 %	73.5 %	77.1%	70.0%	83.3%	1.794	0.002
	2-times	20.6%	14.6 %	27.7 %	20.5%	14.6%	27.4%		
	more than 3 times	13.1%	8.3%	19.4 %	2.4%	0.7%	6.1%		
Contraceptive use	Yes	57.6%	50.6 %	64.3 %	58.7%	52.1%	65.1%	1.050	0.801
	No	42.5%	35.7 %	49.4 %	41.3%	34.9%	47.9%		

Source: Field Data (2019)

The majority of the respondents (mothers), 319 (71%) delivered their children at home, while 135 (29%) did so at the health facility. The majority of the respondents in the households were largely female 95% and 5 % males. Other the other hand, 176 (71%) of caregivers had visited ante-natal clinic visits at least once, 54 (20%) had visited more than two times and 24 (9%) had visited more than three times the health facilities around the sub-county.

As shown in figure 14, slightly more than three quarters, 233 (76%), mothers had attended ANC services at least once, followed by none, 129(28%), and the least was mothers who had attended mother than three times with 25 (6%). Bivariate analysis, there was an association with mothers/caregivers' who had more than one visit with immunization coverage ($\chi 2$ =13.54, df =2 and p-value P<0.001).

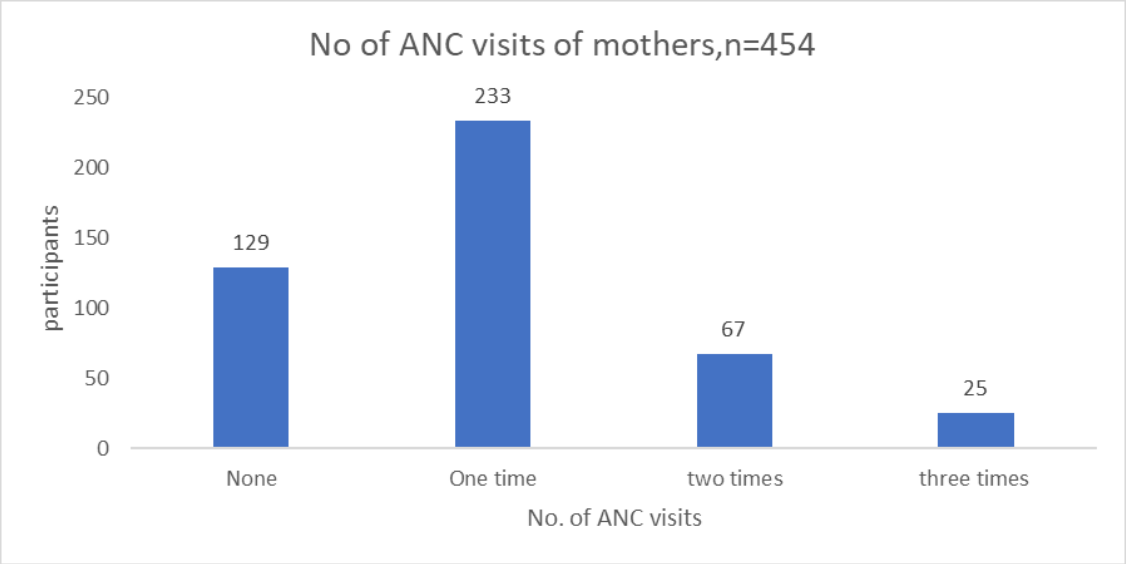

Figure 14: Mothers/caregivers who attended Ante-Natal Clinic visits

As shown in figure 14, under the ante natal care (ANC), most mothers 233 (51%) attended one-time ANC visit, followed by none with 129 (28%) and the least was 25 (%). This implies that mothers/caregivers utilized the ante natal services in health facilities in the study area. There was no relationship between immunization coverage with mother/caregivers attending ANC (χ^2=13.3939, df=1 and p value >0.2938)

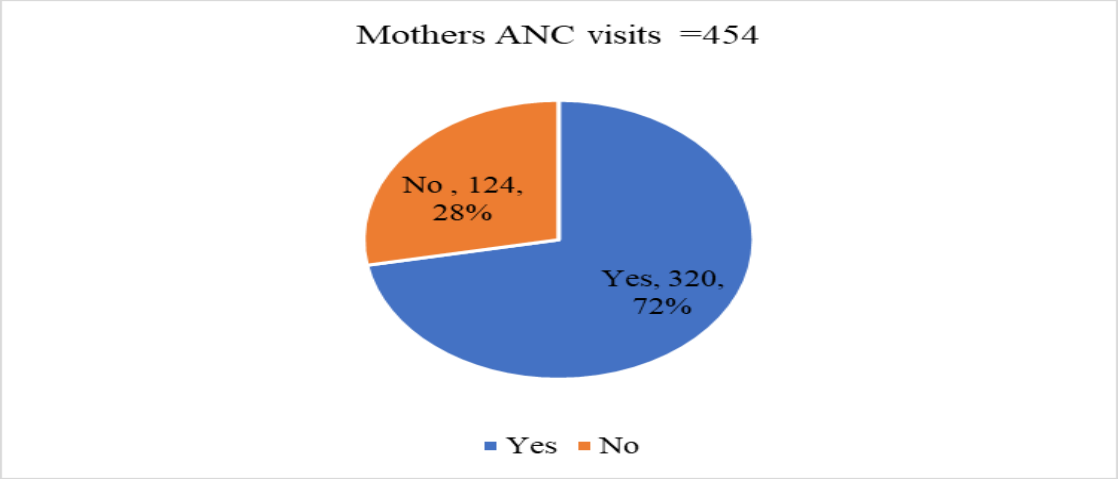

Figure 15: Mothers Ante-natal clinic visits

4.8 Association of children place of delivery with fully immunization coverage

More than three-quarters of mothers, 71% (319) most mothers delivered at home, while 29% (135) delivered at a health facility, as portrayed in the graphical presentation below (figure17). In relation to infant immunization coverage, mothers who delivered at health facilities had 74% of fully immunized children compared to those who delivered at home with 68%. From bivariate analysis, there was a significant association among the delivery places of children with immunization coverage ($\chi 2$=68.38, df =1, OR=6.056, p 0.001). Children who were born at the health facility were six times likely to be fully immunized compared to those born at home.

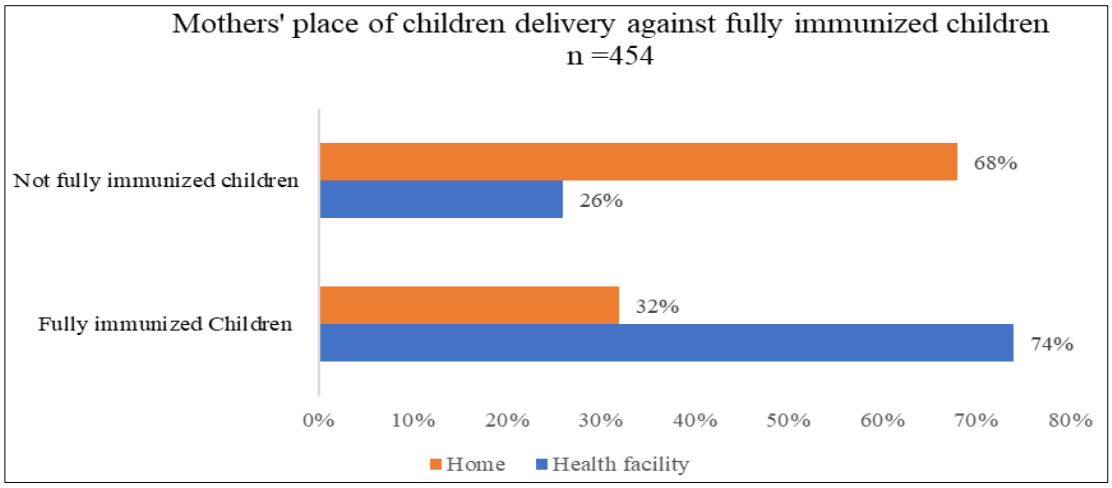

Figure 16 : Association of mother's place of children birth and immunization status

4.9 Mothers/caregiver's contraceptive use with immunization status

Slightly more than half, 57% (257) of mothers/caregivers were using contraceptive for family planning, while 43% (197) were not using contraceptive in the study area. From bivariate analysis, the results implied that there was no association between contraceptive use and immunization coverage in the study area (χ^2 = 0.0634, df= 1 and p value=0.801).

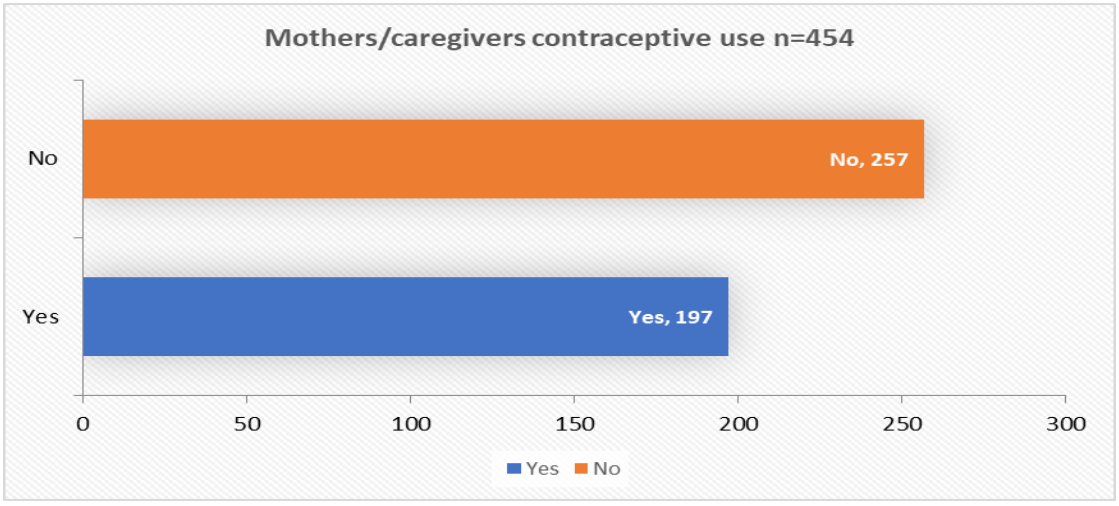

Figure 17: Mothers/caregiver's contraceptive use with immunization status

4.10 Factors for incomplete Vaccination in the study area

On the other hand, slightly half 50% of the mothers/caregivers indicated unmindful of essentials for vaccination, followed by not important return for immunization dosage and not knowing place/time of vaccination with 22%, whilst the least is wrong ideas about contraindications with 2%.

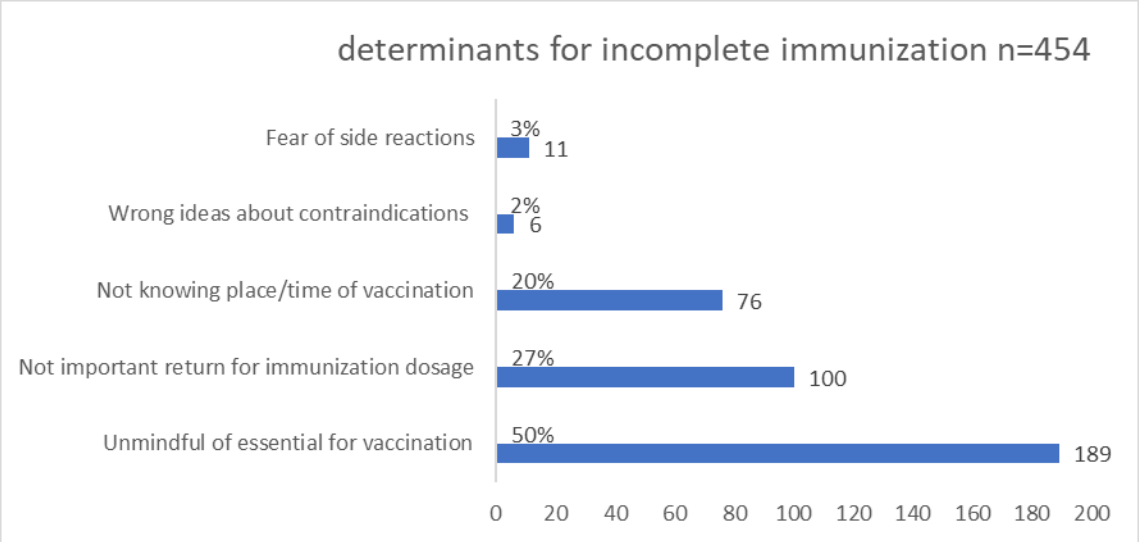

Figure 18 : Category reasons lack of information

Slightly more than half, 173 (53%) of mothers/caregivers had no faith in immunization, followed by those who suspended immunization until another time (busy) with 100 (30%), then cultural/religious beliefs 30 (9%) and the least was rumors with 25 (8%).

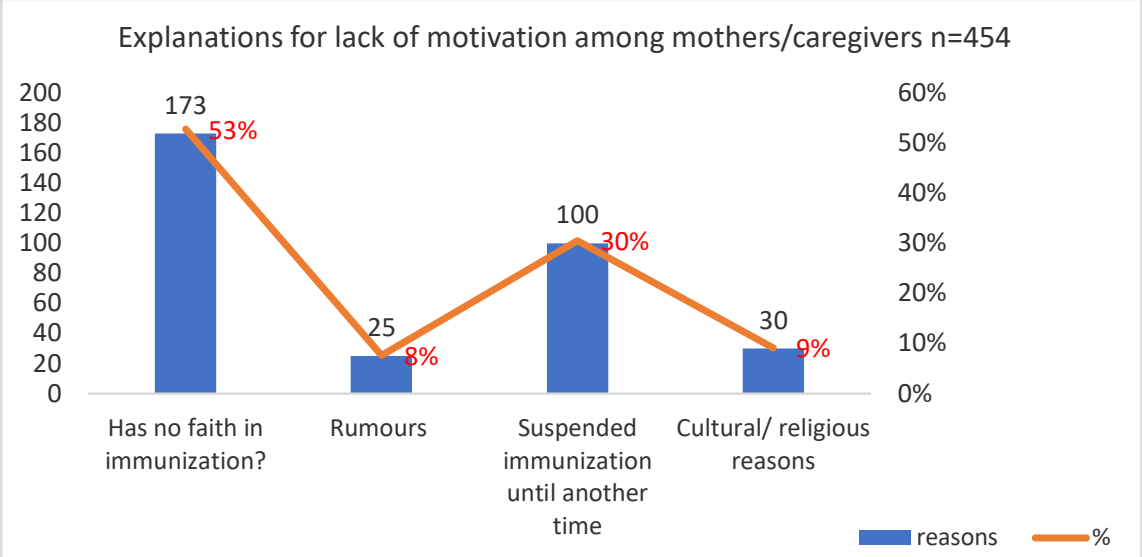

Figure 19 : Explanations for lack of motivation among mothers/caregivers

Table 6: Mother/caregivers' knowledge association with immunization status

		Fully immunized			Partially/Unimmunized children				P value
Variables	**Categories**	**Coverage**	**LCL**	**UCL**	**Coverage**	**LCL**	**UCL**	**OR**	
Age for vaccination start	Just after birth	42.7%	35.9%	49.6%	33.1%	27.0%	39.5%	0.90	0.13
	Four weeks after a birth	19.0%	13.9%	24.9%	21.9%	16.8%	27.8%		
	Six weeks after a birth	5.7%	3.0%	9.7%	10.3%	6.7%	14.9%		
	No idea	32.7%	26.4%	39.5%	34.8%	28.7%	41.3%		
ever visited health facility for any service	No	45.2%	38.3%	52.2%	64.3%	57.8%	70.4%	2.18	0.00
	Yes	54.8%	47.8%	61.7%	35.7%	29.6%	42.2%		
source of the information for vaccination	Immunization card	70.0%	63.3%	76.0%	51.5%	45.0%	57.9%	0.72	0.00
	Recall	12.2%	8.1%	17.4%	17.0%	12.5%	22.4%		
	Immunization card + recall	5.2%	2.6%	9.1%	5.8%	3.2%	9.6%		
	None	12.7%	8.5%	17.9%	25.7%	20.3%	31.7%		
Number of vaccination times	One time	19.1%	14.0%	25.0%	21.5%	16.5%	27.3%	0.97	0.58
	Two times	8.6%	5.2%	13.2%	5.5%	3.0%	9.2%		
	Three times	6.7%	3.7%	10.9%	6.3%	3.6%	10.2%		
	Four times	18.1%	13.1%	24.0%	12.2%	8.4%	17.1%		
	no response	14.8%	10.3%	20.3%	17.3%	12.7%	22.7%		
	Don't know	32.9%	26.6%	39.7%	37.1%	31.0%	43.6%		
child start for vaccination	just after birth	38.7%	32.1%	45.6%		23.0%	34.9%	0.88	0.08
	four weeks after a birth	23.1%	17.6%	29.4%	28.7%	20.7%	32.2%		
	Six weeks after a birth	25.5%	19.8%	31.9%	26.2%	24.2%	36.2%		
	No idea	12.7%	8.6%	18.0%	30.0%	10.9%	20.4%		
Awareness of vaccine preventable diseases	Measles	59.4%	52.5%	66.1%		57.7%	70.2%	1.03	0.74
	Diphtheria	0.9%	0.1%	3.4%	64.1%	0.1%	3.0%		
	Polio	38.7%	32.1%	45.6%	0.8%	27.4%	39.7%		
	Tetanus	0.9%	0.1%	3.4%	33.3%	0.1%	3.0%		
Where did you hear about	Community health volunteers	50.9%	43.2%	58.5%	51.9%	44.4%	59.3%	0.94	0.43

vaccination	Health workers at health facility	20.8%	15.0 %	27.6 %	17.5%	12.3%	23.8%		
	Community health extension workers	7.5%	4.1%	12.5 %	6.6%	3.4%	11.2%		
	Radio	18.5%	13.0 %	25.1 %	18.6%	13.2%	25.0%		
	TV	1.2%	0.1%	4.1%	2.7%	0.9%	6.3%		
	Newspaper	1.2%	0.1%	4.1%	1.6%	0.3%	4.7%		
Vaccination may cause harm to your child	Yes	45.5%	38.7 %	52.5 %	36.5%	30.4%	42.9%	0.92	0.12
	No	11.3%	7.4%	16.3 %	13.3%	9.3%	18.2%		
	Don't know	39.0%	32.4 %	45.9 %	43.2%	36.8%	49.7%		

Source: Field Data (2019)

Slightly more than half of the respondents, 235 (52%) had heard about immunization, while 215 (48%) had not. Further, on the source of immunizations to respondents, the majority of 183 (51%),) have heard about immunizations through community health workers, followed by health workers at the health facility with 68 (19%) and the least was through newspapers, 5(1%). Regarding knowledge of vaccine-preventable diseases, the majority of respondents, 278 (61%) have heard of measles, and polio 161(36%). Under knowledge, the number of times a child is supposed to be immunized, half of the respondents did not know 229 (51%), followed by one time 91 (21%), and the least was three times 29 (6%). In regards to whether vaccination may cause harm to your child, 45% cited yes while 11% said no and the rest, 39% did not know.

As per the Focus Group Discussion (FGD), most of them were in agreement that, creating time for vaccination was problematic and that they were also busy with household errands. On the other hand, the key informants mentioned that at times health facilities would be out of vaccines, have inadequate staffing, and the striking of health care providers. One of the Key Interview Informant (KII), said a few of the health facilities in

the sub-county had one staff per health facility and if the same staff goes for leave, the facility would remain closed, hence no immunization services.

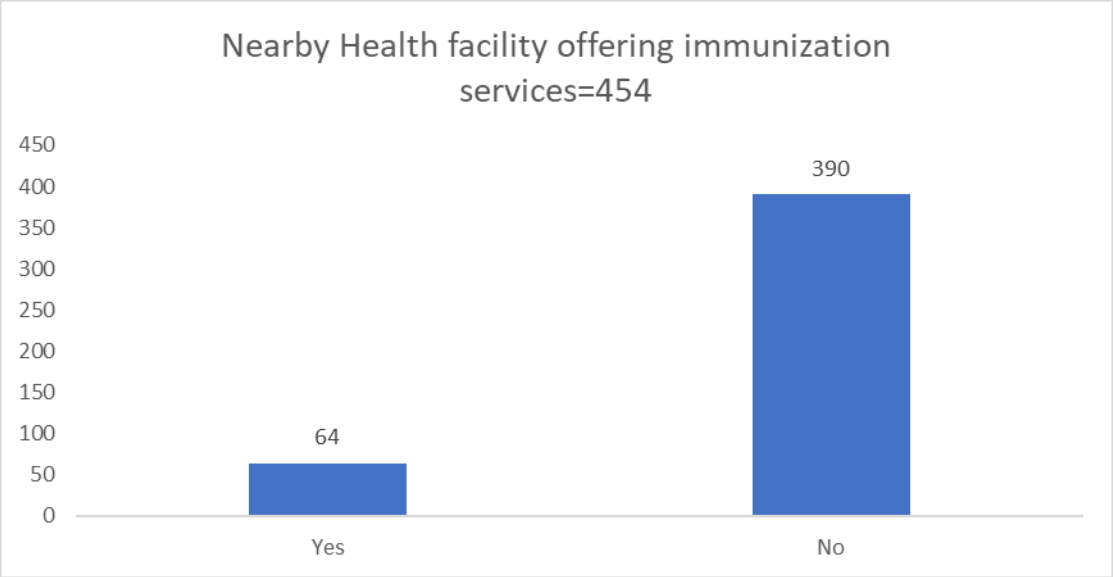

Figure 20: Mothers/caregivers' proximity to health post with immunized status

As shown in figure 20, more than three quarters of the caregivers from the study population 390 (86%) have no health facilities or vaccinations post near them. While, 64 (15%) had health facilities or vaccination post close to them. Regarding to KII (health care providers) and FGDs (mothers/caregivers/opinion leaders), all of them concurred that, communities do complain of distance in accessing the health facilities and terrain with scarce transport.

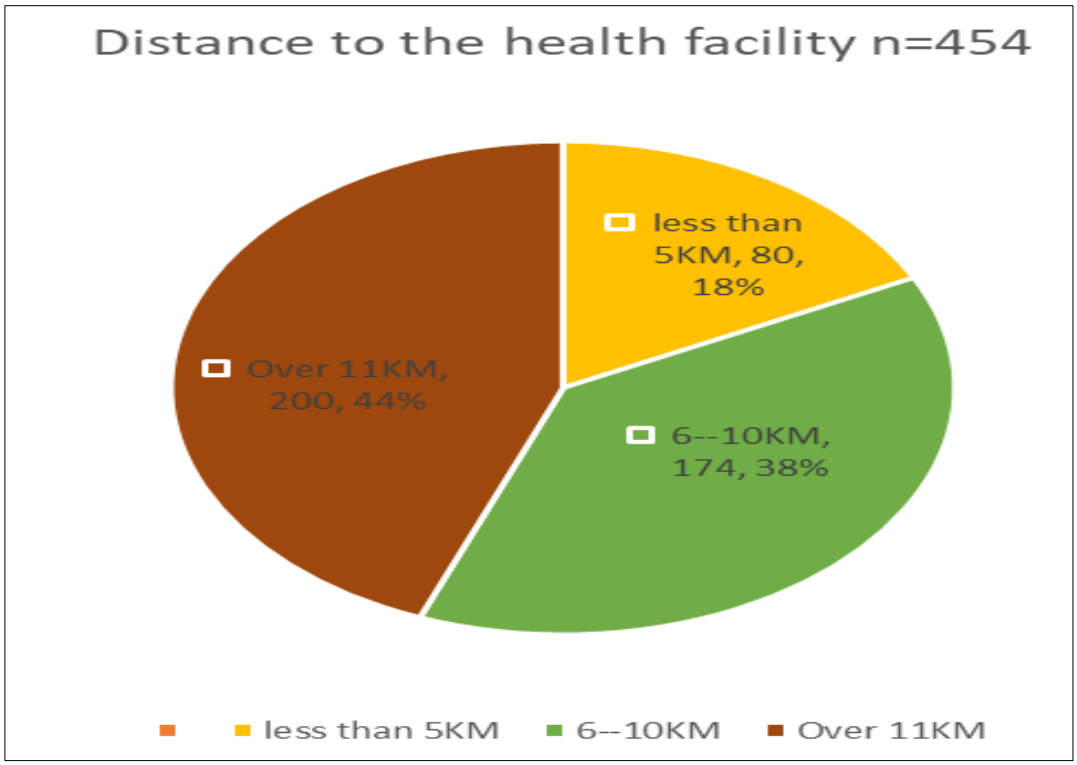

Figure 21 : Distance to health facility association with immunization status

In regard to distance to health facility, majority of caregivers 200 (44%) had to cover over 11 kilometers to access immunization services within the sub-county, 174 (38%) mothers/caregivers had to travel between (6-10 kilometers) and 80 (18%) covered less than five kilometers to reach vaccination post. As per the Pearson chi test, there was significant connotation amid distance to the vaccination post and fully immunized children χ^2=62.30, df=2 and p value=0.00.

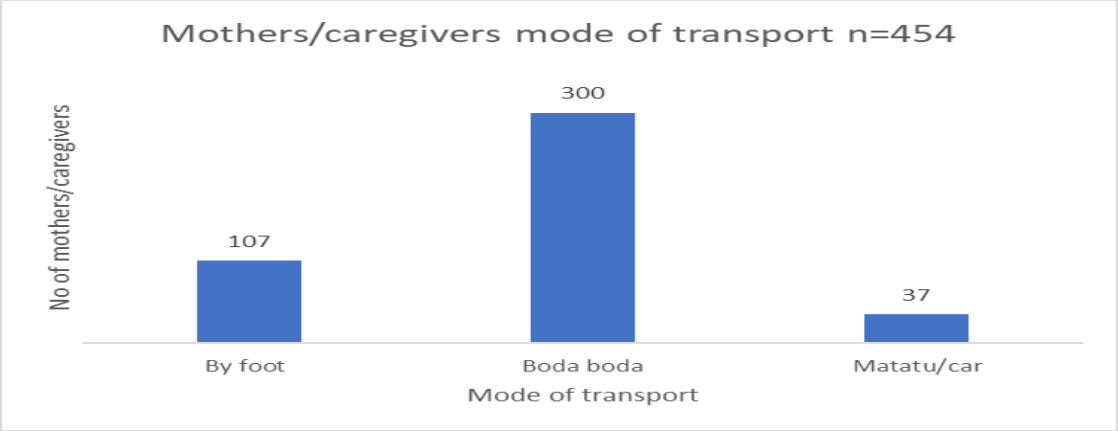

Figure 22 : Means of transport to the health facility by caregivers/mothers

Most mothers/caregivers 300 (68%) preferred to use boda boda (motorcycle taxi) as means of transport to take their children to the nearest vaccination health facility, followed by walking by foot with 107 (24%) and the least favored 37(8%) to use matatus. As illustrated in figure 24, the graph demonstrated mode of transport by mothers/caregivers to the health posts. As per the Pearson chi test, there was an association between distance to the health facility and fully immunized children χ^2= 26.55, df=2 and p value <0.00.

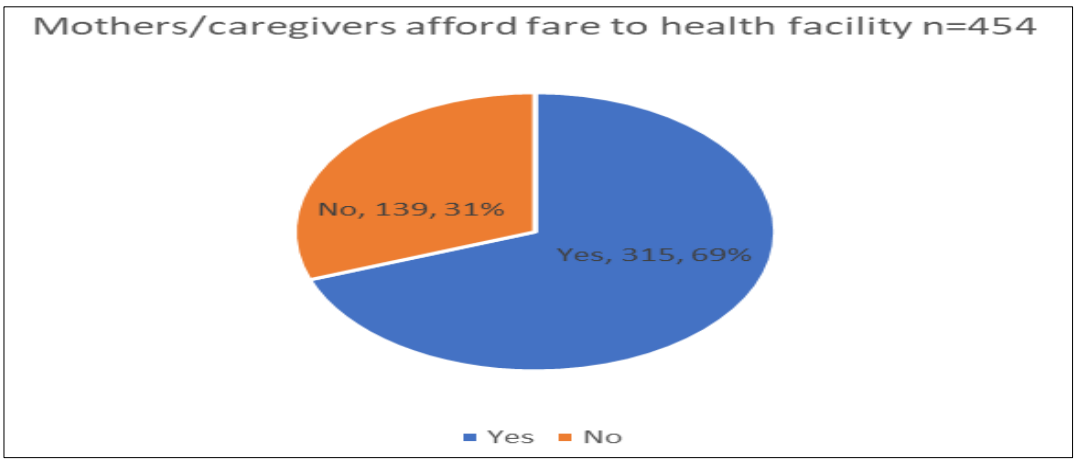

Figure 23 : Mothers transport health facility association with immunization status

As shown in figure 23 mothers/caregiver's transport fare to the health facility, majority, 315 (69%) of the mothers/caregivers, could not afford transport fare to take their children for immunization services in the study area, while 139 (31%) of the respondents could afford transport fare to the vaccination health facility for the immunization services.

There was significant association between fully immunized child and affording transport to the health facility (χ^2= 6.1341, df=1 and p value<0.013)

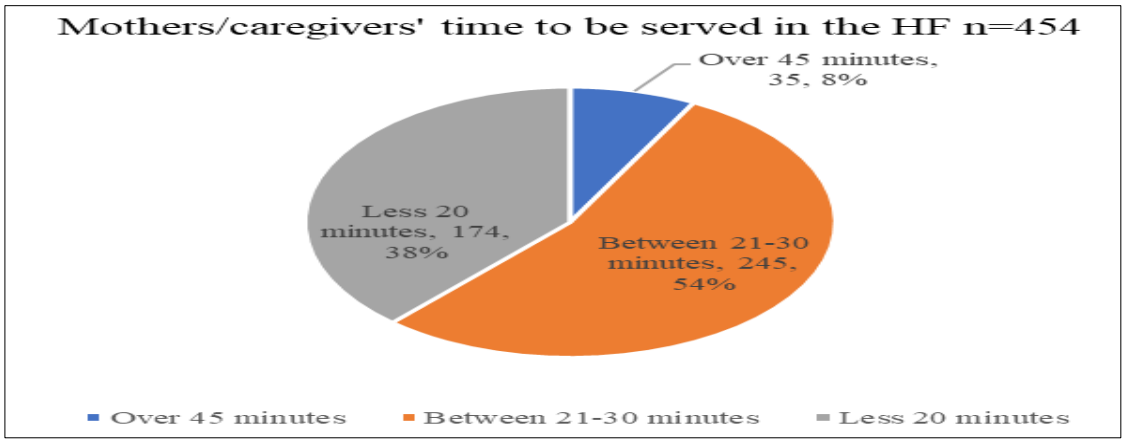

Figure 24 : Association between time served with immunization status

Majority of mothers/caregivers as per the graph above (figure 24), 245 (54%) indicated that, it takes between 21 to 30 minutes to be served in a given health facility, followed by less than 20 minutes 174(38%) and the least 35 (8%) was over 45 minutes to be served in the facility.

In regards to the number of vaccinations that a child should receive, the majority of mothers/caregivers could not distinguish the number of times a child would be immunized, followed by one-time vaccination, and the least was three times. The Pearson

chi test (χ^2= 14.8209. df=2 and p value<0.01), implied that, there was association between time to be served by health care worker with fully immunized children.

Table 7: Multivariate logistic regression of determinants of immunization status

Determinant indicators	Chi-Square (χ2)	df	p-value	OD	LCL	UCL
place of delivery	47.483	1	0.00	6.564	3.843	11.209
education level	47.540	1	0.00	3.121	2.258	4.314
source of information	1.981	1	0.16	0.859	0.695	1.061
the size of family	0.461	1	0.50	1.121	0.806	1.558
source of income	0.840	1	0.36	0.926	0.785	1.092
distance to health facility	26.836	1	0.00	0.222	0.125	0.392
no of children household	2.198	1	0.14	1.302	0.919	1.846
ever visited health facility	0.265	1	0.61	1.139	0.694	1.869
No of vaccination required	4.750	1	0.03	0.807	0.666	0.979
Child rank	3.056	1	0.08	1.437	0.957	2.156
ANC visits	1.285	1	0.26	0.242	0.021	2.814
Ever had about vaccination	2.224	1	0.14	1.724	0.843	3.529

Source: Field Data (2019)

As publicized in table 7 above, the multivariate logistic regression analysis was conducted to ascertain the association between fully immunized children and factors for non-immunized. Further, the following factors were associated to low immunization coverage in Narok South sub county were as follows; education level (p value <0.00, O. R=3.121), place of delivery (p value<0.00, O. R=6.564), size of the family (p value=0.86, O. R=1.121), source of income (p value<0.01, O. R=0.926), source of the immunization information (p value<0.02, O.R=0.75), distance to the health facility (p value<0.02, O.R=1.38) . Children who are born at the health facility are six times likely to be fully immunized as compared to those born at home. Further, mothers who visited at least one

Ante-Natal Clinic visit are three times likely to be fully immunized. In addition, children who are born by educated mothers are three times likely to be vaccinated as opposed to non-educated ones. Further, mothers/caregiver's education status, ANC visits, poor knowledge on immunization, size of the family place of delivery and distance to the facility were forecasters of fully immunized children in the study area.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The next section includes; the summary, conclusions and recommendations

5.1 Summary of Findings and Discussion

5.1.1 Immunization coverage in Narok South sub county

The objective of the research was to understand the Factors of low immunization coverage status among children aged 12 - 23 months in Narok South Sub County. Further, this chapter presents results, conclusions and key commendations to the key stakeholders.

The study results indicated that Penta 1 coverage was 58%, penta3 55%, measles 55 % and fully immunized child was 47% while the unimmunized children coverage was 53% in the sub county. The fully immunized coverage (FIC) for the sub county was 47% which is very truncated compared to the countrywide immunization coverage target which is 80%, further the World Health Organization (WHO) recommendation target was 90%. Children needed to be administered vaccines at the right moment to ensure optimal protection and avoid vaccine preventable diseases or mortalities.

5.1.2 Socio-demographic factors of mothers/caregivers in the study area

A total of 432 (95%) mothers and 22 (5%) fathers of children aged 12-23 months were interviewed during the study period. The overall household response rate was high across all the wards, was 100%. As per this study, mother/caregivers with wealth tend to be [AOR = 1.1467 (95% CI: 0.9497, 1.3845)] times possible to have a have complete immunized compared to poor mothers/caregivers who had low immunization coverage

in respect to fully immunized children. Similarly, this finding corresponded with research conducted by Kiptoo *et al.,* 2015 that presented that mothers/caregivers who earned less than Kshs. 5000 (USD 50) were three times not likely to have their children fully immunized. Other congruent researches carried out by Wado *et al* .2014 and Dikiema *et al*., 2004, also corresponds with this study, where there was a determinant between wealth and fully immunized children (FIC).

Furthermore, distance to vaccination post was a forecaster to full immunization coverage in the study area. Of the mothers/caregivers, 73% could not afford transport fare to take children to the immunization health post, hence affecting the fully immunized coverage in the study area. In respect to this research, there was substantial connotation between fully vaccinated children with mothers/caregivers who did not have fare to access transport to the health facility ($\chi 2$= 6.1341, df=1 and *p* value<0.013).

In addition, another predictor which contributed to low coverage of complete vaccinated children in the study area was the nomadic lifestyle, where nomadic pastoralist moves from one place to another in search of pasture for their cattle. An additional study conducted in Kenya in the East Pokot sub-county by Kiptoo *et al.,* 2015, corresponded with the results of this research, where one of the predictors of low vaccination coverage was the nomadic lifestyle. Even though other studies in Kenya by Kamau et al., 2001 and Okunga et al., 2015 have shown contrarily, that distance was not significantly associated with immunization coverage.

Furthermost of the respondents in the research zone were farmers, followed by nomadic pastoralists, their major livelihood being cattle rearing, where they travel from one place to another looking for pastures. Similar research executed by Kiptoo *et al.,*2015, concurred with the same findings of low immunization coverage to be 23%. In addition, other studies with similar studies were carried out by Ethiopia by Sisay *et al* 2019., with

lower fully immunized child results of 38.3%, and Mohamud *et al.,* 2014 had also lower results of 36.3% concurred with the findings. Furthermore, other studies that were in congruence were an Ethiopian study which showed low fully immunized children coverage of 66% (Lakew *et al.,* 2015) and 55% by Nozaki *et al.,* 2015.

Regarding the dropout rates, the proportion of children with evidence of valid dose vaccination varied across geographical areas, mothers/caregivers' education, and age and wealth index quintile. There were high dropout rates between penta1 to penta3 and BCG to measles 14.3% and 25.8% respectively. Similarly, research done by Baguune *et al.,* 2017, displayed that high dropout rates of BCG to measles of 31.5%. Girmaye *et al.,* 2019, concurred with the same findings, where penta1 to Measles dropout was at 16%. Basically, high dropout rates between penta1 and measles suggested that most mothers/caregivers are not utilizing the health facilities within the sub-county on immunization services. This also implied that most mothers defaulted and not taking their children for subsequent antigens in the nearest vaccinating post across the study population.

According to this study, penta1 to penta3 dropout rate was high with 14.3%, which was corresponding with the results with a research carried out by Girmaye *et al*.,2019 that displayed a high dropout rate of 25.6%. Further, a survey conducted by JSI *et al*., 2015 in Werega, Ethiopia showed that there was a drop out of penta1-penta3 of 15%. Generally, the children with higher crude coverage and card availability have a higher proportion of children with evidence of valid dose and vice versa. In the same breath, Penta1 to Penta3 dropout rates were high, which could be because mothers/caregivers are having challenges in accessing the health facilities for second or third doses of vaccine.

Slightly over fifty percent of the mothers/caregivers showed being unmindful of essentials for vaccination, this means that majority of mothers don't mind returning their children for second or third vaccine doses. Most respondents during focus group discussion said that they only know of measles and BCG vaccines. In fact, one the of the mothers said "*mtoto akishapewa chanjo ya mkono na miguu, tunajua chanjo imekwisha" (FGD, mother). (*If a child has been given BCG and measles vaccines, then the child has completed immunization). Other respondents said they feared side effects and they had no faith in immunizations. Regarding KII, most of the respondents seemed to concur with mothers who said that, they only know of BCG and measles vaccine. Importantly, there was the need to educate mothers/caregivers on the essence of taking their children to the nearest health post for the remaining antigens, by so doing we can avert vaccine-related mortalities in the communities.

Furthermore, the majority 42% of caregivers/mothers mentioned that health facilities for offering immunization services were too far. The majority of respondents who reside close to health facilities were 15 times possibly to comprehend their children to finish vaccination matched up to those who traveled or walk more than one hour to the closest immunization post or facility. Further to that, farness to the immunization posts was associated with incomplete immunization of children ($\chi 2=62.30$, df=2 and p value=0.00). This finding was consistent with other studies conducted by Kiptoo *et al.*, 2015, Wado *et al*., 2014 and Diekema *et al.*, 2004 regarding distance to nearest health facilities offering immunization services. Further, most of the respondents from Loita, Naroosura /Maji Moto wards are nomadic pastoralists and the immunization coverage for most of their children was very low, this was simply because most of the mothers/caregivers had relocated looking for greener pastures for the animals. In addition, a study in Kenya also

revealed accessibility and to health facilities, Ante-natal Care (ANC), place of delivery were factors associated with immunization status of child Mutua et al., (2011)

This was also supported by both key informant interviews (KII) and focus group discussants (FGDs) who agreed that during dry seasons most residents relocate to look for greener pastures in the neighboring county Tanzania, hence children missed out on second and third doses of vaccine.

One of the focus group discussion respondents said, "*Sisi wakati wa kiangazi tunaenda tutafutia ngo'mbe nyasi na maji, mambo ya chanjo inasaulika (FGD, mother33 years)"* During dry seasons travel with our animals in search of pastures and ignore children immunization.

Overall, the influences connected with low vaccination status in Narok South sub county were as follows; education level (p value <0.02, O.R=1.38) , place of delivery (p value=0.00, O.R=0.26), size of the family (p value=0.86, O.R=1.04), source of income (X2 =0.57, O.R=0.954 p value <0.01), source of the immunization information (O.R=0.75 and p value <0.02,), distance to the health facility (P value=0.02, O.R=1.38).

Respondents with children whose education was a little or nil primary education had a significant association with not fully immunized children (p value=0.02). Similarly, a survey study carried out in Nepal on immunization inequalities displays that children with non-educated parents are associated with not fully immunized (Ashish *et al.*, 2017 and Calhoun *et al*.,2014).

Similar findings that corresponded with this study were done in Nigeria which displayed that optimization of vaccination was lesser among children whose mothers/caregivers had none or low in education (Antai 2011*et al.*,).

In regards to multivariable logistic regression logistic between fully immunized children and maternal education level, Ante-natal Clinic (ANC) visits, size of the family, birth

ranking age of the mother/caregivers with age, more than 21 years indicated that there was a significant association with a p-value < 0.05). This corresponds with other studies carried out by Kiptoo *et al*.,2015 and Girmay *et al.,* 2019 which showed a relationship between FIC and, mothers/caregiver's education status, ANC visits, poor knowledge on immunization, size of the family, distance to the facility and place of delivery. One of the KIIs cited the following reasons for low immunization coverage in the sub-county. "*Shortage of skilled healthcare worker/ inappropriate staff skill gaps on EPI among the existing workforce. Erratic supply of EPI logistics for instance syringes, antigens, sparse distribution of health facilities which affect access of health care services to most women and children in the area. Inadequate funds for facilitation of mobile outreach services in hard-to-reach areas. Lack of facilitation to conduct preventive cold chain maintenances of cold chain equipment. Poor monitoring and evaluation institutionalization in the sub-county and county, inadequate supportive supervision both by the County and Sub-County teams due to inadequacy in funding. Lack of storage sites for immunization logistics at both County and Sub-county levels". (KII EPI sub-county focal person).*

Another study with corresponding findings was carried out in Mozambique also revealed that spending more than one hour plus distance to the vaccination post had augmented undesirable effect on the vaccination coverage, with slightly over 52% of caregivers/caregivers who participated in a study showed they lived far away from the vaccination post in the study area (Jani *et al*., 2008).

In the same breath, one of the KII cited that, "despite the stock out of vaccines, the program has continuously noted that counties have collected small quantities of vaccines from the county levels compared to the forecasted quantities. This had a direct impact on stock appropriateness or availability and subsequently service provision at the health facility level (KII, EPI County Health Management Team focal person"

5.1.3 Maternal health care utilization

Under maternal health care utilization services, slightly more than half 71% of mothers had at least visited health facilities once for Ante Natal Services (ANC); therefore, mothers would utilize the services offered in the health facilities.

Furthermore, relating to delivery 30% of the mothers delivered at the hospital or health facility while, majority 70% of the mothers gave birth at household, inferring that mothers do not utilize delivery services in the health facilities.

Further to that, mothers who delivered at health facilities had 74% fully immunized children compared to those children born at home with 68%. Correspondingly, research executed in Kenya by Maina *et al.*,2013 also showed that mothers/caregivers who delivered at health facilities had coverage of slightly higher than 80% while those who delivered at home had 20%. Other studies with congruent findings are from Nigeria (Adedire *et al.*,2016), Ethiopia (Etana *et al*.,2012) and Zimbabwe (Rosi et al.,2015) have shown there was a relationship between fully immunized children with numerous spectrums of maternal health care utilization (health facility deliveries, attending Antenatal services) indices. This also implied that most mothers delivered at home than at the hospital, hence they missed services like health education on the importance of immunization services to the infants.

These findings also concurred with participants of Focus Group Discussions (FGD), where most of them cited that most mothers delivered at home, citing distance to the health facilities, long traveling hours covered by mothers/caregivers to seek immunization services, lack of transport to access the services, lack of money by mothers/caregivers for transport payments and rough terrain. One of the focus group discussants said, *"Hospitali ya serikali huwa mbali sana na pia barabara imeharibika*

na tunaogopa wanyama wa porini kama fisi na chui (FGD,Mother39 years)" translating to "The government health facility was far with poor roads and fear of animals like leopards and hyenas" (FGD, mother). Further to that, the area has terrains and poor accessibility which makes accessibility difficult and in addition, there are wild animals on the way to the facility.

On the other hand, the KII, also mentioned rough terrain, vaccines stockouts, shortage of human resources for health, community health volunteers for tracing the immunization defaulters, poor documentation of reporting and recording of tools in the vaccination health facilities, and inadequate funds to support outreach immunization services. For instance, one of the KII stated: "*the partner who was funding outreach services has pulled out because of stoppage of funding by the donor, hence making it difficult to continue with the services"*. In addition, another key informant also, said: *"There was only one health facility in Ilmotiok ward that offer essential services to the community, hence making it so challenging to serve the entire community" (KII, SCHMT).*

In Kenya a study carried out E. Pokot sub-county by Kiptoo *et al.*, 2015 exhibited that children aged 12-23 months who were delivered in a hospital with a skilled health care worker were further likely to be fully immunized children compared to those are born at home with this odds AOR = 0.2332 (95% CI: 0.1467, 0.3708). Another study with corresponding findings in Ethiopia also displayed that children who are born at a health facility are five times more likely to be completely vaccinated as compared to those delivered at home. Further to that, another research executed in Ethiopia by Mesfin *et al.,* 2017, indicated that children aged 12-23 months delivered at the hospital are likely to be fully immunized matched up to those children who are born at home, (AOR = 2.4 (95% CI: 1.38, 3.65).

A study in Kenya by Awino *et al.,* 2016, was also consistent with this result indicating that index children born at health facilities are more likely to be fully immunized than those born at home. In addition, another study that shared the same corresponding results was conducted by Diekema *et.al.,* 2004, which revealed that there was a significant relationship between the place of delivery and fully immunized children.

Further to that, Odutola *et al*.,2015 also, had a congruent finding in a study conducted in Gambia which exhibited that, if mothers/caregivers utilized the number of Ante-natal (ANC) visits which showed the augmentation in the study population. This was attributed to the bonding between the mothers and health care workers, which enabled trust which further led to an increased number of hospitals delivered, and henceforth, their children tend to have had higher in terms of being fully immunized. Pertaining to contraceptives, the majority 57% of mothers were using modern contraceptives for family planning. So, this implied that mothers tend to utilize the family planning services, henceforth there was the need for continued health education of immunization services for the missed opportunities during the clinic days.

5.1.4 Knowledge on immunization services and vaccine preventable diseases

Most of the respondents (52%) had heard of immunization while 48% had not. Mothers/caregivers' knowledge of immunization and vaccine avertable diseases had significant relation with fully immunized children in the study. Those mothers/caregivers with virtuous familiarity with vaccination and vaccine avertable morbidities were more likely to be fully immunized as compared to those with poor knowledge on vaccination and vaccine avertible ailments. In the same breath, a study in Tshwane district South Africa exhibited that knowledge of vaccine avoidable morbidities was lesser in caregivers/mothers whose children are fully immunized and mothers whose children

were not fully immunized. Further, insufficient knowledge relating to vaccinations of children did not seem not to have contributed to lower vaccination coverage in the study area (Makgomo *et al*.,2018).

Further in analogous research that was done by Mesfin *et al.,* 2017 which showed that mothers/caregivers with children aged 12-23 months who had good knowledge of vaccination and vaccine avertible are 6.18 times likely to be fully vaccinated compared to those with poor knowledge on immunization and vaccine-preventable diseases. Research executed in Ethiopia by Barhane *et al.,* 2008, also revealed that there was an association relationship between fully immunized children with good knowledge on immunization compared to those mothers/caregivers with poor knowledge on immunization. A similar study with corresponding findings was a study carried out in Pakistan by Nasar et al.,2010, which exhibited that, health workers remained the primary basis of information with coverage of (88%).

Further, according to the research executed by Asfa *et al*.,2016 in South Ethiopia revealed that aspects such as mass media acquaintance, insights of immunization, child's place of birth (like a hospital), and place of stay similarly impact the vaccination coverage among children.

Two-thirds of Key Informant Interview (KII) respondents during the interview with them, cited the following reasons for incomplete immunization; distance to the facility, stock-outs of vaccines, no staff at the facility during immunization days, drought, migration of nomadic pastoralist, staff attitudes, ignorance by community members and long waiting hours during immunization services ("*KII, SCHMT"*).

5.2 Conclusions

To this end, the sub-county immunization coverage for fully immunized children was fairly low at 47 percent, compared to the national average of 77 percent. So far,

caretaker's little or no education, distance to vaccination post, inadequate mothers/caretakers' knowledge about vaccination, staying together in huge household size, not visiting the facility for Ante-Natal Clinic (ANC) services, and non-health facility delivery were hindering the achievement of full immunization coverage in the sub-county. Based on the findings was a strong association of illiteracy with the non-immunization of children in the sub-county. Also, the study showed low utilization and access of immunization services by communities to the health facilities. Based on the research findings the chances of the county getting vaccine-preventable diseases (measles, Polio) are very high because of low immunization coverage in the region coverage. Finally, public responsiveness on health education in order to reduce mortality, morbidity, and disability from diseases related to the vaccine through optimum use of available and new vaccines.

5.3 Recommendations

There should be continuous education of women especially expectant mothers at antenatal clinics (ANC) on the importance of immunization and completing all doses, in pursuance of condensing the number of children defaulting from vaccination in the sub-county. Efforts should be focused on the high economic status in enlightening them on the importance of completing all doses of vaccines for their children. The government should build more health facilities that offer immunization services within communities and there should regular outreaches to communities with no health facilities to prevent a high dropout rate. Further, there was the need to motivate community health volunteers to intensify in defaulter tracing of children missed opportunities, hence will increase the vaccination coverage for this country, and also, sensitize the communities through health care workers/ community health volunteers on the essence of childhood immunization.

The government and stakeholders should advocate, through social medial, radios, TV, churches, schools, and community for immunization as the best option of preventing vaccine-preventable diseases and disabilities. Finally, there was the need for the county government of Narok to create demand for services in health facilities so that communities can utilize-more so vaccination services.

5.4 Recommendations for Further Studies

The study has opened avenues into various researches that may be done:

i. A study could be carried out on determinants of low immunization coverage among children aged 12 - 23 months in the other counties so as to offer comparison.

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APPENDICES

Appendix I: Informed Consent Form

Principal investigator: Langat Kipkemoi Richard
Contacts: +254720420087
E-Mail: langrichie@outlook.com
Co-researchers:

1) Dr. Samwel Oduwuor, PHD
   Senior Lecturer
   School of Public Health
   Pwani University
2) Dr. Maxwell Philip Omondi, PhD
   Senior Lecturer
   School of Public Health
   Mount Kenya University.

Dear Participant,

Greetings, my name is …..... from Mount Kenya University. Presently, we are carrying out a study in Narok South Sub County. The title of the study

The objective of the study

The major purpose of this research was to find out what factors contributed to low immunization coverage among children aged 12 to 23 months in Narok South sub-county, Narok County, Kenya. Kindly, your participation in this study was regarded because of your valued knowledge and intense experience was of worth to the study.

Contribution

If you agree to participate in this study, you will be required to answer series of questions that have been prepared.

Privacy

The detailed information collected from the participant was not disclosed to third party and was held confidential.

Risks

A few questions in the questionnaire would make you not comfortable while answering them. This is to inform you that, your contribution in this research is voluntarily, also, its within your right to choose not to partake or respond to questions. This project is not harmful, it involves asking you to share some information to be used to improve the immunization coverage provided by the health care services.

Stop or withdraw in participating the research

This is to inform you that, your contribution in this research is voluntarily. You may opt out in participating in the research if you so wish, even if you have consented

Benefits

The data that you have given would help in launching the determinants of low immunization coverage among children aged 12 - 23 months in Narok south, Narok county-Kenya"

Contact person

Should you need any clarification or question about the study, kindly contact the researcher using the details below:

Lang'at Kipkemoi Richard
The Principal Investigator,
Mount Kenya University**,** P.O. Box 4595 – 20100**.** Nakuru Kenya

Appendix II: Questionnaires

Household QUESTIONAIRRE

Ward Name ……. Location……...Sub Location……..… Village..... Cluster No……...… HH No.....

Date: ……...Interviewer: .....

Introduction

My name is Richard K. Lang'at. Currently, pursuing Master of Public Health concentration in Monitoring & Evaluation from Mount Kenya University. As part of my study, I am required to undertake a research project for my project. This project is not harmful.it involves asking you to share some information which would be used to improve the immunization coverage provided by the health care services. The title of my research is "Determinants of low immunization coverage status among children aged 12 - 23 months in Narok South Sub County". It has been approved by Mount Kenya university ethics board. Some questions maybe personal but responses would be appreciated and treated with utmost confidentiality.

This is to inform you that, your contribution in this research is voluntarily, also, its within your right to choose not to partake or respond to questions. If you are comfortable with the information share, I now seek consent to proceed with the interview.

Given consent yes☐ No ☐

Signature……..……...

Date……..……...

Child demographic data

1. What is the gender of the child 1: Female 2 Male
2. When was the child born? (Date of Birth) (DD/MM/YYYY) …….
3. Age of the child in months…….
4. Child place of delivery: 1) Health facility 2). Home (TBA) 3. Don't Know
5. Child birth rank order in the family

1=1st 2 =2rd 3= 3rd 4 >=4th

6. Was the child sick during the immunization clinic day? 1. Yes 2. No

7. Is the child orphan 1. Yes 2. No

8. Does the child have immunization card? 1. Yes 2. No

9. Does the mother/caregiver have the mother baby booklet 1. Yes 2. No

10. Source of the information to complete the table below 1. immunization card 2. History 3. Both

Antigen issued	**Status**	**Date given**
BCG	Yes / No	
OPV at Birth	Yes / No	
OPV 1	Yes / No	
OPV 2	Yes / No	
OPV 3	Yes / No	
DPT1	Yes / No	
DPT2	Yes / No	
DPT 3	Yes / No	
PCV1	Yes / No	
PCV2	Yes / No	
PCV3	Yes / No	
Rota1	Yes / No	
Rota2	Yes / No	
Measles	Yes / No	
Immunization status (tick appropriately)	Immunized not	
	Partially immunized	
	Fully immunized	
Fully immunized child	Yes / No	

Child immunization card

11. Has your child received any vaccine? 1. Yes 2. No

12. What could be the possible reason for not taking your child for immunization? **(Tick on each category reason).**

Category reason	**Reasons**	**Tick one reason for each category**
Lack of information	Unmindful of essential for vaccination	
	Not important return for immunization dosage	
	Not knowing place/time of vaccination	
	Wrong ideas about contraindications	
	Fear of side reactions	
Lack of motivation	Has no faith in immunization?	
	Rumours	
	Suspended immunization until another time	
	Cultural/ religious reasons	
Obstacles	Health vaccinator absent	
	Vaccine out of stock	
	Mother too busy	
	Family had relocated of grazing	
	Vaccination post/facility is too far	
	Time of vaccination is problematic	
	Sickness or family social problem	
	The child was sick	
	Long waiting time before the service,	

DEMOGRAPHIC INFORMATION OF THE MOTHER/CAREGIVER

13. Age of the mother/caregiver in years……..

14. What is the marital status of mother/caregiver?

1= Not married 2 = Married monogamous 3 =Divorce 4 = Separated 5= Widow

15. What is the size of your family in the household?

1) <=2 2) 3-4 3) >5

16. What is your highest education level?

1= None 2 = Primary education 3= Secondary 4 = college/university

17. State the source of family income?

1 = Formal employment 2= Business 3 = Farming 4 = pastoralism 5. Housewife

18. The number of children that caregiver/mother has

1 = 1 child 2) 2-3 children 3) = 4 or more children

19. What is your religion?

☐man Catholic ☐testant ☐am ☐ne ☐ther specify ……

20. The total earnings of the mother/caregiver in the household?

☐2500 or less (Kshs) ☐ 3000-5000 Kshs ☐5000-9000 Kshs ☐ Over 10,000Kshs

MATERNAL HEALTH CARE UTILIZATION AT THE HEALTH FACILITY

21. Did you attend Ante Natal Care visit ☐ Yes ☐ No

22. If yes, kindly state the number of times you have attended?

☐ 1 times ☐ 2-4 times ☐ > 4 times

23. Did you attend Post Natal Care visit 1.Yes 2.No

24. Have you visited any health post with your child for any purpose 1.Yes 2.No

25. Was your child given any vaccine for immunization 1.Yes 2.No

26. Has the mother/caregiver ever used contraceptive? 1.Yes 2.No

ACCESS AND QUALITY OF IMMUNIZATION SERVICE

27. Is there health facility nearby offering immunization services? 1. Yes 2.No

28. Transportation to the health facility {**1**.By foot **2**.Boda **3.** Matatu **4**.other……}

29. If using a matatu or motorcycle how much money do you pay to reach the health facility for immunization? (Tick as appropriate).

1. <Ksh 100 2 Kshs 150-400/= 3 >Kshs 500/

30. How long does it take to travel to the clinic facility

{1}. Less than 15 minutes **{2}**.30minutes to 1 hour **{3}.** Over one hour

31. Long waiting time at facility to be served **1**. Yes **2**.No

32. Turned back home without getting vaccine **1**. **Yes** **2**.No

33. How long will it take for your child to be immunized at the health facility?

1.< 15 minutes **2**. 20-30 minutes **3**. > 45 minutes

Knowledge score on immunization and vaccination

43. When does, the child start vaccination?

1.Immediately after birth **2**. One month after birth **3**. At any time **4.** After one year of birth

5. I do not know

44. Have you heard about vaccination? 1. Yes 2 No

45. If yes, where do you hear about the vaccination? (**Multiple response possible)**

1. Community health volunteers 2. Health workers at health facility 3. Community health extension workers 4. Radio 5. TV 6. newspaper 7. other specify

46. Which vaccine preventable diseases do you know? (**Multiple response possible)**

1Measles 2. Diphtheria 3. Polio 4. Tetanus 5. Pertussis 6. Hepatitis B 7. Homophiles influenza b 8.pneumonia 9. Diarrhea 10. Tuberculosis 99=No response

47. At what age should the child begin to be vaccinated?

1= just after birth 2= four weeks after a birth 3=six weeks after a birth

48 How many times should a child be vaccinated to be fully immunized?

1=one 2= two 3= three 4= four 5=five 99=No response 88=I don't know

49. Do you think vaccination may cause health problem to the child?

1.yes 2. No 99=No response 88=I don't know.

Appendix III: Focus Group Discussion guide

My name is Richard K. Lang'at, currently, pursuing Masters of Public Health concentration in Monitoring & Evaluation from Mount Kenya University. I am obligated to conduct research for my project as part of my studies. This initiative is not

harmful; it simply asks you to contribute some information that will be utilized to improve the health-care system's immunization coverage. The title of the research "Determinants of low immunization coverage status among children aged 12 - 23 months in Narok South Sub County". We are going to have a group discussion. Let us now discuss each of the following questions.

1. What are your thoughts about vaccination and its importance?
2. How is the vaccination acceptability in the community?
3. What problems are there in the immunization service delivery?
4. Is the immunization service integrated with other services?
5. Why do you think mothers don't complete their child's immunization schedule?
6. Do you think gaps from health professionals exist that contribute for the incomplete immunization status of children? What are these gaps?
7. What do you think the health professionals need to do to improve the immunization service delivery?
8. What needs to be improved, generally, to increase the number of fully vaccinated children?
9. Is there any problem in the community that inhibited immunization completion of the children? If then what are the problems?
10. Is the support given from SCHMT/CHMT staff satisfactory?
11. What are the possible solutions to increase the number of fully vaccinated children?

Appendix IV: Key informant's interview guide

I'm Lang'at Kipkemoi Richard. Presently, pursuing Master of Public Health concentration in Monitoring & Evaluation from Mount Kenya University. As part of my study I'm required to undertake a research project. This project is not harmful, it involves asking you to share some information to be used to improve the immunization coverage

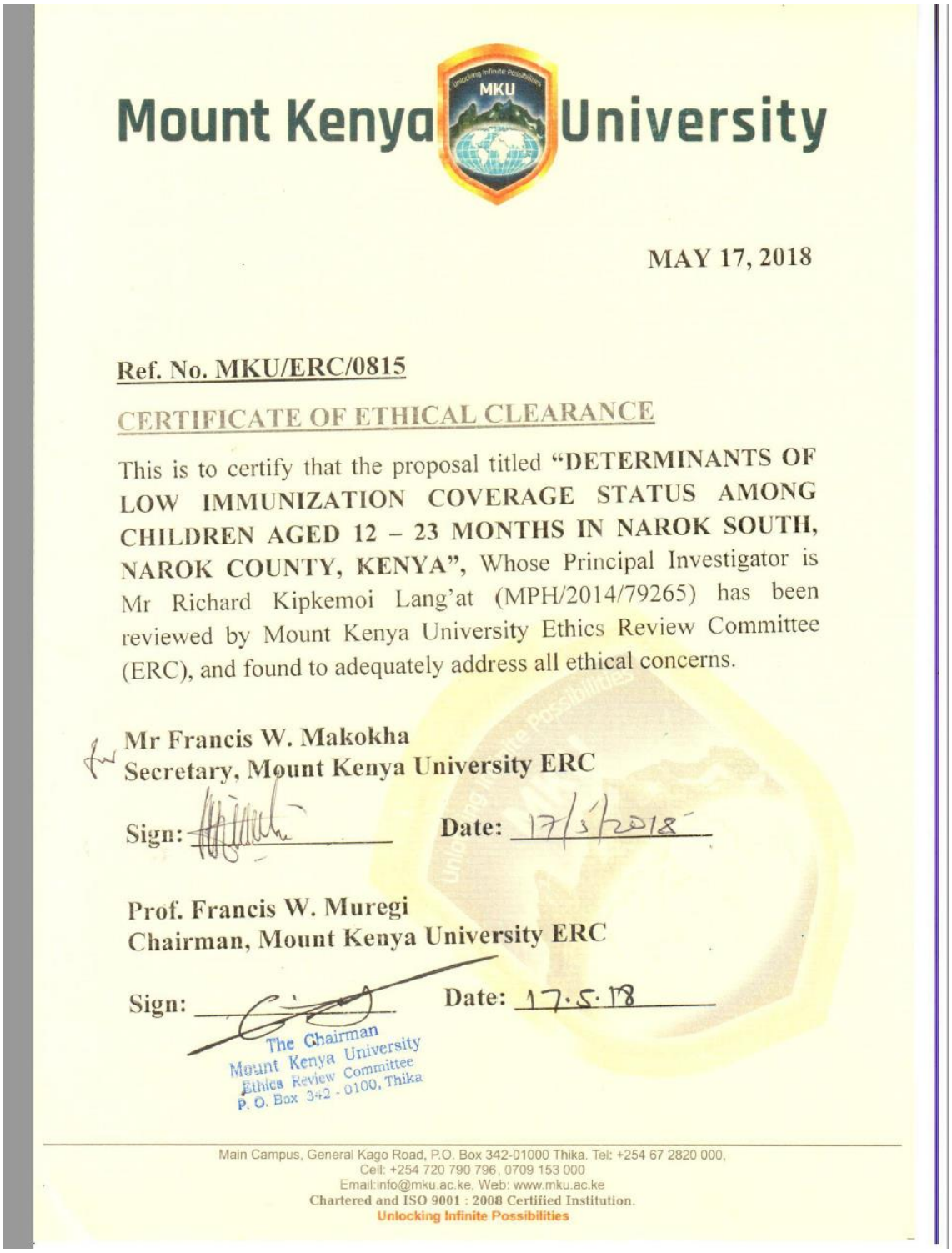
provided by the health care services. The title of my research is “Determinants of low immunization coverage status among children aged 12 - 23 months in Narok South Sub County”. It has been approved by Mount Kenya university ethics board. Some questions maybe personal but responses would be appreciated and treated with utmost confidentiality.

This is to inform you that, your contribution in this research is voluntarily, also, its within your right to choose not to partake or respond to questions. If you are comfortable with the information share, I now seek consent to proceed with the interview How is the immunization program being managed?

1) What problems exist in the implementation of the immunization program?
2) Are there enough resources for the immunization program? If no, which resources are lacking?
3) Was there occasions in which vaccine shortage was encountered in last year? If yes which antigens were missing?
4) How do you identify your target population for vaccination coverage?
5) Is dropout rate monitored monthly and feedback given to community health volunteers?
6) Do you have adequate staff to cover the population target for the immunization schedule?
7) Is there adequate logistic for supervisory activities?
8) Do you always meet community health volunteer at community unit during your visit?
9) In your opinion, what are the most challenging issues during your visits to the health post?

10) What are some of the reasons that contribute incomplete vaccination status of children?

Appendix V: Letter of introduction/authorization



Mount Kenya University

MAY 17, 2018

Ref. No. MKU/ERC/0815

CERTIFICATE OF ETHICAL CLEARANCE

This is to certify that the proposal titled **"DETERMINANTS OF LOW IMMUNIZATION COVERAGE STATUS AMONG CHILDREN AGED 12 – 23 MONTHS IN NAROK SOUTH, NAROK COUNTY, KENYA"**, Whose Principal Investigator is Mr Richard Kipkemoi Lang'at (MPH/2014/79265) has been reviewed by Mount Kenya University Ethics Review Committee (ERC), and found to adequately address all ethical concerns.

Mr Francis W. Makokha
Secretary, Mount Kenya University ERC

Sign: _____ **Date:** 17/5/2018

Prof. Francis W. Muregi
Chairman, Mount Kenya University ERC

Sign: _____ **Date:** 17.5.18

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Main Campus, General Kago Road, P.O. Box 342-01000 Thika. Tel: +254 67 2820 000,
Cell: +254 720 790 796, 0709 153 000
Email:info@mku.ac.ke, Web: www.mku.ac.ke
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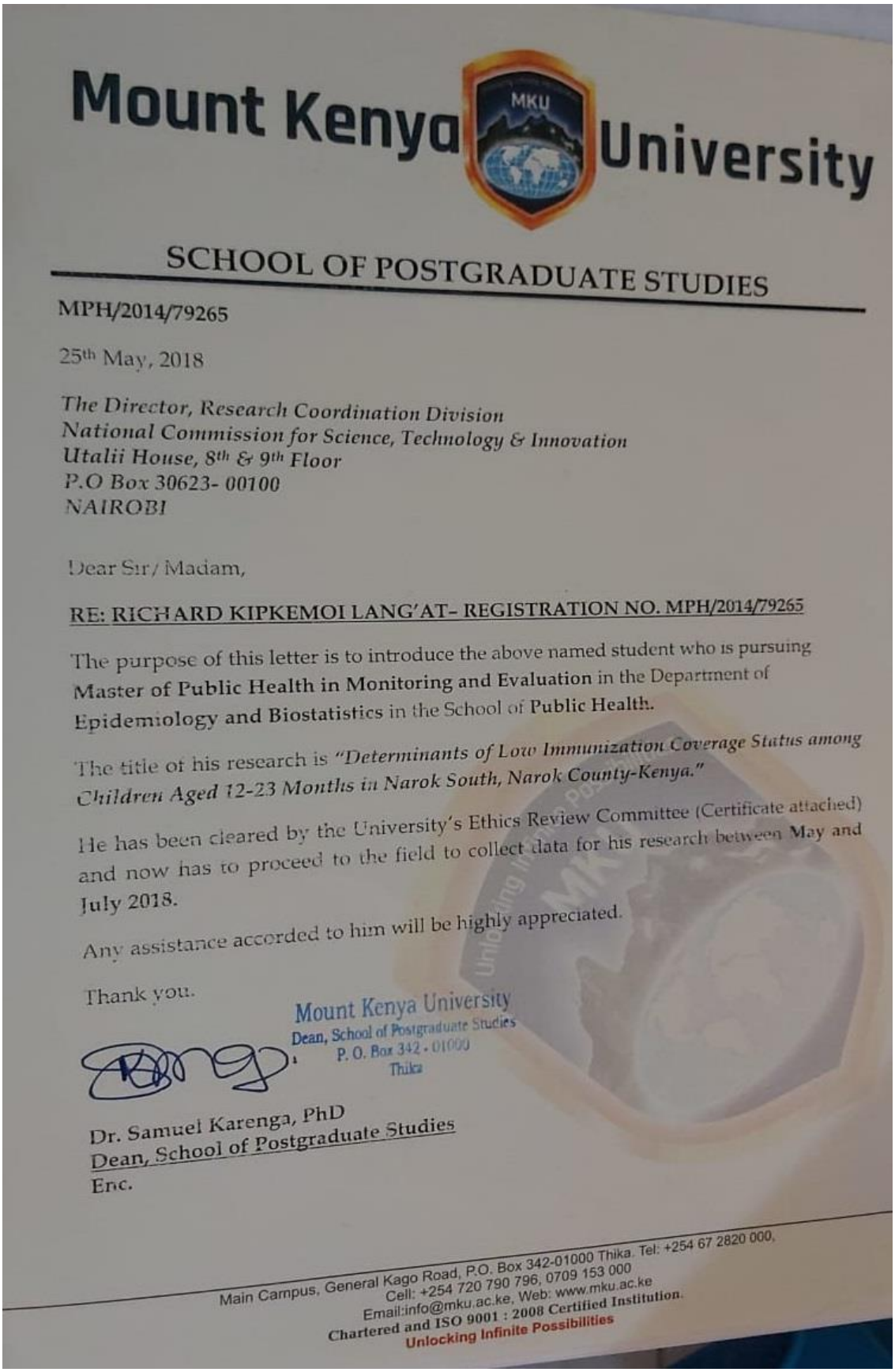
Appendix VI: Letter from School of Postgraduate



Mount Kenya University

SCHOOL OF POSTGRADUATE STUDIES

MPH/2014/79265

25th May, 2018

The Director, Research Coordination Division
National Commission for Science, Technology & Innovation
Utalii House, 8th & 9th Floor
P.O Box 30623- 00100
NAIROBI

Dear Sir/ Madam,

RE: RICHARD KIPKEMOI LANG'AT- REGISTRATION NO. MPH/2014/79265

The purpose of this letter is to introduce the above named student who is pursuing **Master of Public Health in Monitoring and Evaluation** in the Department of **Epidemiology and Biostatistics** in the School of **Public Health.**

The title of his research is *"Determinants of Low Immunization Coverage Status among Children Aged 12-23 Months in Narok South, Narok County-Kenya."*

He has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data for his research between **May and July 2018.**

Any assistance accorded to him will be highly appreciated.

Thank you.

Mount Kenya University
Dean, School of Postgraduate Studies
P. O. Box 342 - 01000
Thika

Dr. Samuel Karenga, PhD
Dean, School of Postgraduate Studies
Enc.

Main Campus, General Kago Road, P.O. Box 342-01000 Thika. Tel: +254 67 2820 000,
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Email:info@mku.ac.ke, Web: www.mku.ac.ke
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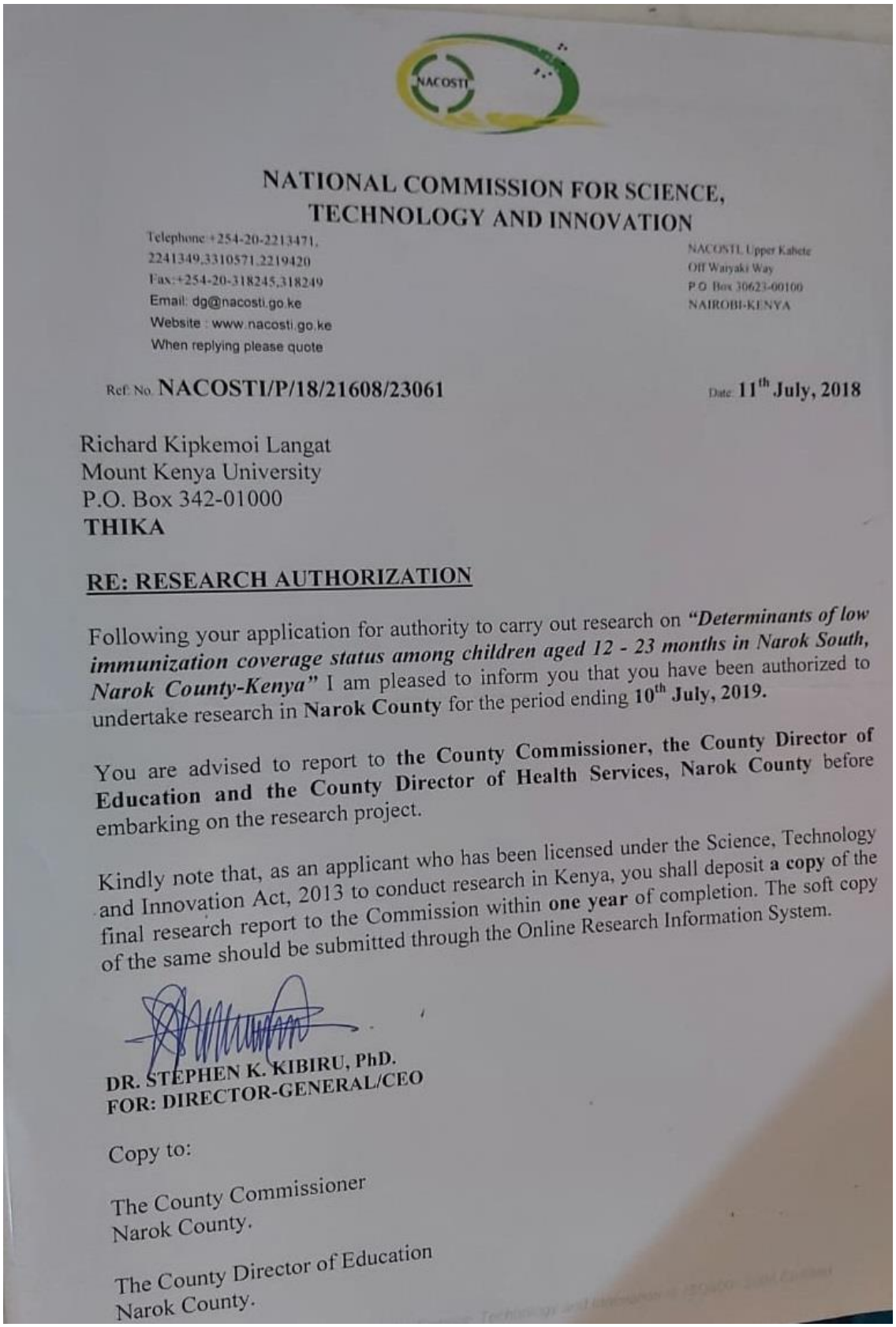
Appendix VII: Authorization from NACOSTI



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NAIROBI-KENYA

Ref: No. **NACOSTI/P/18/21608/23061**

Date: **11th July, 2018**

Richard Kipkemoi Langat
Mount Kenya University
P.O. Box 342-01000
THIKA

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Determinants of low immunization coverage status among children aged 12 - 23 months in Narok South, Narok County-Kenya"*** I am pleased to inform you that you have been authorized to undertake research in **Narok County** for the period ending **10th July, 2019.**

You are advised to report to **the County Commissioner, the County Director of Education and the County Director of Health Services, Narok County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO

Copy to:

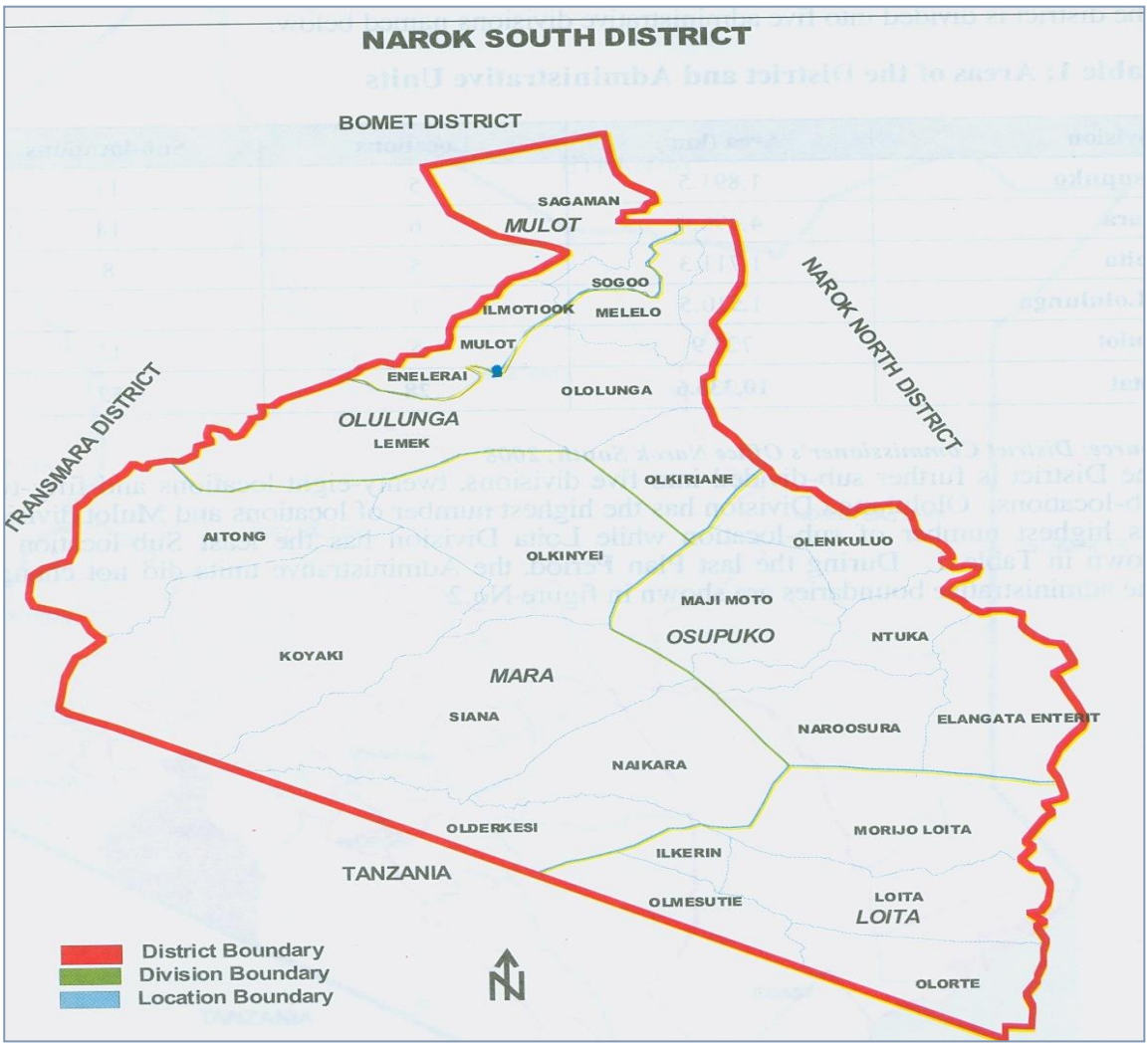
The County Commissioner
Narok County.

The County Director of Education
Narok County.

Appendix VIII: List of Cluster Identification for the Study

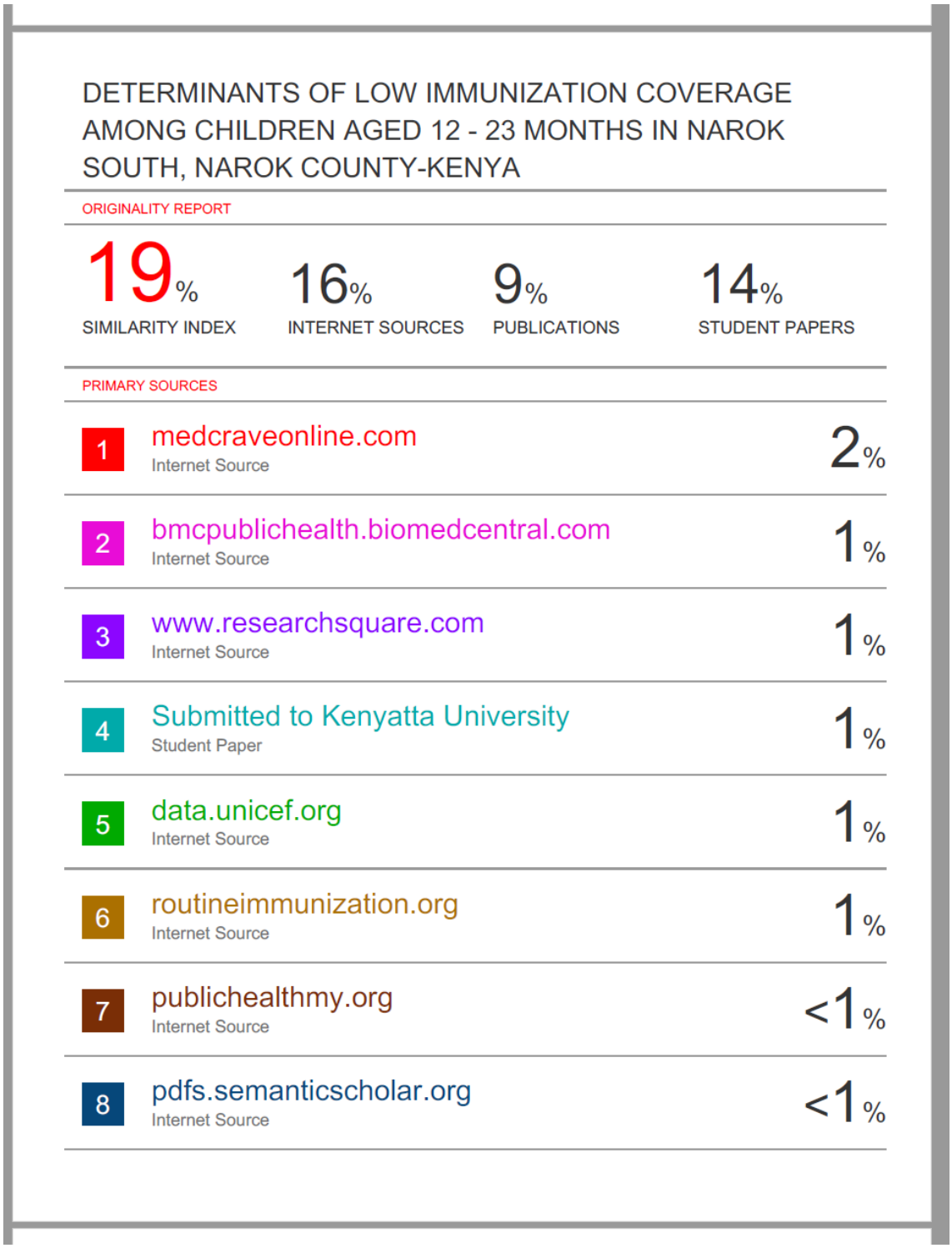
Wards	Locations	Sub-locations	Population	<I year Pop.	cummulative projection	Selected sub-locations # after adding the sampling interval	sub location clusters	Sub locations selected
MULOT	MULOT	MULOT	11220	516	516	864	1	Mulot
		NGIITO	3754	173	689	1371		
		KUTO	8908	410	1099	1878	2	Kuto
		OLCHORO	5111	235	1334	2385		
	ENELERAI	ENELERAI	7252	334	1667	2892	3	Enelerai
		RONGENA	10831	498	2165	3399	4	Rongena
	ILMOTIOK	ILMOTIOOK	17993	828	2993	3906	5,6	Ilmotiok
	SAGAMIAN	SAGAMIAN	9728	447	3441	4413	7	Sagamian
		TENDWET	11213	516	3956	4920	8	Tendwet
		MOGUIYWET	8108	373	4329	5427		
	SOGOO	SOGOO	19540	899	5228	5934	9,10	Sogoo
		NKARONI	17635	811	6039	6441	11,12	Nkaroni
OLOLULUNGA	NKORKORRI	NKORKORRI	14436	664	6704	6948	13	Nkokori
	LEMEK	LEMEK	12116	557	7261	7455	14	Lemeck
	OLKIRIAINE	OLKIRIAINE	8099	373	7633	7962	15	Olkiriane
	OLOLULUNGA	OLOLULUNGA	14128	650	8283	8469	16	Ololulunga
	MELELO	MELELO	13343	614	8897	8976	17	Melelo
	ENDONYONGIRO	OLASHAPANI	50599	2328	11225	9483	18,19,20, 21,22	Oloshapani
	ERETETI	ERETETI	12137	558	11783	9990	23	Ereteti
	NKOBEN	NKOBEN	3487	160	11943	10497		
Naroosura/Majimoto	MAJIMOTO	MAJIMOTO	6197	285	12228	11004	24	Majimoto
	NTUKA	ENKIU	1992	92	12320	11511		
		NTUKA	3731	172	12492	12018		
	E.ENTERIT	NKIMPA	583	27	12518	12525		
		E.ENTERIT	5391	248	12766	13032	25	E.enterit
	NAROOSURA	ENKUTOTO	3189	147	12913	13539		
		NAROOSURA	14824	682	13595	14046	26,27	Naroosura
	OLENKULUO	ENTUROTO	2244	103	13698	14553		
		OLOROIWUA	976	45	13743	15060		
		OLENKULUO	2336	107	13851	15567		
		OLDONYO RAS	3392	156	14007	16074		
LOITA	ENTESEKERA	ENTESEKERA	4126	190	14196	16581	28	Entasekera
	OLORTE	OLORTE	3524	162	14359	17088		
		MAUSA	3800	175	14533	17595		
	OLMESUTIE	OLMESUTIE	4320	199	14732	18102	29	Olmesutie
	ILKERIN	NKOPON	1445	66	14799	18609		
		ILMARAE	2742	126	14925	19116		
	MORIJO	MORIJO	5982	275	15200	19623	30	Morijo Loita
TOTAL			330432	15200				

Appendix IX: Map of study area



Source: KNBS 2009.

Appendix X: Turn-it-in generated originality report for final thesis



DETERMINANTS OF LOW IMMUNIZATION COVERAGE AMONG CHILDREN AGED 12 - 23 MONTHS IN NAROK SOUTH, NAROK COUNTY-KENYA

ORIGINALITY REPORT

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