

**FACTORS ASSOCIATED WITH MEASLES VACCINATION AMONG CHILDREN
AGED 12 – 24 MONTHS IN BUSIA DISTRICT**

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DECLARATION

I Birikire Elisha hereby declare to the best of my knowledge that the dissertation presented is my own work and that it has never been submitted either in partial or in full for publication or any academic award in any other institution for the award of a degree. Where works of others are quoted, references have been given.

I therefore present it for the award of a Master's Degree of Public Health of Makerere University, Kampala

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DEDICATION

I dedicate this dissertation to my Dear wife and children for the support they gave me during my time of study. Thank you Katakaine Clara, Ezra Birikire, Elijah Birikire and Ethel Birikire and all the MPH officers of 2015/2016 intake.

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TABLE OF CONTENTS

DECLARATION.....	i
DEDICATION.....	ii
ACKNOWLEDGEMENT.....	iii
LIST OF TABLES.....	ix
ABBREVIATIONS AND ACRONYMS.....	x
OPERATIONAL DEFINITIONS	xi
ABSTRACT	xii
CHAPTER ONE.....	1
1.0 INTRODUCTION AND BACKGROUND.....	1
1.1 Introduction	1
1.2 Background.....	3
CHAPTER TWO.....	6
2.0 LITERATURE REVIEW	6
2.1 Vaccination coverage.	6
2.2 Mother/caretaker factors.....	7
2.3 Community factors	9
2.4 Vaccination program related factors.....	12
CHAPTER THREE	15
3.0 STATEMENT OF THE PROBLEM, JUSTIFICATION, RESEARCH QUESTIONS AND CONCEPTUAL FRAME WORK.....	15
3.1 Problem statement	15

3.2 Study justification.....	16
3.3. Research questions	17
3.4 Conceptual Framework.....	1
CHAPTER FOUR	20
4.0 STUDY OBJECTIVES	20
4.1 General study objectives.....	20
4.2 Specific objectives.....	20
CHAPTER FIVE	21
5.0 METHODOLOGY	21
5.1. Study area	21
5.2 Study design	21
5.3 Study population.....	22
5. 4 Study unit.....	22
5.5 Selection criteria.....	22
5.5.1 Inclusion criteria.....	22
5.5.2 Exclusion criteria.....	22
5.6 Sample size determination.....	23
5.7 Sampling procedure and selection criteria.....	24
5.8 Study variables	25
5.8.1 Dependent variables	25
5.8.2 Independent variables.....	25

5.9 Data collection.....	26
5.9.1 Quantitative data.....	26
5.9.2 Qualitative data.....	27
5.10 Quality control.....	27
5.10.1 Training of research assistant	27
5.10.2 Pre-testing	27
5.10.3 Supervision	28
5.10.4 Field editing of data.....	28
5.11 Data management and analysis.....	28
5.11.1 Data management	28
5.11.2 Statistical analysis.....	29
5.12 Ethical consideration.	30
5.13 Dissemination of results	30
CHAPTER SIX.....	31
6.0 RESULTS.....	31
6.1 Introduction	31
6.2 Social demographic characteristics of the respondents	31
6.3 Measles vaccination coverage	33
6. 4 Mother/caretaker factors associated with vaccination of among children aged 12- 24months in Busia district.....	33
6.5 Community factors associated with measles vaccination of children aged 12-24 months in Busia district.....	36

6.6 Vaccination program related factors associated with measles vaccination among children aged 12-24months in Busia district.....	38
6.7 Multivariable analysis of factors associated with measles vaccination among children aged ... 12-24 months	41
CHAPTER SEVEN	44
7.0 DISCUSSION OF RESULTS	44
7.1 Measles vaccination coverage among children aged 12-24months in Busia district	44
7.2 Mothers/caretaker factors associated with measles vaccination among children aged 12-..... 24months in Busia district	45
7.3 Community factors associated with measles vaccination among children aged 12-..... 24months in Busia district	47
7.4 Vaccine program related factors associated with measles vaccination among children aged 12-24months in Busia district	48
7.5 Study limitations and strengths.....	51
CHAPTER EIGHT	52
8.0 CONCLUSIONS AND RECOMMENDATIONS.....	52
8.1 Conclusion	52
8.2 Recommendation.....	53
REFERENCE	54
Appendices	65
Appendix 1: Study questionnaire	65
Appendix 2: Consent form.....	80

Appendix 3 : Key informant interview guide.....	82
Appendix 4: Work Plan	84
Appendix 5: A map of Busia district showing distribution of health facilities	85

LIST OF TABLES

Table 6.1: Socio demographic characteristics of the study participants	32
Table 6.2: Bivariable analysis of mothers/caretaker factors associated with measles vaccination among children	35
Table 6.3: Bivariable analysis of community factors associated with measles vaccination	37
Table 6.4: Vaccine program related factors associated with measles vaccination.....	40
Table 6.5: Multivariate analysis of factors associated with measles vaccination coverage.....	42

ABBREVIATIONS AND ACRONYMS

ANC	:	Antenatal Care
CDC	:	Centre for Disease Control
DHMT	:	District Health Management Team
DHO	:	District Health Officer
EPI	:	Expanded Program on Immunization.
GAVI	:	Global Alliance for Vaccines and immunization
GVAP	:	Global Vaccine Action Plan
KII	:	Key Informants Interviews
MaKSPH	:	Makerere University School of Public Health
MCV	:	Measles Containing Vaccine
SDG	:	Sustainable Development Goals
NID	:	National Immunization Days
UBOS	:	Uganda Bureau of Statistics
UNEPI	:	Uganda National Expanded Program on Immunization
UNICEF	:	United Nations Children's Fund.
VHT	:	Village Health Team.
WHO	:	World Health Organization.

OPERATIONAL DEFINITIONS

Vaccination Coverage: Is the percentage of children within the target population who received vaccination against specific vaccine preventable disease within a given period.

Immunization: The protection of susceptible individuals from communicable diseases by administration of living modified agents (as in measles), a suspension of killed organisms (as in whooping cough), or an inactivated toxin (as in tetanus).

Cold Chain Management: A system of maintaining vaccines within the recommended temperature, usually stored between +2C and +8C for them to remain potent and functional, this involves distribution and storage.

Measles vaccination: This is administration of measles antigenic materials to stimulate a child's immune system to develop immunity.

Cluster: Subdivision of a population under study

Caretaker: The person with the primary responsibility over someone like a child who cannot take care of herself or himself. This person can be a family member, health professional or any concerned member of the community.

Village Health Team: is a team that mobilizes the community for health interventions and promotes health through educating the community on prevention of diseases (Turinawe et al., 2015).

ABSTRACT

Introduction: Measles vaccination is an effective public health intervention to reduce morbidity and mortality among children below 5 years due to measles. In Busia measles vaccination has remained low at 70% despite the efforts being made by the district to improve immunization services.

Objective: The major objective of the study was to identify factors associated with measles vaccination among children aged 12 to 24 months in Busia district.

Methodology: Between April and May/2018 a mixed method study was conducted in Busia district. A total of 700 mothers/caretakers of children 12-24 months and 6 key informants were selected to participate in the study. Data was entered in Epi-Data version 3.1 and later exported into STATA version 14.1 and analysis done using modified Poisson regression. Two sided p-values were considered statistically significant at <0.05 . For qualitative data, recorded voices were transcribed verbatim for all the KIIs and deductive thematic analysis was done.

Results: Measles vaccination coverage was 71.0% (497/700) and some of the reasons for non-vaccination included, forgetting appointment dates 52% (105) and lack of awareness 15.4% (31). The associated factors with measles vaccination included listening to health education messages on radio (Adj.PR =1.22, 95% CI; 1.10-1.34), husbands providing transport to mothers to take the children for vaccination (Adj.PR =1.16, 95% CI; 1.05-1.27), mothers attending ANC services (Adj.PR =1.17, 95% CI; 1.07-1.27) and health education during vaccination sessions (Adj.PR=1.17, 95% CI; 1.08-1.26).

Conclusion: Efforts to increase current measles vaccination should take into account interventions like health education of mothers and caretakers on the importance of vaccination during vaccination sessions antenatal care visits. The men should be encouraged to participate in the vaccination programs to improve completion of measles vaccination.

CHAPTER ONE

1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

Measles is a highly contagious viral disease and it remains an important cause of death among children globally despite the availability of a safe and effective vaccine (CDC, 2017). Childhood vaccination is one of the most cost effective public health interventions to reduce child morbidity and mortality. Measles is one of the eight killer immunizable diseases and the vaccine is given routinely at 9 months. The decision not to fully vaccinate a child puts the child and others at risk of contracting measles (WHO, 2012).

Globally, approximately 90,000 people died from measles in 2016 and most of these occurred in developing countries particularly Africa and Asia (WHO, 2017). Measles immunization is a global concern particularly related to the Sustainable Development Goal 3 which aims at improving health among children below 5 years (WHO, 2010).

The lowest rates of immunization coverage are in South East Asia at 75% and Africa at 73% yet in developed countries the coverage is 94%. Measles is still common in many developing countries particularly in Africa and Asia. In Africa, more than 20 million people are affected by measles every year and 60% of measles deaths occur in Sub Saharan Africa (WHO, 2017). In 2010 the world assembly established milestones towards increasing routine coverage by more than 90% and to maintain annual measles incidence to less than 5 cases per 1,000 people.

This would reduce measles mortality by more than 95% but with all the initiative established, lifesaving vaccines remain inaccessible to approximately 24 million children who are exposed to a great risk of illness and death (WHO, 2015).

The effectiveness of vaccination programs in resource poor settings can be influenced by the factors like coverage of the health networks, the existence of quality outreach and static services, mechanisms of maintaining cold chain, mobilization of the community and family support. These significantly vary according to the geographical area and in this context, the understanding of local barriers for effective vaccination programs is crucial to develop and implement appropriate solutions (WHO, 2013).

The Uganda National Expanded Program on Immunization was established in 1983 with the mandate of managing immunization activities in Uganda against the eight vaccine preventable diseases. These are sometimes referred to as the killer diseases because they are the leading causes of morbidity and mortality among children. These include; Whooping cough, Diphtheria, Neonatal tetanus, hepatitis B and Haemophilus influenza type b (Hib), Polio, pneumonia, diarrhea and measles (UNAS, 2013). Measles alone affects more than 60,000 children per year in Uganda and this is due to inadequate coverage of measles vaccination which is single dose of vaccine at 9months (MOH, 2016). Immunization is listed among the recommended child health interventions and can greatly reduce the burden of illness and disability from vaccine preventable diseases, hence reducing deaths of children under five years (UNAS, 2013).

The ministry of health introduced Reach Every District/Reach Every Child strategy so that all eligible children can be vaccinated. The strategy includes support supervision, establishing of outreach posts, micro planning, managing resources and monitoring actions. Accessibility and quality of vaccination services during sessions are used as guides to successful implementation

of the strategy. The aim is to strengthen systems in order to attain global milestones of increasing coverage and controlling measles by improving skills of the district EPI focal persons, improving surveillance, local planning, analyzing data, identifying underserved communities (MOH, 2014).

According to Uganda National expanded program on immunization (UNEPI) the vaccine is administered as a single dose subcutaneously on the left arm. A child is considered fully vaccinated against measles if he/she receives measles vaccine at 9months. For any community considered to be having herd immunity for measles the coverage should be equal or greater than 90%. In Busia vaccination coverage was 70% despite the above interventions. The aim of the study is to determine factors associated with measles vaccination in Busia.

1.2 Background

Measles is an acute viral disease caused by a paramyxovirus of the genus morbillivirus. Symptoms include fever, cough, runny nose, red eyes and generalized maculo papular rash and complications include corneal scarring blindness, hearing loss, and encephalitis.

Globally it is estimated that about 2 to 3 million deaths occur every year because of vaccine preventable diseases and 1.5million deaths is among the under-fives, despite the efforts and interventions with routine vaccination. Children living in developing countries are not fully vaccinated and this exposes them to premature deaths and disability. By the end of 2017, only 85% children globally had received one dose of measles vaccine by 24months. Ministers from 194 countries have agreed to strengthen immunization in order to achieve the Global Vaccine Action plan by improving monitoring of vaccination programs in their respective countries, strengthening surveillance systems and mobilization of resources (WHO, 2018).

In 2014 over 60% of the 1.8million infants were not fully immunized and these lived in developing countries like Uganda, India, Ethiopia and Iraq (WHO, 2014). Uganda has been ranked lowest in East Africa in immunization coverage. Between 2012 – 2014, 111 districts were affected Busia inclusive and 1,497 children were confirmed having measles (MOH, 2014). Busia district experienced a measles outbreak in 2012 and 157 children were affected especially in the municipality (DHO, 2012). In 2017 Ministry of Health confirmed measles outbreak in Kampala and Wakiso (MOH, 2017). Between January and May/2018, 26 districts have experienced measles outbreaks in Uganda, putting the country at risk of missing the 2020 elimination target (MOH, 2018).

Findings on factors that influence childhood immunization in children 10-23months revealed that only 54% of children in Uganda were fully immunized, 89% received full dose of BCG, 24% received DPT, 52% received Polio and 64% received measles vaccine and the percentage of immunized children increased with maternal education (Bbaale, 2013). A retrospective study conducted by Babirye and others revealed that strengthening of the cold chain and introduction of second opportunity for measles vaccination should be part of routine immunization because it improves effectiveness of the vaccine among children under 5years (Babirye et al., 2011).

Kiio found out that vaccines were not administered according to the recommended time and untimely receipt of vaccination was lowest with measles and vaccination not received on time was associated with increasing number of children a mother had (Kiio, 2012).

Vaccination offers many advantages including reduction in child morbidity and mortality hence averting millions of premature deaths and saves many children from disabilities. It is the only strategy for ensuring safety and survival of children against the vaccine preventable diseases like measles (Pavlopoulouetal., 2013).

In Uganda, the ministry of health and its partners like World Health Organization, United Nations Children's Fund and Global Alliance for Vaccines and immunization have supported districts to plan for immunization activities, training of service providers, social mobilization and facilitating outreaches. Despite the interventions invested in the fight against immunizable diseases, a big proportion of children have been affected by measles in different parts of the country some resulting into complications (Mafigiri et al., 2017). Immunization is a proven tool for controlling and eliminating life-threatening infectious diseases. It is one of the most cost- effective health investments, with proven strategies that make it accessible to even the most hard-to-reach and vulnerable populations. Defined target groups can be reached effectively through outreach activities (MOH, 2013).

In Busia Global Alliance for Vaccines and immunization procured a vehicle and one motorcycle per Sub County to assist the district health team members in supervising immunization activities, delivering logistics for immunization at the health facilities and transport for vaccinators when going to the outreach vaccination centers. VHT's have been facilitated by existing implementing partners like World Vision and Child Fund to mobilize the community for immunization services. Despite all this, the coverage has remained low with a likelihood of measles outbreak in the nearby future. It is therefore important to periodically monitor vaccination status and explore factors for non-vaccination. This helps to improve thus maintaining a high vaccination coverage.

The aim of this study is to determine the factors associated with measles vaccination among children aged 12 to 24months in Busia district.

CHAPTER TWO

2.0 LITERATURE REVIEW

Globally, there has been an increase in vaccination coverage in the previous years. However the percentage of children completing the recommended immunization schedule especially measles has remained below expectable targets in many developing countries and this has contributed to high child morbidities and mortalities (WHO, 2017). In developed countries intervention towards elimination of measles have worked, however there are still factors that influence completion of measles vaccination in Sub Saharan Africa as well as Busia. These factors can be divided into mother/caretaker, community and vaccine program related factors.

2.1 Vaccination coverage

Children develop protective immunity against measles when vaccination coverage is equal or exceeds 95%. In Uganda coverage has stagnated at 82% for measles containing vaccine (UNICEF, 2016). In order to control and eliminate measles disease it is important to determine the coverage and reasons for non-immunization. In most cases, the immunization coverage administratively is always exaggerated and one of the best ways of determining immunization coverage is by doing a community survey. In this case both cards and maternal recall should be used (Huhn et al., 2006). While mother's recall is the most widely used source of information in most developing countries and is considered highly reliable, some studies show parental recall to be inferior to health facility records. Validity of these measures is profoundly important since misreporting of data can misguide immunization programs. Underreporting results in greater costs of immunization through repeated immunization campaigns, over reporting means that some children will be missed during immunization activities (USAID, 2012).

Haddad conducted a study to measure vaccination coverage and he found out that administrative information on vaccination coverage is always inaccurate. The health workers use outdated census data to calculate the catchment populations eligible for immunization (Haddad et al., 2010). This is supported by a study carried out in 45 countries to ascertain validity of immunization data, it revealed that data reported by administrative structures to assess vaccination coverage is questionable and house hold surveys were suggested to validate data collected by service providers (Murray et al., 2003). Similarly a study carried out by Ma and others revealed that despite very high reported administrative coverage greater than 95% in China there was an outbreak of measles in 2015, the wrong coverage was because of using inaccurate figures as denominator the actual coverage was 83% when the survey was done (Ma et al., 2015).

2.2 Mother/caretaker factors

Mother/caretaker factors associated with measles vaccination;

Mother/caretaker education; previous studies have found a link between education of a mother and childhood vaccination. A study carried out in Angola revealed that uneducated mothers did not take their children for immunization. Low level of education directly affected vaccination because mothers remained unaware about important information and this interfered with the general vaccination outcomes. Mother's education was associated with timely vaccination and seeking for medical services like antenatal care (Wiysonge et al., 2012). This is supported by another study which revealed that educated mothers knew the causes of measles and this had an advantage over the uneducated mothers on completing the vaccination schedule (Sia et al., 2007). In the same regard the education level of mothers is associated with change in cultural beliefs and this enhances the health seeking attitude, empowering her with information related to the benefits of

vaccination (Bbaale, 2013). Furthermore, a study carried out by Barrera and others revealed that uneducated mothers do not take their children for immunization claiming that children developed fever and became very weak after measles immunization. When such parents share information about the side effects of measles immunization with those who have not yet vaccinated, they end up discouraging others to take their children for vaccination (Barrera et al., 2014). He further said there was a need to educate the girl child in order to reduce significantly the morbidity and mortality rates among children.

Antenatal care services also greatly affects completion of the vaccination schedule. During pregnancy, mothers are educated on benefits of vaccination. Antenatal care services are significantly associated with completion of measles vaccination (Dixit et al., 2013). Bugvi also found out that underutilization of antenatal care services can lead to incompleteness of childhood vaccination schedule (Bugvi et al., 2014). To ensure completion of the vaccination schedule mothers should be encouraged and sensitized on the importance of completing all the 4 antenatal care visits (Leask et al., 2006). Therefore mothers/caretakers should be sensitized to seek maternal healthcare services during pregnancy. Attendance of antenatal care services or delivery at a facility puts a mother in contact with the healthcare system, hence building a relationship with the health workers and this guarantees improvement in childhood vaccination.

Some studies have found a positive influence of income and vaccination coverage. Family income/wealth index influences the likelihood of children receiving vaccination. Availability of money for transport for mothers to take their children to the vaccination centers is an enabling factor. The evidence in this respect indicates a link between income and completion of measles vaccination (Glatman-Freedman and Nichols, 2012). This is also supported by another study in china where completeness of vaccination was associated with the income of the mothers (Hu et

al., 2014). Furthermore a study carried out on determinants of immunization status among children 12-23months found out that household income and wealth index are predictors of complete vaccination than children from poor families (Holipah et al., 2018).

On contrary a study carried out by Sullivan and others on family characteristics associated with vaccination completion rates in rural Ethiopia found no evidence that socio-economic status was associated with vaccination (Sullivan et al., 2010).

Other individual factors that have influence on measles vaccination include mothers/caretakers characteristics such as occupation, maternal age, child sex, possession of vaccination cards. In some societies with cultural discrimination against female children, boys have a greater chance to be vaccinated. In a study carried out by Wado et al a child's sex was associated with complete vaccination status with male children being more likely to be fully vaccinated compared to the female children (Wado et al., 2014). A son is preferred in Ethiopia and this tradition of sex preference has resulted in providing proper care for male children including the decision to immunize a child. For maternal age Reynolds and others found out that children born to older mothers were more likely to be immunized than those born to young mothers(Reynolds et al., 2006). Another child factor that determines completion of vaccination is possession of vaccination cards. The children born from a health facility setting and with vaccination cards are more likely to be vaccinated than those born at home and without the cards (Moïsi et al., 2010).

2.3 Community factors

Few studies have examined the influence of community factors on the utilization of childhood vaccination, below are some of the factors.

In some communities, misconceptions and myth have been reported as barriers to vaccination. Manjunath with others found out that mothers with misconceptions on vaccines were more likely

to default vaccination than mothers with appropriate perception hence misconceptions were related to partial vaccination (Manjunath and Pareek, 2003). However a study carried out by Matsumura, it was found that misconceptions may play a less important role when it comes to vaccination programs. Parents are likely to obtain vaccination for their children even when they have a negative perception about a public health intervention (Matsumura et al., 2005).

Measles is attributed to a variety of causes and no link to a virus, each episode of measles is traditionally considered as a punishment for breaching family taboos. Measles disease is believed to be an evil deed from witches or enemies and this belief is always stronger in polygamous households where co wives are naturally suspects. This perception about measles causes parents especially in rural areas fail to take their children for vaccination or seek medical care when their children have measles (Baker et al., 2010). In a qualitative study carried out in Kampala by Babirye and others revealed that misconceptions and myths about childhood vaccine safety acted as barrier for mothers to take their children for vaccination (Babirye et al., 2011).

Religion and cultural beliefs affect vaccination coverage one of such a belief is among a certain community in Mbale. The religious leaders of this cult do not allow the flock to vaccinate or treat their children when sick claiming their gods will heal them. They also believe vaccines are made from wild animals which will instead make their children sick (Nuwaha et al., 2000). In Jewish ultra-orthodox communities in Jerusalem the Rabbis or religious leaders enjoy extreme respect and almost blind their followers who refer to them for guidance and advice on matters not necessarily related to religion. The public health workers in Jerusalem faced hardships of having children vaccinated against measles during an outbreak in those communities (Stein-Zamir et al., 2008).

Family support is another determining factor especially on decision making concerning vaccination and treatment. In Uganda, men are heads of households and key decision makers therefore have influence on health matters in a home. Due to inferiority complex of women they are unlikely to take their children for vaccination if men objected. In order for mothers to take their children for vaccination a close relative has to take over the husbands duties by providing transport. Husbands do not always participate in this process making it difficult for mothers to get the lifesaving vaccine for their children (Mupere et al., 2006). Decision making process for taking the child to the vaccination centers was determined by other members of the family like the mother in law. Mothers in law did not let the newborns or the small aged babies to get vaccinated and would also not let the baby get more than one shot at a time (Topuzoğlu et al., 2007). However in situations where mothers are not marginalized, social support given to overcome gender barriers it helps to improve vaccination coverage (Taylor, 2009).

Mobilization of the community by political, religious leaders, traditional leaders, youth groups, women groups and the general public helped to spread immunization messages hence gaining support and good for improving measles vaccination coverage (Bedford and Chitnis, 2017). These findings concur with a study carried out by Zaffran and Michael, which revealed that including the general public in your outreaches and static programs for vaccination helped to establish broad support. This in the long run creates public ownership of the activity and hence changes of attitude towards vaccination (Zaffran et al., 2013). Social mobilization at different levels maximizes effectiveness and efficiency. Community leaders play a role of advocacy with intensive grassroots mobilization to marginalized communities hence addressing social/gender norms to improve interpersonal communication and increasing access to hard to reach groups with vaccination services (Obregón and Waisbord, 2010).

2.4 Vaccination program related factors

Vaccine program related factors that are associated with low measles vaccination status have been documented in literature, and these are briefly described below.

Distance to outreach and static sites is a prominent concern in Uganda and other sub Saharan countries. Mothers far away from vaccination service points are more likely to abscond and this affects uptake of vaccination services (Kiwanuka et al., 2008). In a study carried out by Cockcroft and others about local determinants of measles vaccination in Pakistan, they revealed that mothers of children who lived within a radius of 5kms to the vaccination centers had increased chances of completing vaccination as compared to those who lived far away (Cockcroft et al., 2009). These findings are supported by another study carried out by Etana and Deressa which revealed that most vaccination services are carried out far away from people's homes and it required money for transport which is a problem to most rural dwellers hence affects vaccination uptake (Etana and Deressa, 2012). Since vaccination is not an emergency mothers/caretakers tend to postpone or ignore taking their children for vaccination due to the long distances to vaccination centers. A study done in Tanzania on timeliness and completeness of vaccination. Distance to vaccination centers determined completion of vaccination with mothers far away from vaccination centers absconding (Le Polain de Waroux et al., 2013). The opportunity costs lost due to travel and waiting time were constraints to the uptake of services. Even if the vaccine were free of charge, mothers incurred costs related to travelling. This accounts for the difference in uptake between those closer the vaccination posts and far. In a study done by Ames and others, he found out that even if distance was short the vaccination coverage was low and there were other factors responsible for non-completion like forgetting the appointment dates. Therefore distance was not associated with vaccination completion (Ames et al., 2017). This

study was supported by Saunou and others in Burkina Faso who found out that location and distance to vaccination centers were not determinants of vaccination completion. other factors like failure of health workers to educate mothers on the importance of vaccination and household income (Sanou et al., 2009).

Inadequate logistics and nonfunctional equipment is another factor under vaccination program which affects coverage of measles vaccination. Proper cooling and storage of vaccines is key to maintaining quality and potency of vaccines. Findings in a study carried out in Kenya revealed that only 40% of available equipment for keeping vaccines were in good condition and about 60% needed repair (Kiiro, 2012). Vaccine supply and logistics systems in almost all developing countries will require significant investments of time and resources and this is critical if we are to reach more people with vaccines (Zaffran et al., 2013). Therefore, a significant improvement in logistics translates clearly into improved vaccine coverage.

Another vaccine program related factor associated with measles vaccination is unskilled health workers. A study conducted in Uganda revealed that vaccination has been left to community vaccinators (VHT's) instead of the qualified staff like nurses and midwives, it further revealed weak government policies, inadequate funding, vaccine stock outs, poor distribution channels and non-maintenance of the cold chain system were key challenges hindering the realization of routine immunization (Steadman, 2003). The knowledge of health workers could be a factor building trust that is paramount in any healthcare interaction. As noted by Benin and others a trusted health professional is one who has spent time with the child and parent, listened to their concerns, accepted them and possesses the necessary scientific information that builds confidence of the mothers unlike someone who is not a professional and unqualified (Benin et al., 2006).

On health education a study carried out by Tadesse revealed that when a mother is given adequate information on immunization there are more chances of her fully vaccinating her children compared to a mother who is not health educated (Tadesse et al., 2009). These findings are similar to a study conducted by Owais and others in Karachi Pakistan who found out that educational strategies during vaccination sessions for low-literate populations in the community improved knowledge of the mothers and was responsible for complete vaccination (Owais et al., 2011).

Cost of vaccination services and vaccination cards is another vaccine program related barrier to children accessing the vaccination service. When health workers sell vaccination cards and ask for money to administer the vaccine and yet these cards and services are supposed to be offered at no cost this definitely affects completion of immunization (Babirye et al., 2011).

Another vaccination program related factor is attitude; when health workers don't provide a conducive atmosphere for mothers to interact with them freely during vaccination it acts as barrier for them to take back their child for immunization (Odusanya et al., 2008).

Findings from literature shows a number of barriers associated with measles vaccination in different parts of the world, some factors are similar and others very different. Findings from one study cannot exhaust the gaps hence need to look at other settings. Therefore, it is necessary to conduct this study so as to come up with more recommendations in improving measles vaccination coverage in Busia.

CHAPTER THREE

3.0 STATEMENT OF THE PROBLEM, JUSTIFICATION, RESEARCH QUESTIONS AND CONCEPTUAL FRAME WORK

3.1 Problem statement

Measles is a vaccine preventable disease that is still associated with high morbidity and mortality rates mostly among children in Africa and Asia (CDC, 2017). Vaccination is done free of charge at all major health centers in Busia. Despite all this, measles vaccination stands at 70% consistently falling short of 85% target set by the district (DHIS2, 2017).

Only 70% of the eligible children in Busia district are vaccinated against measles instead of the mandated district target of 85%. Possible explanatory factors for failure to hit the target include: failure of mothers to attend antenatal care services and un qualified health workers administering the vaccine. The consequences are felt differently at household, community and national level at family level poverty due to paying excessive medical bills, at community level loss of a vibrant and resourceful child since some become disabled and others die. At national level resources are used to buy the medicines for treating the disease/complications yet measles can be prevented.

Several interventions have been tried by Global Alliance on Vaccines and Immunization (GAVI), United Nations Children’s Fund (UNICEF) and World Vision. These projects have supported Busia district in training of health workers, VHT’s and have facilitated immunization programs. However, the 85% district target remains far from being achieved. Uganda is among the 30 countries the United States of America is to assist through advancing the Global Health Security Agenda to improve measles immunization and hence prevent outbreaks (CDC, 2015).

This study intends to examine factors influencing measles vaccination in Busia district so as to ultimately improve on children's health outcomes.

3.2 Study justification

The communities/people in Busia are not fully engaged in measles vaccination. A report at the district health department puts measles coverage at 70% despite the efforts and resources invested in the vaccination activities (DHIS2, 2017).

To avoid future outbreaks it is crucial to attain high coverage levels by timely vaccination so that herd immunity can be robust enough to protect children who are not yet 9months.

The reasons and factors contributing to under vaccination and non-vaccination of children between 12- 24 months are yet to be fully and sufficiently explored by this study because they hinder effective utilization of vaccination services. This puts the children below 24 months at risk of developing measles. It's therefore important to document factors associated with measles vaccination to improve and strengthen routine vaccination in Busia district.

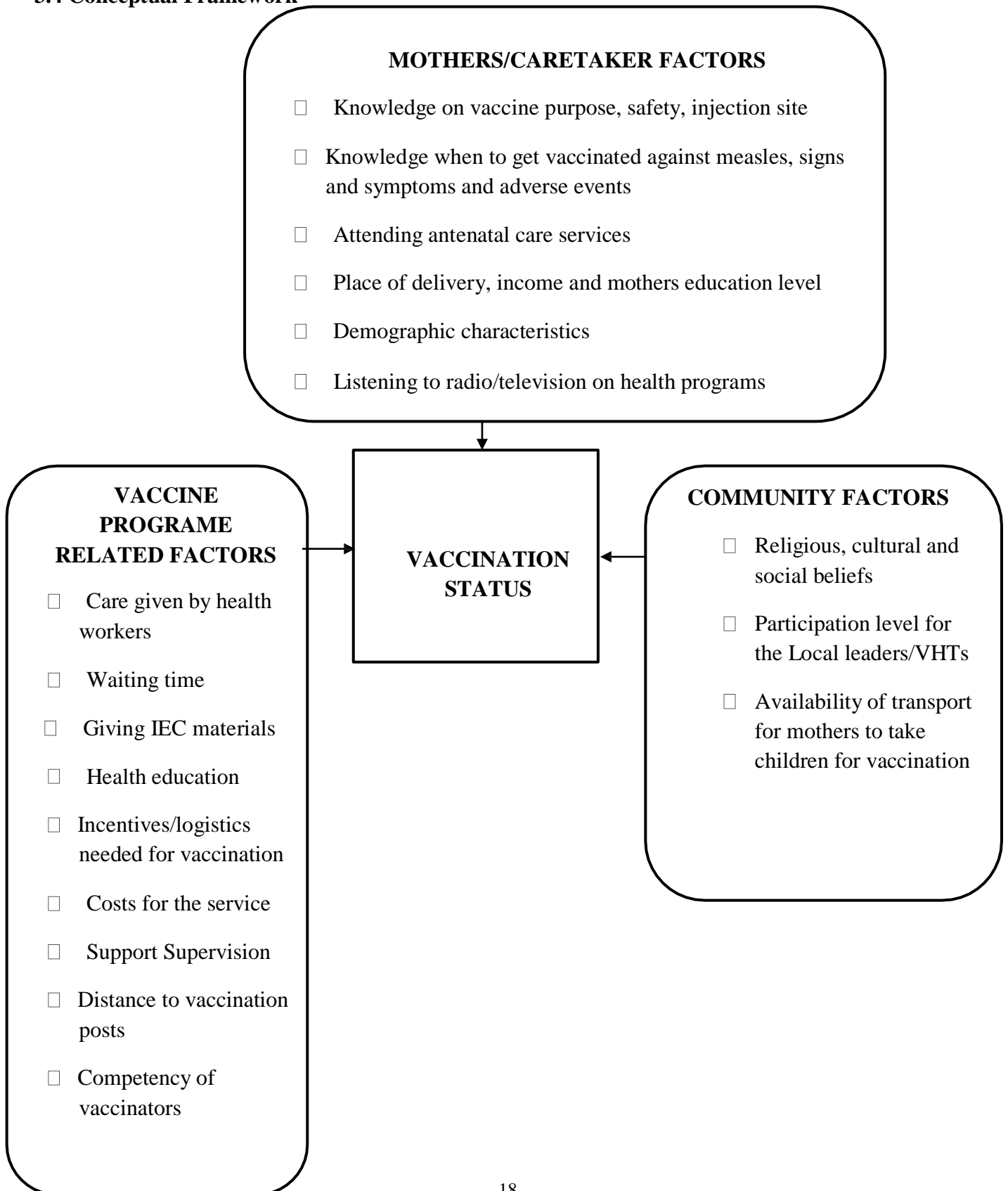
This study seeks to generate information that will guide Busia district medical team and policy makers to plan relevant, reliable, evidence based and sustainable interventions. These Interventions will help improve routine measles vaccination hence reducing on morbidities and mortalities related to measles. The findings will guide the district and Uganda at large on how to improve measles coverage hence stimulating community acceptance for vaccination, ownership of the program, community empowerment, development of sustainable public health programs related to the Sustainable Development Goal 3 and achievement of Uganda vision 2040.

The findings of this study will be published so as to contribute literature of the factors associated with measles vaccination coverage in the population.

3.3. Research questions

1. What is the measles vaccination coverage among children aged 12-24months in Busia district?
2. What are the mother/caretaker factors associated with measles vaccination among children aged 12-24months in Busia district?
3. What are the community factors associated with measles vaccination among children aged 12-24months in Busia district?
4. What are the vaccine program related factors associated with measles vaccination among children aged 12-24months in Busia district?

3.4 Conceptual Framework



Narrative of the conceptual framework diagram

The factors associated with measles vaccination were categorized into mother/caretaker, community and vaccine program related.

Knowledge of the mothers on when the measles vaccine is given, attending antenatal care services (ANC) during pregnancy, place where mother seeks child care services, demographic characteristics e.g. marital status, knowledge on vaccine purpose, safety and educational level are some of the individual factors that are associated with measles vaccination.

Community factors could be due to ignorance of the available vaccination services. Religious, cultural beliefs, family support, political and religious leaders participation in mobilization can influence measles vaccination status of children.

The vaccination program related factors associated with vaccination status included, waiting time, attitude of health workers, availability of IEC materials to clients, accessibility of outreach services, mobilization, availability of incentives/logistics for immunization, educating mothers on importance of return dates.

CHAPTER FOUR

4.0 STUDY OBJECTIVES

4.1 General study objectives

The major objective of the study was to determine factors associated with uptake of measles among children aged 12-24months in Busia district.

4.2 Specific objectives

1. To determine measles vaccination coverage among children aged 12-24months in Busia district.
2. To identify the mother/caretaker factors associated with measles vaccination in children aged 12-24 months in Busia district.
3. To assess the community factors associated with measles vaccination among children aged 12- 24months in Busia district.
4. To explore the vaccine program related factors associated with measles vaccination among children aged 12-24months in Busia district

CHAPTER FIVE

5.0 METHODOLOGY

5.1. Study area

This study was conducted in Busia district located 228kms from the capital Kampala. Busia is located in eastern Uganda and is bordered by the districts of Busia - Kenya in the north, Bugiri in the south, Namayingo in the west and Tororo in the east. Majority of the people reside in rural areas and the major economic activity is agriculture with a range of crops grown for subsistence and commercial purpose on fragmented pieces of land. There is one hospital, 1 health centre IV, 3 private not for profit (PNFP) facilities and 1 Private for profit facility (PFP), 7 health centre IIIs, 22 health center IIs. All these facilities offer static and outreach services in the community. There are 167 immunization Outreach sites in the whole district. The major cause of morbidity in children under five years in Busia district are malaria, common cold, diarrhea, intestinal worms, Skin infections (fungal and bacterial) and pneumonia. The district consists of two constituencies, Samia Bugwe North, Samia Bugwe South and 1 municipality. Busia district comprises of 16 sub counties, 60 parishes and 544 villages. The 2014 national census estimated the population of Busia at about 325,400, with 60,199 children under 5years of age. The indigenous tribe is Basamia but also there are Basoga's, Baganda's, Itesotis, Bagisu and Karamojong's.

5.2 Study design

A mixed method study was conducted in May 2018 and it employed both quantitative and qualitative data collection methods because the outcome variable of interest measles vaccination and non-vaccination were measured at the same time.

5.3 Study population

The study was conducted among mothers/caretakers aged 15years and above to provide information on the vaccination status of their children aged 12-24months, regardless of whether they knew how to read and write. Those below 18years their caretakers assented on their behalf. We also interviewed the district local government district health team members and 4 health workers for the qualitative interviews besides the mothers/caretakers. This was done because these cadres of health workers had experience and knowledge on the subject since they participate directly in ensuring that all children receive the recommended dose of measles.

5.4 Study unit

The households constituted a sampling frame where the study units were selected. Eligible mothers/caregivers 15years and above with children 12-24months were randomly selected from the entire district.

5.5 Selection criteria

5.5.1 Inclusion criteria

This study enrolled mothers who had lived in Busia for at least two years and have children aged 12- 24months. At 12months, a child is expected to have completed his/her vaccination schedule in Uganda. The information obtained from a child aged 12-24 months is reflective of more recent trends of vaccination events in the district.

5.5.2 Exclusion criteria

The study excluded mothers or children who were found ill.

5.6 Sample size determination

It is very important to determine the sample size according to the study design and the objectives of the study. In this study, we used a formula developed by Kish Leslie (1965) for cross sectional studies to determine the sample size (Pourhoseingholi et al., 2013).

$$n = \frac{Z^2PQ}{\delta^2}$$

P - The estimated children aged 12-24months not vaccinated against measles is 30% (DHO, 2017).

Z - Critical value form for a Standard normal distribution with α as level of significance set to 0.05 Thus the value of 1.96, assuming anon-response rate of 10%

δ^2 = is the margin of error which will be 5%

$$Q = (1-P) = 1-0.3 = 0.7$$

$$n = \frac{(1.96)^2 \times (0.3) \times (0.7)}{(0.05)^2}$$

$$n = \frac{323}{1}$$

Adjusting for non-response (10%) $n = 323/0.9 = 360$

Design effect of 2 using WHO recommendations was incorporated to adjust for sampling error introduced to multi stage sampling (WHO, 2015b)

$$n = 360 \times 2 = \underline{720}$$

5.7 Sampling procedure and selection criteria

A multistage sampling was used. Five sub counties were randomly selected in the rural communities and one sub county from the municipality was purposively selected. Two parishes per sub county/cluster were randomly selected. Then 3 villages were selected randomly per parish making a total of 36 villages. In the second stage, I obtained a list of all households from the local council chairperson and with their guidance, I established all households that had children aged 12-24months. The houses were allocated numbers serially and a smart phone application via play store called the random number generator was used to randomly select households without replacement. The number chosen was the household visited and this process was repeated for each village until the study enrollment was complete. In case a household had more than one child the youngest would be considered.

Illustrating how the study units were selected

	Total number	Random selection
Sub counties/divisions	16	6
Parishes/wards	60	12 (2parishes per s/county)
Villages/cells	544	36 (3 villages per parish)
House holds		20children per village& 1 child per house hold
Total		36 x 20 = 720 sample size

Key Informant Interviews (KII). To explore in depth, complement and triangulate on factors perceived to be related with measles vaccination, KIIs with particular knowledge about the topic of interest were interviewed in addition to mothers/caretakers in quantitative data collection method. They were used to assess the inner perceptions, attitudes and feelings of reality, which may not be possible to determine with mothers (Bryman, 2004). These people included health

workers who participate in measles vaccination programs, 2 district health team members. A total of 6 enabled us reach data saturation.

5.8 Study variables

5.8.1 Dependent variables

The primary outcome of this study was completion of measles vaccination and this was measured on a binary scale whether a child was vaccinated against measles or not. A child was considered vaccinated for measles if the vaccination card had a tick at 9months/date written on the card when child was vaccinated or mother reported that the child received the measles vaccine. I also probed to verify the information by asking some questions on knowledge about measles vaccination like the injection site and the schedule.

5.8.2 Independent variables

The independent variables included socio demographic characteristics of the respondents like; age, sex, tribe, education level, marital status, residence, religion and employment status.

In determining measles coverage, I assessed mothers for presence or absence of a vaccination cards, whether child is vaccinated or not, reasons for not having a card/booklet and reasons for not vaccinating. Mothers/caretaker factors assessed were attending antenatal care (at least twice), knowledge on when the child is vaccinated against measles, the site of injection, place of delivery and whether the mothers listens to health education messages on radio or television. Community factors assessed included the mother/caretaker participating in decision-making at home regarding health issues, provision of transport by the husband, having political, religious and VHT's participate in community mobilization and whether the culture and religion agree with vaccination. Vaccine program related factors assessed included distances to vaccination outreach posts, convenient time for the outreaches, whether health workers explain to mothers

the importance of vaccination, whether the mothers/care takers pay for the services and the cadre in charge of vaccination (qualified health worker or VHT).

5.9 Data collection

5.9.1 Quantitative data

Quantitative data was collected using interviewer administered structured questionnaires to collect data from each mother/caretaker. The questionnaires were administered by research assistants in April and May 2018 to 700 mothers/caretakers.

Objective one, Research assistants requested for the children's vaccination cards and marked yes for measles vaccine given and no for the ones that defaulted. In case the card was unavailable, the mother was requested to recall and some probing questions given to ascertain whether the child received the vaccine.

Objective two (mother/caretaker factors), the research assistants interviewed mothers and collected data on the child mother pairs on demographic characteristics, knowledge of mothers on measles vaccine; safety, injection site, symptoms & signs of measles, place of delivery and attendance of antenatal care services

Objective three data was collected from mothers/ caretaker on whether they are involved in decision making at home regarding health issues, provision of transport by their husbands, culture and religion, whether political, religious leaders and VHT's are involved in mobilization.

Objective four I collected data related with vaccination programs, attitude of health workers during vaccination categorized as bad, fair or good, whether vaccination messages are given to mothers during the outreach sessions and issues to do with stock outs.

Demographic data like age, sex, educational level, tribe, marital status, place of residence and employment were collected from mothers. This was important because some of these demographic factors like level of education and employment independently influence measles vaccination coverage.

5.9.2 Qualitative data

Qualitative data was collected by using key informants interview guides. Two district health team members and four health workers who have experience and knowledge on the subject matter were asked whether the vaccination activities are facilitated, transport provided for the vaccinators, availability of vaccines and other logistics used in vaccination programs, whether supervisions are done, how information about vaccination is disseminated to the community, whether services were free at the vaccination centers, mechanisms of mobilizing the community for vaccination activities.

5.10 Quality control

5.10.1 Training of research assistant

To ensure a quality study, four research assistants who were fluent in Samia and Ateso were trained and equipped with various interpersonal and interview skills like probing and proper information recording. All efforts were made to ensure that they understand the aim of the study,

Objectives, methodology and expected results. The training took 4 days with five training hours per day.

5.10.2 Pre-testing

The designed questionnaires and tools were pre-tested on 10 individuals from one village that was not included in the study so as to make the necessary adjustments in the questions thus

making them valid and fit for the study respondents. Duration for completing a questionnaire was known and noted for easy planning of time during respondent interview. Pretesting of the tools was done to address validity, relevance, comprehensiveness and degree of robustness of the tools and this was done in the neighboring district Tororo.

5.10.3 Supervision

The principal investigator worked closely with the research assistants throughout the data collection period to make sure the observations and interviews were comprehensively done and recorded properly. During data collection, research assistants were supervised closely by the principal investigator (Birikire Elisha) and we met every evening to discuss any emerging challenges and solutions were sought to ensure the success of data collection process.

5.10.4 Field editing of data

The principal investigator supervised research assistants at the end of each day. Together with the research assistants, he checked questionnaires for correctness, completeness, accuracy and consistency. Filled questionnaires were kept under key and lock by the principal researcher.

5.11 Data management and analysis

5.11.1 Data management

Quantitative data was collected, edited, coded and then checked for consistency, and then entered into Epi data, cleaned and then exported to STATA 14.1. For qualitative data, the KIIs involved note taking in the field as well as tape recording. The notes were used mainly to record non-verbal communication while the tape recording allowed an accurate account of the discussions to be taken. All the KIIs were recorded and transcribed verbatim.

5.11.2 Statistical analysis

Data was entered in Epi-Data version 3.1 and later exported into STATA version 14.1 for analysis. Data was summarized as proportions and percentages for categorical variables, chi-square tests used to check for statistical significance. Prevalence ratios are presented as measures of association from modified Poisson regression models fitted at both bivariate and multivariate analysis because the outcome was very common above 10%. All factors highlighted in literature and those with a p-value of 0.2 were further evaluated in the multivariate model. Two-sided p-values were considered statistically significant if less than 0.05 and 95% confidence intervals were presented.

For qualitative data, recorded voices were transcribed verbatim for all the KIIs. The transcripts were read and re-read to familiarize with the data so as to make sense. Data were organized in a meaningful and systematic way and this was followed by coding, reducing data into small chunks of meaning. Deductive thematic analysis was used in which, data was analyzed with a particular research question in mind. I coded each segment of the data that was relevant to the research question. Open coding was used, but developed and modified the codes as we worked through the coding process. The codes were examined and some of them fitted together into a theme. These codes were then organized into broader themes that seemed to say something specific about the research question. This was done through cut and paste function in word. Navigation through the data was done again to establish how the themes worked both within a single interview and across all the interviews. After this process, the themes were refined to identify the relevance of what each theme was all about. I categorized the themes into four (i) charges for vaccination cards/services (ii) dissemination of information to the community (iii) Mobilization of the community (iv) Health education during sessions.

5.12 Ethical consideration

Ethical clearance to conduct the study was obtained from Makerere University School of Public Health, Higher Degrees, Research and Ethics Committee (IRB). Permission to conduct the study was sought from the Chief Administrative Officer and District Health Officer of Busia district.

Introductory letter was obtained from the District Health Officer of Busia district before interviewing the mothers at the community level. Participants were allowed to pull out of the study anytime they wanted. Confidentiality of data was assured and maintained for every participant.

5.13 Dissemination of results

This research problem is very relevant thus the study findings will be disseminated to the following:

1. Busia District Health Office and ministry of health. This information is necessary and very important in improving measles vaccination coverage in Uganda.
2. Multi Sectoral collaboration with WHO and UNICEF; The report will be shared with these organizations since they play a crucial role in improving vaccination coverage for children worldwide with Uganda inclusive
3. The Makerere University School of Public Health as partial fulfillment of the requirement for the award of the Master of Public Health degree. I also plan to publish findings of the study in a peer-reviewed journal in the nearby future.

CHAPTER SIX

6.0 RESULTS

6.1 Introduction

A total of 720 respondents were selected to participate in the study however, 700 participated in the study giving a response rate of 97.2% (700/720). Some respondents thought we were law enforcement officers and others had incomplete data. These were selected from the sub counties of Majanji, Masinya, Mbehenyi, Sikuda, Dabani and Western division in Busia district.

6.2 Social demographic characteristics of the respondents

The majority 96.7% (n=677) of the respondents were females and 84.0% (n=588) resided in the rural areas. Less than half 37.4% (n=262) of the respondents were aged 21-26 years while more than half 63.6% (n=445) of the respondents were Basamias. Majority 80.6%, (n=564) of the respondents were married and slightly more than half 51.7% (n=362) had a primary education level. Almost half 43.3% (n=303) of the respondents did not have any form of employment. In terms of utilization of health services, only 32.7% (n=229) mothers had attended all the four antenatal care visits for the children considered in this study excluding the male and caretakers who participated in the study. Less than half of mothers/caretakers had a monthly income of 51,000 shillings and above. More than half 55.4% (n=388) of the children were females while less than half 40.9 (n=286) were aged 12-15 months (Table 6.1).

Table 6.1: Socio demographic characteristics of the study participants

Variable	Frequency N (%)	Percentage (%)
Sex		
Female	677	96.7
Male	23	3.3
Age in years		
15-20	132	18.9
21-26	262	37.4
27-32	176	25.1
33-38	84	12.0
≥39	46	6.6
Marital status		
Married	564	80.6
Not married	136	19.4
Education level		
Primary	362	51.7
Secondary	167	23.9
No formal education	120	17.1
Tertiary	51	7.3
Religion		
Anglican	266	38.0
Catholic	187	26.7
Pentecostal	147	21.0
Muslim	89	12.7
Others	11	1.6
Employment status		
Employed	397	56.7
Unemployed	303	43.3
Residence		
Rural	588	84.0
Urban	112	16.0
Tribe		
Basamia	445	63.6
Others	255	36.3
Mother/caretaker income (UGX)		
≥30, 000	99	14.1
31,000-50, 000	209	29.9
51, 000-100, 000	276	39.4
≥101, 0000	116	16.6
Sex of child		
Female	312	44.6
Male	388	55.4
Age of children		
12-15	286	40.9
16-19	227	32.4
20-24	187	26.7

6.3 Measles vaccination coverage

Majority 83.4% (n=584/700) of the mothers/caretakers reported having vaccination cards at the time of the survey. After verification only 69.6% (n=487/700) were proved to have been vaccinated against measles by card. The actual measles vaccination coverage (vaccination card or mother recall) was found to be 71.0% (n=497).

The main reasons for not having a health card included; got lost 58.3% (67), card was not available at the time of immunization 15.7% (15) and lacked money to pay for vaccination cards 24.4% (28). On the other hand, the reasons for not receiving vaccination included; forgetting appointment 52% (105) and lack of awareness 15.4% (15.4).

The issue of charging mothers money for vaccination cards and vaccination services. The health workers said it was the village health team members who charged mothers between 500= to 1000=. As emphasized in the quote below

"... Due to work overload we request village health team members who have some knowledge in immunization to help us vaccinate. We are poorly facilitated because PHC funds are released once every quarter; in most cases we use our own resources and then later demand for a refund. VHT's are never patient and at times they sell vaccination cards and yet the mothers don't have the money to buy. They also don't indicate the appointment dates on some vaccination cards and yet they act as reminders..." (health workers).

6.4 Mother/caretaker factors associated with vaccination of among children aged 12-24 months in Busia district

At bivariate analysis, the prevalence of measles vaccination completion was 1.47 times higher among mothers who always listened to the radio and watched television compared to those who did not (Un Adj. PR = 1.47; 95% CI: 1.32 - 1.63). Also the measles vaccination status was

1.29 times higher among mother who had attained secondary education level compared to those who did not (Un Adj.PR = 1.29; 95% CI: 1.18-1.41). The richest mothers according to wealth ranking were 1.32 times higher to vaccinate their children compared to those who were not rich at (Un Adj.PR = 1.32, 95%CI; 1.41-1.52). Similarly the prevalence for complete measles vaccination was 3.16 higher in mothers who attended at least 2 ANC visits and above compared to those who did not at (Un Adj.PR = 3.16, 955 CI; 2.26-4.42).

Listening to health education messages on radio and television one of the district health team members said that they have a work plan and airtime for radio talk shows is considered. This has helped a lot in disseminating information to the entire population of Busia especially for those who have radios on issues related to health.

"... We have always budgeted for some air time on radio in our work plan every quarter but also the existing Implementing partners in Busia district have always supported us in terms sponsoring radio talk shows. I believe the families with radios get information on health related issues especially on immunization and we promise to continue giving health education messages even integrate immunization in other radio programs supported by the district..." (DHMT members).

The health workers said educating mothers attending antenatal care services on health related topics has been key in ensuring completion of measles vaccination. During the ANC visits the health workers integrate information on different services offered and their importance like complete vaccination.

"...The challenge is that mothers come to attend the first antenatal care visits late, majority after 3months. We have noted that those mothers who attend ANC get chance to listen to our health education sessions in maternity. Those who don't attend these sessions can't appreciate the importance and they are always defaulters when it comes to children getting immunized..." (health workers).

Table 6.2: Bivariate analysis of mothers/caretaker factors associated with measles vaccination among children

Variables	Vaccinated against Measles		Unadjusted PR (95% CI)	P-value
	Yes N=497	No N=203		
Level of education				
Primary or no formal education	314 (65.2)	168 (34.8)	1.00	
Secondary or above	183 (83.9)	35 (16.1)	1.29 (1.18,1.41)	<0.001*
Residence				
Rural	417 (70.9)	171 (29.1)	1.00	
Urban	80 (71.4)	32 (28.6)	1.01 (0.89,1.14)	0.913
Number of children				
1-3	305 (73.3)	111 (26.7)	1.00	
4+	189 (67.7)	90 (32.3)	0.92 (0.84,1.02)	0.120
Employment status				
Employed	276 (69.5)	124 (30.5)	1.00	
Unemployed	221 (72.9)	82 (27.1)	1.05 (0.95,1.15)	0.321
Age in months				
12-15	205 (71.7)	81 (28.3)	1.00	
16-19	165 (72.7)	62 (27.3)	1.01 (0.91,1.13)	0.800
20-24	127 (67.9)	60 (32.1)	0.95 (0.84,1.07)	0.389
Educational messages on Radio				
No	178 (56.5)	137 (43.5)	1.00	
Yes	319 (82.9)	66 (17.1)	1.47 (1.32,1.63)	<0.001*
Wealth index				
Poorest	97 (63.4)	56 (36.6)	1.00	
Poor	115 (75.2)	38 (24.8)	1.19 (1.02,1.38)	0.027
Middle	83 (63.8)	47 (36.2)	1.01 (0.84,1.20)	0.938
Rich	96 (70.1)	41 (29.9)	1.11 (0.94,1.30)	0.228
Richest	106 (83.5)	21 (16.5)	1.32 (1.14,1.52)	<0.001*
Recommend other children for vaccination				
No	14 (56.0)	11 (44.0)	1.00	
Yes	483 (71.6)	192 (28.4)	1.28 (0.90,1.81)	0.171
Attended 2 or more ANC visits				
No	26 (25.0)	78 (75.0)	1.00	
Yes	471 (79.0)	125 (21.0)	3.16 (2.26,4.42)	<0.001*

6.5 Community factors associated with measles vaccination of children aged 12-24 months in Busia district

At bivariate analysis the prevalence of measles vaccination completion was 1.2 times higher for mothers participating in decision making on health related issues at home compared to those who did not (Un Adj.PR=1.20 95% CI;1.03-1.40). Measles vaccination completion was 1.22 times higher with mothers whose husbands provided transport for children to be taken for vaccination compared to those who did not provide transport at (Un Adj.PR = 1.38 95% CI; 1.25-1.53). Prevalence of measles vaccination completion was 1.22 times higher with mothers who used appointment dates on cards/booklets as reminders compared to those who did not (Un Adj.PR =1.22, 95% CI; 1.12-1.34). Similarly mothers who reported political and religious leaders participating in mobilizing the community for vaccination were 1.31 times higher to vaccinate their children compared to those who said the leaders and VHT's were not involved (Un Adj.PR=1.31, 95% CI; 1.16-1.47).

For qualitative, The DHMT members said village health team members, politicians and religious leaders have been very instrumental in helping the district to mobilize and disseminate information to the community concerning immunization activities

"... Political leaders and VHT's have played a pivotal role in mobilizing the community for immunization activities however not all the politicians and VHT's participate fully in immunization activities because they want to be facilitated. The pillar of immunization is mobilization ..." (DHMT members).

Table 6.3: Bivariate analysis of community factors associated with measles vaccination

Community characteristics	Vaccinated against Measles		Unadjusted Prevalence Ratio (95% CI)	P-value
	Yes	No		
Mother participates in decision making				
No	70 (60.9)	45 (39.1)	1	
Yes	427 (73.0)	158 (27.0)	1.20 (1.03,1.40)	0.021*
Who takes the child for vaccination				
Father/Other (Auntie/Uncle)	19 (65.5)	10 (34.5)	1	
Mother	478 (71.2)	193 (28.8)	1.09 (0.83,1.42)	0.541
Parents' culture agrees with vaccination				
Yes	489 (70.7)	203 (29.3)	1	
No	8 (100)	0 (0)	1.42 (1.35,1.48)	<0.001*
Husband/Partner provides transport				
No	210 (59.7)	142 (40.3)	1	
Yes	287 (82.5)	61 (17.5)	1.38 (1.25,1.53)	<0.001*
Who reminds you to take the child for vaccination				
Spouse/Self/VHTs	319 (66.7)	159 (33.3)	1	
Appointment dates on card	178 (80.9)	42 (19.1)	1.21 (1.11,1.33)	<0.001*
Local leaders/religious leaders involved in mobilization				
No	136 (58.9)	95 (41.1)	1	
Yes	361 (77.0)	108 (23.0)	1.31 (1.16,1.47)	<0.001*

6.6 Vaccination program related factors associated with measles vaccination among children aged 12-24months in Busia district

At bivariate analysis, measles vaccination completion was 0.82 times higher in mothers who travelled a distance of ≤ 2 kms to vaccination centers compared to those who travelled more than 2kms (Un Adj.PR = 0.82, 95% CI; 0.74-0.91). Mothers who mentioned that time for vaccination was convenient were 1.33 times higher to vaccinate their children compared to those who said the time was not convenient (Un Adj.PR=1.33, 95% CI; 1.21-1.47). The prevalence of measles vaccination completion was 1.23times higher for mothers/caretakers who did not pay for vaccination services compared to those who paid (Un Adj. PR= 1.23, 95% CI; 1.03-1.47).

Similarly the prevalence of measles vaccination completion was 1.14 higher with mothers who said their children are vaccinated by qualified health workers compared to those who said Village health team members (Un Adj.PR = 1.14, 95%CI; 1.03-

1.26). In addition, the prevalence of measles vaccination completion was 1.40 times higher among mothers who received information concerning vaccination during the sessions compared to those who did not (Un Adj.PR=1.40, 95% CI; 1.29-1.52).

On health education messages during vaccination sessions the district health team members said that effective communication was important especially explaining to mothers the importance of vaccination and ensuring that mothers take note of the appointment dates.

"... effective communication and information transfer between the health personnel and the mothers acts as a facilitator for mothers getting adequate information as concerns immunization resulting into timely vaccination of children..." (DHMT members).

The district health team members said that due to understaffing at times the village health team members support health workers to vaccinate yet they don't have adequate knowledge on how to administer the measles injection and health educating mothers during sessions.

"...currently the staffing level for Busia district stands at 57%, very few staffs are involved in immunization and in most cases they are rushing back to do some work at the facility hence little time for giving health education, at times the vaccination is left in the hands of VHT's who do not have adequate knowledge to give to the mothers..."(district health team members)

Table 6.4: Vaccine program related factors associated with measles

Institutional characteristics	Vaccinated against Measles		Unadjusted Prevalence Ratio (95% CI)	P-value
	Yes	No		
Have an immunization center in your parish				
Yes	487 (70.5)	204 (29.5)	1	
No	11 (78.6)	3 (21.4)	1.11 (0.84,1.47)	0.443
Distance from Immunization centre				
Less than 1 Km	272 (78.6)	74 (21.4)	1	
2 Km	169 (64.5)	93 (35.5)	0.82 (0.74,0.91)	<0.001*
≥3 KM	56 (60.9)	36 (39.1)	0.77 (0.65,0.92)	0.004*
Waiting time at the vaccination centre				
<1 hour	19 (70.4)	8 (29.6)	1	
≥2hours	478 (71.0)	195 (29.0)	1.01 (0.79,1.30)	0.942
Vaccination carried out in a clean place				
No	60 (62.5)	36 (37.5)	1	
Yes	436 (72.3)	167 (27.7)	1.16 (0.98,1.36)	0.079
Time for outreach sessions are				
Not convenient	229 (61.4)	144 (38.6)	1	
Convenient	268 (82.0)	59 (18.0)	1.33 (1.21,1.47)	<0.001*
Waiting time to for the service				
<1hr	67 (71.3)	27 (28.7)	1	
1-2hrs	415 (70.9)	170 (29.1)	0.99 (0.87,1.14)	0.947
≥3 hrs	15 (71.4)	6 (28.6)	1.00 (0.74,1.35)	0.989
Paid for vaccination services				
Yes	55 (59.1)	38 (40.9)	1	
No	442 (72.8)	165 (27.2)	1.23 (1.03,1.47)	0.020*
Information on vaccination given				
No	299 (62.9)	176 (37.1)	1	
Yes	198 (88.0)	27 (12.0)	1.40 (1.29,1.52)	<0.001*
Who vaccinates the children				
VHTs	202 (65.8)	105 (34.2)	1	
Qualified Health Worker	295 (75.1)	98 (24.9)	1.14 (1.03,1.26)	0.009*
Mother/caretaker attitude				
Good	200 (84.0)	38 (16.0)	1	
Fair	280 (67.5)	135 (32.5)	0.80 (0.74,0.88)	<0.001*
Bad	16 (34.8)	30 (65.2)	0.41 (0.28,0.62)	<0.001*

6.7 Multivariable analysis of factors associated with measles vaccination among children aged 12-24 months

The table below shows that mothers who had heard messages about measles vaccination on radio were 1.47 times more likely to have immunized children compared to those who had not heard any vaccination messages on radio. This association was statistically significant with a $p < 0.001$. Husbands who provided transport for their wives were 1.38 times more likely to vaccinate their children than those who did not provide transport. The association was statistically significant with a $p < 0.002$. Mothers who had vaccination cards with appointments dates, attendance of at least 2 or more ANC visits, provision of health education messages by health workers were also statistically significant at $p < 0.001$. Mothers who were reported having been mobilized by the political, religious leaders and village health team members were 1.16 times more likely to vaccinate their children compared to those who were not. This association was statistically significant with a $p < 0.004$.

Table 6.5: Multivariate analysis of factors associated with measles vaccination coverage

Variable	Un Adj. P R (95% CI)	Adj.PR (95% CI)	P-value
Age in months			
12-15	1:00	1:00	
16-19	1.01 (0.91,1.13)	0.98 (0.89,1.07)	0.605
20-24	0.95 (0.84,1.07)	0.93 (0.83,1.04)	0.184
Educational messages on Radio			
No	1:00	1:00	
Yes	1.47 (1.32,1.63)	1.22 (1.10,1.34)	<0.001*
Mother involved in decision making			
No	1:00	1:00	
Yes	1.20 (1.03,1.40)	1.03 (0.89,1.18)	0.710
Culture agrees with vaccination			
Yes	1:00	1:00	
No	1.42 (1.35,1.48)	1.10 (0.86,1.39)	0.450
Husband/Partner providing transport			
No	1:00	1:00	
Yes	1.38 (1.25,1.53)	1.16 (1.05,1.27)	0.002*
Reminder to take the child for vaccination			
Spouse/Self/VHTs	1:00	1:00	
Appointment card	1.21 (1.11,1.33)	1.16 (1.07,1.27)	<0.001*
Local leaders/religious leaders involved in encouraging vaccination			
No	1:00	1.00	
Yes	1.31 (1.16,1.47)	1.16 (1.05,1.29)	0.004*
Wealth index			
Poorest	1.00	1.00	
Poor	1.19 (1.02,1.38)	1.06 (0.92,1.21)	0.420
Middle	1.01 (0.84,1.20)	0.95 (0.81,1.11)	0.502
Rich	1.11 (0.94,1.30)	1.01 (0.87,1.18)	0.854
Richest	1.32 (1.14,1.52)	1.01 (0.87,1.17)	0.904
Distance from Immunization Centre KM			
1	1.00	1.00	
2	0.82 (0.74,0.91)	0.93 (0.84,1.03)	0.151
≥ 3	0.77 (0.65,0.92)	0.94 (0.81,1.09)	0.427
Knowledgeable the purpose, timing, cause & signs and symptoms)			
No	1.00	1.00	
Yes	1.09 (0.98,1.20)	1.02 (0.93,1.11)	0.648

Attended 2 or more ANC visits			
No	1.00	1.00	
Yes	3.16 (2.26,4.42)	1.17 (1.07,1.27)	<0.001*
Is the vaccination center clean place			
No	1.00	1.00	
Yes	1.16 (0.98,1.36)	0.96 (0.83,1.11)	0.602
Time for outreach sessions			
Not convenient	1.00	1.00	
Convenient	1.33 (1.21,1.47)	1.12 (1.02,1.23)	0.014*
Ever gone for vaccination and gone back without child being vaccinated			
Yes	1.00	1.00	
No	1.37 (1.23,1.54)	1.12 (1.01,1.23)	0.025
Paid for immunization services			
Yes	1.00	1.00	
No	1.23 (1.03,1.47)	1.10 (0.94,1.30)	0.234
Information given at vaccination centers			
No	1.00	1.00	
Yes	1.40 (1.29,1.52)	1.17 (1.08,1.26)	<0.001*
Person who vaccinated the child			
VHTs	1.00	1.00	
Qualified Health Worker	1.14 (1.03,1.26)	1.04 (0.95,1.14)	0.365
Mothers' level of education			
Primary or below	1.00	1.00	
Secondary or above	1.29 (1.18,1.41)	1.11 (1.02,1.21)	0.017*
Gauge the care given to you			
Good	1.00	1.00	
Fair	0.80 (0.74,0.88)	0.93 (0.86,1.01)	0.090
Bad	0.41 (0.28,0.62)	0.54 (0.37,0.77)	0.001*
Constant		0.36 (2.4,0.55)	<0.001

CHAPTER SEVEN

7.0 DISCUSSION OF RESULTS

This study assessed factors associated with vaccination and non vaccination of measles among children aged between 12 and 24months in Busia district. Measles vaccination coverage of children was confirmed using immunization cards of children or mothers recall method. This study found out that the level of vaccination coverage was 71%. Having a child vaccinated was associated with mothers listening to education messages on radio, husbands providing transport, local leaders participation in immunization mobilization, appointment dates written on cards to remind mothers about the schedule, mothers attending more than 2 antenatal care visits.

7.1 Measles vaccination coverage among children aged 12-24months in Busia district

Measles vaccination was 71%, which is lower than the national average of 82% (UNICEF, 2016). Researchers have noted discrepancies between surveys and administrative coverage. Care has to be taken when interpreting immunization coverage estimated using administrative data. The best way of estimating immunization coverage is by using community survey. However, a study carried out by WHO and UNICEF found out that both administrative and community surveys are both important in determining coverage once properly designed they provide accurate and reliable results (WHO, 2008). In our study estimation of measles immunization coverage was done using maternal recall or vaccination cards with a tick and date written when child received the vaccine.

7.2 Mothers/caretaker factors associated with measles vaccination among children aged 12-24months in Busia district

The study revealed that listening to radio health talk shows and watching television was very beneficial to mothers acquiring knowledge on immunization and hence having their children vaccinated.

These findings are in consistency with previous study carried out by Peng and others in Ethiopia who revealed that communication using media was key to success in vaccination programs because mothers got information on the importance of vaccinating their children (Peng et al., 2012). Similarly a study carried out on parents/caregiver views and experiences on routine vaccination found out that health education via radio programs enabled parents acquire information about vaccination and influenced acceptance (Ames et al., 2017). Abadura and others also found out that exposure of a mother to media influenced children's basic immunization status. If a mother is exposed and listens to health talks on television or radio there's a possibility of the children completing immunization as opposed to a mother who does not and it was a significant predictor of childhood immunization (Abadura et al., 2015). Increasing the parent's awareness about the vaccination schedule and health educating mothers using mass media has the potential to increase vaccination uptake.

Antenatal care services attendance was another factor associated with measles vaccination. Mothers who attended antenatal care services and delivered from health facilities was because of health education sessions carried out by midwives and other health workers. During these sessions, mothers get chance of communicating with health care providers and ask questions regarding immunization and hence ensuring that their children are vaccinated on time. These findings are similar to a study done by Mbengue and others who found out that children born

by mothers who attended antenatal care during pregnancy or who gave birth at the health facility were more likely to be fully vaccinated (Mbengue et al., 2017). Also interaction of workers and mothers during ANC visits helps to build a relationship and there is a chance for the health worker to educate mothers on the importance of seeking health care services for herself and newborn hence improving on vaccination coverage (Dixit et al., 2013). Attendance of ANC services or delivery at a facility puts a mother in contact with the healthcare system, hence building a relationship with the health workers and this guarantees improvement in childhood vaccination. Also Bugvi and others carried out a cross sectional study in Pakistan and found out that mother's attendance of antenatal care services increased the opportunities of a child being vaccinated and it was an associated factor with immunization (Bugvi et al., 2014). Antenatal care visits were strongly associated with childhood vaccination status and this may be a further indication that a mother's contact with the healthcare system will carry over to her child's healthcare.

Education of the mothers was associated with full measles vaccination, the mothers who had attended secondary level and above were 1.3times higher to vaccinate their children compared to those who had attended primary or no education. These findings confirm previous studies carried out in Nigeria where level of education was highly associated with vaccination. Mothers who attended secondary and higher levels of education were capable of understanding the scientific information more easily than those with low education (Oduanya et al., 2008). This is similar to a study carried out by Schoeps and others in Burkina Faso who found out that mothers education level was key to a child completing her or his vaccination schedule on time (Schoeps et al., 2013). On the contrary a study carried out by Etana and Deressa in Central Ethiopia, educational level of the mothers did not show significant association of immunization completion among children aged between 12–23months (Etana and Deressa, 2012).

In our study the explanation for the uptake could have been ability of mothers to interpret and read information on the vaccination cards like date when a child is to be vaccinated.

It is difficult to improve vaccination coverage without taking into account the education level of a mother/caretaker. Higher levels of education imply more knowledge about childhood vaccine preventable diseases, understanding of the immunization goals and hence completion of the schedule.

7.3 Community factors associated with measles vaccination among children aged 12-24 months in Busia district

Husbands allowing mothers to make decisions on health related issues and provision of transport to the vaccination centers was contributing factor to mothers vaccinating their children against measles. This finding is in line with a qualitative study carried by Babirye and others on factors affecting immunization behaviors in Kampala. She found out that male involvement played a pivotal role in ensuring that children were vaccinated at household level (Babirye et al., 2011). In a similar study carried by Lanti and others in Indonesia, they out found that a husband is the closest person to the mother and any information given or suggested will be taken and as well influence the mother in decision making and attitude towards vaccination (Lanti et al., 2017). This study suggests that a mother's autonomy alone is not a critical factor for complete vaccination but support from the spouse on health related issues was key to making life saving decisions.

Appointment dates on vaccination cards; monitoring childhood immunization status by mothers using appointment dates on the vaccination cards was another factor associated with measles vaccination, the dates on the cards acted as a reminder to the mothers to have their children vaccinated. Vaccination cards are an important tool in determining vaccination completion. A study carried out in South Africa were majority of the mothers did not have health cards contributed significantly to poor utilization of health services and vaccination uptake was low (Tarwa and De Villiers, 2007). This finding is consistent with a cross sectional household survey

carried out in Kampala by Mukanga and Kiguli who found out that vaccination cards when used by mothers or care takers they provide a relatively inexpensive and effective instrument in the promotion of childhood immunization (Mukanga and Kiguli, 2006). Children with health cards with appointment dates clearly indicated were more likely to be up to date with the immunization schedule. This re-enforces the fact that these cards help mothers/caretakers follow up on the child's health issues.

Our study also shows that public health strategies like involving the local leadership at community level to mobilize the community for vaccination activities helps to improve uptake and it was associated with measles vaccination. These findings are similar to a study carried out in Northern Nigeria on importance of grass root mobilization campaigns. It was revealed that empowering the community leaders to participate in vaccination activities improved the vaccination coverage and it was associated with schedule completion (Nasiru et al., 2012). This is in line with a study carried out by Ozawa et al., who revealed that involvement of religious leaders makes information dissemination easier and strengthens vaccination services (Ozawa et al., 2018). Social mobilization of the community using the existing political, religious leadership structures creates demand and ownership of health services at individual and community level. Mobilization of the community helps to overcome gender barriers and resistance to vaccination and reaching out to the poorest and marginalized populations.

7.4 Vaccine program related factors associated with measles vaccination among children aged 12-24months in Busia district

This study is in agreement with previous studies that found out that health workers administering the vaccine to children was associated with measles vaccination.

The mothers who reported having been attended to by a qualified health worker in previous encounters had their children vaccinated against measles. Effective communication and information transfer between the health personnel and the mothers is important during the

vaccination sessions and this factor was significantly associated with measles vaccination. The knowledge of health workers could be a factor Building trust which is paramount in any healthcare interaction. As noted by Benin and others the trusted health professional is one who has spent time with the child and parent, listened to their concerns, accepted them and possesses the necessary scientific information that builds confidence of the mothers unlike someone who is not a professional and unqualified (Benin et al., 2006). Qualified health workers respond to questions of mothers with confidence and this motivates them to keep going to the vaccination centers in search of answers to misconceptions and myths on health related issues.

This study recognizes that effective communication and information transfer between the health personnel and the mothers is important during the vaccination sessions and this factor was significantly associated with measles vaccination. Mothers who had knowledge on site of injection when it is given, appointment dates and knew symptoms and signs told us that they had been taught by the health workers and VHT's. These findings are similar to a study conducted by Owais and others in Karachi Pakistan who found out that educational strategies during vaccination sessions for low-literate populations in the community, improved knowledge of the mothers and was responsible for complete vaccination (Owais et al., 2011). Also a study carried out by Kimura found out that a vaccine day and health education messages were vital in improving coverage. These messages empower women with knowledge and it helps to deal with myths and misconceptions about vaccination and his findings highlight a dependent relationship between the mother and the health care worker (Kimura et al., 2007). Giving information to the mothers during vaccination sessions on when to return their children for vaccination would enable them plan and postpone other programs to create time for taking their children for vaccination.

Therefore, educating mothers/caretakers about vaccine preventable diseases, as well as the vaccines themselves is key to completion of the vaccination schedule. We should however note that in this study stock out of vaccines was mentioned though it was not significant. Some mothers of non

vaccinated children reported having gone to vaccination centers only to go back home without their children being vaccinated due to vaccine stock outs. In a study carried out on maternal constraints towards compliance of expanded programs on immunization, revealed that unavailability of vaccines acts as a barrier to immunization services. This discourages mothers from coming back for the next appointments and hence causing high defaulter rates among mothers. In this study unavailability of vaccines was significant factor (Atienza et al., 2017). A significant improvement in logistics translates clearly into improved vaccine coverage. These improvements can also be attributed to district authorities' reinforcement of immunization strategies of maintaining a good cold chain systems maintenance. In this study unavailability of vaccines, needles and syringes was not an associated factor with measles vaccination completion.

Attitude of health workers; the findings suggest that providing parents with the opportunity to discuss vaccination in detail with a healthcare professional may further facilitate completion of measles vaccination. The attitude of health workers/vaccinators plays a crucial role in parental decision making, regarding vaccination. Some mothers of especially unvaccinated children complained that the vaccinators were so rude at the vaccination centers. Our study determined problems related to the providers attitudes and behavior. It is important to improve all aspects of the practices of the service providers to enhance uptake of vaccination. In fact our findings are similar to a study carried by Streefland in Netherlands who found out that the attitude of the health care workers formed a barrier for getting the vaccination services. If a mother missed out on a vaccination appointment date they feared to go back (Streefland, 2001)

If the attitude of health workers does not provide a ground for an effective information transfer then the mothers were hesitant to ask questions pertaining vaccination resulting to high defaulter rates (Topuzoğlu et al., 2007). Also a study carried out by Braka and others in Uganda found out that general information and good attitude by health workers was key to successful implementation of vaccination activities and a contributing factor to vaccination completion (Braka et al., 2012).

Effective communication and information transfer between qualified health personnel and the mothers is important during the vaccination sessions and this factor is a predictor for vaccination completion.

7.5 Study limitations and strengths

One of the strengths of the study was that we used measles vaccination to estimate coverage. Community surveys give reliable information and good for estimating immunization coverage unlike the administrative data. A sample size of 720 was sufficient enough to give reliable results about the status of measles vaccination in Busia district.

To assess quality of immunization services offered to mothers and the information given was subject to recall bias regarding the vaccine administered to children. This information collected relied on the mothers recall ability. Therefore, we cannot guarantee that those who reported receipt of vaccine were accurate. However, this should not affect interpretation of our findings to a degree of statistical significance and we counteracted the recall bias by probing.

Limitation. I believe the best way to confirm immunization status would have been sole use of the vaccination cards but this was not possible not all mothers had cards

CHAPTER EIGHT

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusion

The measles vaccination coverage of 71% was low compared to the national target of 95%.

In this study the individual factors associated complete measles vaccination among children age 12-24months were; mothers attending at least more 2 or more ANC visits, family income, mothers listening to health talk shows on radio and mother/caretaker level of education.

The community related factors associated with complete measles vaccination among children aged 12-24 in Busia district were; mothers participating in decision making issues concerning health at family level, Husbands of mothers/caretakers providing transport to take children for vaccination, presence of appointment dates on vaccination cards and participation of political, religious leaders and VHT's in mobilizing the community for vaccination programs.

The vaccine program related factors were; a distance of 2kms or less centers offering Immunization services, conducting health education talks related to vaccination, Cadre/qualification of vaccinator, Care given by vaccinators during vaccination sessions. Ethics and professionalism is key in arousing health-seeking behavior, providing health education and communication are essential for ensuring the mothers adhere to the vaccination schedule of measles.

8.2 Recommendation

The study provides insights into the factors associated with measles vaccination, hence the recommendations that will help improve coverage in Busia district. Maintaining high coverage through routine vaccination can minimize the number of susceptible children, and consequently avoid periodic epidemics.

1. Health workers should give sufficient information to mothers on the importance of childhood vaccination, return dates during vaccination sessions and attendance of antenatal care visits.
2. Supervision of immunization activities by the district EPI focal person. This is key in identifying gaps during static and outreach programs. Emphasis on vaccinators arriving on time and all services given to mothers without a cost.
3. Religious leaders, political leaders should continue with mobilization of immunization activities more so encouraging men to participate in immunization, involving their wives in decision making at household level and providing transport for them to take children for immunization.

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Appendices

Appendix 1: Study questionnaire

Determining factors associated with measles vaccination among children aged 12 to 24months in Busia district

Name of Respondent..... signature.....Date.....

1. District.....2. Division/ Sub County.....

3. Parish.....4. Village.....

SOCIAL DEMOGRAPHICS			
NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
MIC101	What is your age? (in complete years)	15-20-----1 21-26-----2 27-32-----3 33-38-----4 ≥39-----5 Sex - Male [] Female []	
MIC102	For the child under consideration; What is his/her age? (in months)	12-15-----1 16-19-----2 20-24-----3 Sex 1= Male[] 2= Female []	
MIC103	What is your current marital status	Married-----1 Never Married-----2 Cohabiting-----3 Single-----4 Divorced-----5	
MIC104	What is your highest level of education?	No education-----1 Primary-----2 Secondary-----3 Tertiary-----4	

MIC105	What is your religious belief and affiliation?	Catholic-----1 Protestant-----2 Muslim-----3 Pentecostal-----4 Others-----5	
MIC106	What is your tribe?	Musamia-----1 Musoga-----2 Muganda-----3 Mugisu-----4 Somali-----5 Karamajongo-----6 Muteso-----7 Others-----8	
MIC107	What is your occupation?	Fulltime house wife-----1 Subsistence farmer-----2 Civil servant-----3 Businesswoman-----4 Casual Laborer-----5 Others-----6	
MIC108	Place of residence?	Rural-----1 Urban-----2	
MIC109	How many children do you have?	1-3-----1 4-6-----2 ≥7-----3	
MIC110	What is the birth order of this child?	First born -----1 Second born -----2 Third born-----3 Fourth born and above-----4	
MIC111	Nature of the residence	Permanent-----1 Semi-permanent-----2 Mud and wattle-----3 No shelter-----4	

MIC112	Family income per month	\leq 10,000-----1 11,000-30,000-----2 31,000-50,000-----3 51,000-100,000-----4 >101,000-----5	
COVERAGE			
MIC113	Do you have this child's vaccination card/booklet	Yes-----1 NO-----2	
	If Yes	Child vaccinated-----1 Child Unvaccinated-----2	
MIC114	If no why don't you have?	Card got lost-----1 Not available when i took my child for vaccination-----2 Didn't have money to buy-----3	
	No card/recall by mother	Child vaccinated-----1 Child unvaccinated-----2	
MIC115	Reasons for not vaccinating	Forgetting appointment dates-----1 Fear of side effects-----2 Lack of awareness-----3 vaccination has no benefit-----4 Religious and cultural beliefs-----5	
mothers/caretaker			
MIC116	Have you ever heard about measles vaccination?	Yes-----1 No-----2	

MIC117	Source of information?	Friend-----1 Television or Radio-----2 Health workers-----3 VHT's-----4	
MIC 118	What are the objectives of measles vaccination?	Protects against all disease-----1 Protects children against immunizable diseases-----2 I don't know-----3	
MIC119	What are the signs and symptoms of measles	Macula popular rash, cough, fever and red eyes-----1 I don't know-----2	
MIC120	What causes measles	Witch Craft-----1 Poor diet-----2 A virus/germ-----3 I don't know-----4	
MIC121	When is a child immunized for measles	At birth-----1 At 6months-----2 At 9months-----3 I don't know-----4	
MIC122	Which site is the injection given	Right upper arm-----1 Left upper arm-----2 I don't know-----3	
MIC123	Where was the child born?	Health care setting? -----1 TBA\Home-----2	
MIC124	Did you attend all the 4 ANC Visits	Yes-----1 No-----2	
	If no, how many visits did you attend	(0, 1, 2, 3)-----?	
MIC125	Are you scared about the side effects after immunization?	Yes-----1 No-----2	

MIC126	Has any of your children ever gotten a side effect of vaccination?	Yes-----1 No-----2	
MIC127	If yes, what was it?	Fever-----1 Abscess-----2 Disability-----3 Others(specify)-----4	
MIC128	If your child fell sick on the appointment day, would you take him or her for Immunization?	Yes-----1 No-----2	
MIC129	Can you recommend other mothers to take their children for immunization?	Yes-----1 No-----2	
MIC130	Why would you recommend	Protection of our children against diseases-----1 Government policy-----2 Good Health for the general population-----3 Others(specify)-----4	
MIC131	Do you listen to health education messages on radio or TV concerning immunization?	Yes-----1 No-----2	
COMMUNITY FACTORS			
MIC132	Do you participate in making decisions regarding seeking for health care	Yes-----1 No-----2	
MIC 133	Who takes the child for vaccination	Father-----1 Mother-----2 Others-----3	

MIC134	Does your culture agree with Immunization?	Yes-----1 No-----2	
MIC135	Does your religion agree with Immunization?	Yes-----1 No-----2	
MIC136	Does your husband provide transport when you're taking the child for immunization	Yes-----1 No-----2	
MIC137	Which transport do you normally use when taking a child for immunization	A vehicle-----1 Bicycle-----2 Walking-----3 Others(specify)-----4	
MIC138	Who normally reminds you to take the child for immunization?	Spouse-----1 Self-----2 Neighbor-----3 Appointment card-----4 Others(specify)-----5	
MIC139	Are the local leaders, Religious leaders, women groups involved in Immunization	Yes-----1 No-----2	
MIC140	How much is transport to the nearest health facility?	1000-2000-----1 3000-5000-----2 ≥6000-----3	
MIC141	Do you have VHT'S in this community?	Yes-----1 No-----2	
MIC142	If yes, do they mobilization you to take children for immunization	Yes-----1 No-----2	

MIC143	Which one of these is the best method of reminding you about immunization dates	1= Media-----1 2= VHTs/political leaders-----2 3= Telephone/Mobile phones---3		
MIC144	(i) Does your household have: a) Electricity? b) A radio? c) A Video player? d) A television? e) A mobile phone? f) A fixed phone? g) A refrigerator? h) A Bicycle? i) A Motorcycle? j) A car?	Item	Yes	No
		Electricity	1	2
		Radio	1	2
		Video player	1	2
		Television	1	2
		Mobile phone	1	2
		Fixed phone	1	2
		Refrigerator	1	2
		Bicycle	1	2
		Motorcycle	1	2
	k) A bed? l) A cupboard? m) A sofa set.	Car	1	2
		Bed	1	2
		Cupboard	1	2
		Sofa Set	1	2
	(ii) Wealth Index	Poor-----1 Middle-----2 Rich-----3		
SYSTEMS RELATED FACTORS				
MIC145	Do you have a vaccination center in your parish?	Yes-----1 No-----2		
MIC146	How far is the vaccination center?	1kms-----1 2kms-----2 >3kms-----3		
MIC147	How long do you wait at the vaccination sites?	<30minutes-----1 1hr-----2 2hrs-----3 ≥3hrs-----4		
MIC148	How long are you willing to wait before you receive services	<30minutes-----1 1hr-----2 2hrs-----3		

MIC 149	Are there designated waiting areas for vaccination both outreaches and static?	Yes-----1 No-----2	
MIC150	Are the designated places clean	Yes-----1 No-----2	
MIC 151	Time for outreach sessions	Convenient-----1 Not convenient-----2	
MIC152	What is the most convenient time	9am to 12pm-----1 12pm to 3pm-----2	
MIC153	Have you ever gone to the vaccination center and gone back home without your child/children	Yes-----1 No-----2	

	being vaccinated?		
MIC154	If yes, what were the reasons	Vaccination team never came---1 Child was sick and told to return--2 Vaccines were over-----3 Needles got finished-----4 Vaccination team had already left-5 I was told child had already completed-----6 Didn't have YCC card-----7	
MIC155	In relation to health worker behavior how do you gauge the care given to you	Good-----1 Fair-----2 Bad-----3	
MIC156	Are the cards given to you without any cost?	Yes-----1 No-----2	
MIC157	Do you pay for immunization services?	Yes-----1 No-----2	

MIC158	Do vaccinators/health workers reach immunization centers on time?	Yes-----1 No-----2	
MIC159	Who vaccinates children during outreaches and static at the facility?	Qualified Health Worker-----1 VHTs-----2	
MIC160	How many Outreaches do you have in a period of 1month in your parish?	1-----1 2-----2 >2-----3 None-----4	
MIC161	Are you given information about immunization when you take your child for immunization?	Yes-----1 No-----2	
MIC 162	Have you ever seen any poster on immunization in your community or health facility?	Yes-----1 No-----2	

TRANSLATED QUESTIONARE IN SAMIA

ENDAALO CHIO MWOSI..... Ameeta

Esikumu..... Olugala

Kawo-----

Egombolola..... Omuluha

Olukong.....

Ebi hudiraho ngo mundu

N	Ebiteebo	Amakaluso	
MIC101	Oli nende emyaka chinga	15-20-----1 21-26-----2 27-32-----3 33-38-----4 ≥39-----5 Muhaye[] musacha []	
MIC102	Omwana ono ali nemyaka chingha (mu mwesi)	12-15-----1 16-19-----2 20-24-----3 Musele [] muhana []	
MIC103	Oli omuscha / omuhasi wedaala	Ndadeha / ndadehya.....1 Sisiri ohudeha / ohudehya.....2 Ndi mubwicha.....3 Ndi omusumba.....4 Ndaloba / hwauhana.....5	
MIC104	Wasoma wola hudara sina mu byohusoma	Hasi ndasomaho.....1 Edara lisoha.....2 Edara lyohubiri.....3 Edara lya haya.....4	
MIC105	Oli wadini sina	Katulika.....1 Ekanisa etukufu ya Uganda.....2 Musiramu.....3 Mulokole.....4 Edini chindi.....5	
MIC106	Oli owesiha sina	Omusamia.....1 Omusoga.....2 Omugisu.....3 Omuganda.....4 Omuteso.....5 Omusomali.....6 Omukaramoja.....7 Owe biiha bindi.....8	

MIC107	Ohola mulimo sina	Omuhasi wedaala.....1 Omulimi.....2 Omuhosi wagavument.....3 Omuchurusi.....4 Ndehosesa.....5 Emirimu chindi.....6	
MIC108	Omenya yeena	Mushalo.....1 Mu nanga.....2	
MIC109	Oli nende abaan banga	1-3.....1 4-6.....2 ≥7.....3	
MIC110	Omwana ono wahungha?	Niye asoha-----1 Wa hubiri-----2 Wahudatu-----3 Wahu ne nenda ohucha amukuru----4	
MIC111	Enyumba yomenyamu yesiha sina	Enyumba yo bwangasi.....1 Enyumba ya mabati yeloba.....2 A hasisira.....3 Mbuma enyumba.....4	
MIC112	Mwingisa esende chinga mudala lino	<10000-----1 11,000-30,000-----2 31000-50000-----3 51000-100000-----4 >101,000-----5	
	COVERAGE		
MIC113	Olinenda ahatabo ho hugema	Yeeh-----1 Haaba-----2	
	Nisiba Yeeh	Omwana bamugema-----1 Sibamugema-----2	
MIC114	Lwasi obuma hatabo ho hugema	Hakota-----1 Habumayo ninayira omwana ohugema--2 Nalimbuma esende-----3	
	Obuma hatabo/onyala weyichurisa oba	Omwana bamugema-----1 Oba siba mugema-----2	

MIC115	Esonga lwasi sibamugema	Nelabila endalo Cho mwosi-----1 Natya ebitadahiwa nogemere-----2 Siba njechurisa ho-----3 Ohugema huwuma mugaso-----4 Ebyedina ne byo buwanga sibifukirira--5	
MIC116	Ensonga chawo koti ngomundu omanyire hubidiranaho hulugema lwo bulwaye bwo okuwereketo.	Yeeh.....1 Haaba.....2	
MIC117	Nanu eya hubolera embosi yohugema	Omwicha wange-----1 Tv oba e radio-----2 Abasawo-----3 Abasawo bo musyalo/VHTs-----4	
MIC118	Nikalo mbu yeeh, sina syomanyireho hu billiranoho nohugema obulwaye bwo okuwereketo	Ohwakamya endwaye chosi.....1 Ohwakamya endwaye chigembwa.....2 Ohutangira endwaye echidira bamaama.....3	
MIC119	Bubonero sina obuletebwa nende obulwaye bwo okuwereketo	Ohuseruha omubiri, ehololo, ohubala omubiri nende ohwa hanya emoni.....1 Hasi manyire.....2	
MIC120	Sina esieta obulwaye bwo okuwereketo	Obuloke.....1 Ohulya bubbi.....2 Ebibuha.....3 Ebifwo bichafu.....4	
MIC121	Buhulundu sina bubagemeraho abaan obulwaye bwo okuwereketo	Hubiha byo hwibulwa.....1 Hu myesi chisasaba (6)2 Hu myesi tiisa (9)3 Simanyire-----4	
MIC122	Bahuba ena episo	Humambala yo muhono omusacha-----1 Humambala yo muhono omuhasi-----2 Simanyile-----3	
MIC123	Omwana bamwirulila yena	Mudwaliro-----1 Mudala-----2	
MIC124	Wacha mudwaliro amahabi Kane	Yeeh-----1 Haaba-----2	

	Noba notamala yo wacha amahabi kanga	Erala-----1 Kabili-----2 Kadatu-----3	
MIC125	Otya ebitasi bilayi oluvanyumalwo hugema omwana	Yeeh-----1 Haaba-----2	
MIC126	Eriyo omwana wawo afuna ngha ho Ebidinyu no hugema	Yeeh-----1 Haaba-----2	
MIC127	Nisiba situfu Binesi	Omubiri ohubala-----1 Ebutte-----2 Obulema-----3 Nebindi?-----4	
MIC128	Omwana naba nabala omubiri ofukirira bamugema	Yeeh.....1 Haaba.....2	
MIC129	Onyala waboleraho abahaye bandi oyila abana ohugema	Yeeh-----1 Haaba-----2	
MIC130	Lwasina owagira	Ohutangira endwaye mu baana.....1 Silagiyo sha gavumenti.....2 Hulwo bulamu mulayi eyiri abandu boosi.....3 Ebindi (nyonyola).....4	
MIC131	Owulirisangho emilomwa chidirana nende ebyobulamu hunahalondo hwomba husihondyosi	Yeeh.....1 Haaba.....2	
EBYE SYALO EBIDIRA HUHUGEMA			
MIC132	Mudisyana nende omusacha wawo hubyo bulamu	Yeeh.....1 Haaba.....2	
MIC133	Nani ayira obana ohu bagema	Omusacha wange.....1 Simwene--.....2 Abandi-----3	
Mic 134	Ebye enono nende emisiro chawo chifukirisania nende ebyo hugema	Yeeh.....1 Haaba.....2	
MIC135	Edinin yao yifukirira ebyo hugema	Yeeh.....1 Haaba.....2	
MIC136	Omusacha wawo ahuberesa engeenda noba noyira omwana ohumugema	Yeeh.....1 Haaba.....2	
MIC137	Ngeenda sina yiwehonyera noba noyira omwana ohumugema	Eburusi.....1 Engalangatani.....2 Amakulu.....3 Eyindi (nyonyola).....4	

MIC138	Nanu ahwichulisanga ohuyira omwana ohumugema	Baba womwana.....1 Ese omwene.....2 Omulirwana.....3 Esyandiko.....4 Ebindi (nyonyola).....5	
MIC139	Abahulundu mungongo, abahulundu ba amadini nende ebikande bya hu bidira huhugema	Yeesh.....1 Haaba.....2	
MIC140	Sende chinga chohosesa ohucha hunderero yiri eyambi nawe	1000-2000-----1 3000-5000-----2 ≥6000-----3	
MIC141	Muli nende abasawo bo musyalo VHTs mulukongo lwemwe	Yeesh.....1 Haaba.....2	
MIC142	Nisiba situfu muli nabo baba hubirisa oyila abana ohugema	Yeesh-----1 Haaba-----2	
MIC143	Engeri si eyamba ohufana amabulire ko hugema	Ebye mpulizaganya-----1 VHTs/Abakulembeze-----2 Amasimu-----3	
MIC144	Ebyobugaga byabo	Mwafu-----1 Oli akati-----2 Mugaga-----3	
EBILANA NENDE EBYO BULAMU/NENGERI EYI BIKENDA MO			
MIC145	Muli nende esifwo syohugemeramu mumuluha kuno	Yeesh.....1 Haaba.....2	
MIC146	Esifwo syohugemeramu siri lukendo sina ohutula yomenyere	≤ 1km.....1 2kms.....2 3kms.....3	
MIC147	Noba niwolere husifwo syohugemeramu omalayo ebiha binga	Echitola edadika 30.....1 Esawa laal (1).....2 A maswa kabiri (2).....3 ≥Amasawa Kadatu-----4	
MIC148	Wenda olinde ngha amasawa kanga nochire ohugema	≤1hr-----1 Amasawa kabiri (2)-----2 Kadatu-----3	
MIC149	Ebifo byo hugema bimanyihane, nocha ohugema	Yeesh-----1 Haaba-----2	
MIC150	Biyonjo	Yeesh-----1 Haaba-----2	
MIC151	Esawa cho hugema	Ndayi-----1 Sindayi-----2	
MIC152	Esawa ettufu	Muchuli ohutula esawa 3-6-----1 Esidete esawa 6-9-----2	

MIC153	Wa chaho ohugema wakobola omwana nibata mugemire?	Yeeh-----1 Haaba-----2	
IC154	Nikaba mbu yeeh, bahubere sa songa sina	Abaswo bahola hu byo hugema hasi becha.....1 Omwana yali omulwaye bahubolera omukaluse olundi.....2 Omusala kwo hugema kwali kuwere.....3 Esindani chali chiwere.....4 Abasawo bagema bali bamalire ohukobolayo.....5 Omwana yali yamalayo esindani chosi.....6 Ndali mbula esyandikp sha YCC.....7	
MIC155	Obolaho sina esidirana nende esambo ya bandu bahola hubyobulamu nibali hu mulimo kwawe.	Balayi.....1 Balayi esigero.....2 Babbi.....3	
MIC156	Babechanga ekadi cho hugema awawuma ohuchi sasulira	Yeeh.....1 Haaba.....2	
MIC157	Ohugema hwo husasulira	Yeeh.....1 Haaba.....2	
MIC158	Abandu bagema boola mu bifwo byohugemeramu mu biiha	Yeeh.....1 Haaba.....2	
MIC159	Bananu abagema	Abasawo abali nende ebaluwa-----1 Abasawo bomu syalo VHTs-----2	
MIC160	Mahabi kanga mu mbaka yo mwosi mulala kabasawo bohugema becha mu muluha kwawo	Lala (1).....1 Kabiri (2).....2 Akhira kabiri3 Yibula.....4	
MIC161	Baba beresa nga embosi edirana nende ohugema nimuyirire abana	Yeeh.....1 Haaba.....2	
MIC162	Mubonangaho epinde/ ebyekeresa ebidilana nende ohukema musyalo	Yeeh.....1 Haaba.....2	

Appendix 2: Consent form

Introduction

Good morning/ afternoon. Thank you for allowing me talk to you. My name is Birikire Elisha; I have worked with Busia local government for the last 13years. I am a pursuing masters of Public Health at Makerere University, (School of Public Health). I am requesting you to participate in this study that will establish the factors associated with measles immunization coverage in Busia District. You will be asked questions and the information given will help Busia district, the country to design appropriate interventions that will help increase on coverage and prevent future outbreaks of measles in Busia and Uganda.

Procedure for the study: This questionnaire will take between 30-40minutes.

Benefits: There are no immediate and direct benefits to you as a person that you will get from your participation in the study. However, the information you will give will help the District Health team to have focused interventions that will help improve coverage and prevent future measles outbreak in Busia.

Confidentiality: Any information given will remain confidential and will be used for the purpose of this study only. The answers will be treated in a confidential way and the findings of the study will be generalized and not attributed to0 a single individual.

Voluntary Consent: You are free to choose whether to take part in this study or not, and you are free to withdraw at any time. Feel free to ask any questions before or after interview.

Potential risks- There are no potential risks in this study.

If you have any questions please contact me on Tel.no.O772855898 email address

ebirikire@gmail.com

Statement of consent

I..... have read the consent form and have understood what has been explained about what is required from me if i decide to participate in the study

I hereby agree to take part in this study.

Translated Consent Form from English to Lu Samia

Olukonyeresa hubidirana nende obulwaye bwe okuwereketo mubaana bali nobuhulundu bwe emwesi 12 lhwola 24 mulugala lwe busia

Esiandiko syohufukirira

Ohwanjulisa

Oliyo otye, webale ohufukirira ohulomaho yoli.

Mumeta nise omwami Birikire Elisha omuhosi khu lugala e'busia amalileho embaka ye mwaka ehumi nende chidatu (13), ndi omweki hulyekero ehulundu lye makerere ebidirana nende ebyobulamu bwe bandu ebifwo bibamenyamu.

Husaba wegata mu khukonyerea huno khusobole ohutegera esonga chidiranaho nende obulwaye bwo okuwereketo mu lugala lwe e'busia.

A makaluso ke bitebo binja ohuhuteba kecha ohuhonyeraho olugala lwe e'busia nende esyalo sya Uganda ohutawo etekeha eyicha okhukikungula omutindo kwo hwetangira nende ohumanaya ebidira khu bulwaye bwo okuwereketo mubiha bichayo.

Endagiriro yo khukonyeresa

Ohweteba khuno hwicha oyira edadika a mahumi kadatu khu kane.

Ebyohufuna

Yiwumao esyohufuna koti omundu khulwo hwegata khu hweka khuno naye a makaluso kawo kecha ohuhonyera abebyobulamu mu lwe e'busia ohutumbula omutindo mu ngeri yo hwetangira obulwaye bwo okuwereketo.

Okhulinda ebyama.

A makaluse kawo kecha ohubukuliwa koti esyama, kahosesebwe khu lwo mulino kwohukonyeresa hwongane awawuma ohwatula ameta komundu yesi.

Okufukira si bahuyika

Oli omulehule okhufukira ohwegata khu hweka khuno hwomba okhuhaya era ofukirirwa ohuteba esitebo syosi esidirananho nende okhukonyeresa khuno.

Ebyobulabe

Wawumao esyobulabe syosi esidirana nende okhukonyeresa khuno. Niyibayo esitebo syosi, kuba esimu khu Number 0772855898

Esyandiko syo khufukirira

Ano nise

Somere era ndategera ebyo byosi ebinyoyolwe khubidahibwa etula yindi ndafukirira ohuba mulala hwabo abali mukhukonyeresa khuno

Appendix 3 : Key informant interview guide

Interviewer Name----- Date-----

INFORMED CONSENT FORM

Hello my name is -----, You have been selected randomly to participate in the research entitled “**FACTORS ASSOCIATED WITH MEASLES VACCINATION AMONG CHILDREN AGED 12-24MONTHS IN BUSIA DISTRICT. A CROSS SECTIONAL STUDY**” leading to an award of Masters of Public Health of Makerere University in Kampala. We regard the information and experiences you will give important. No risks or physical harm is expected to occur to you but you might be slightly inconvenienced in terms time spent during the interview as well as psychological discomfort if you have had a bad experience with immunization services. There are no payments or direct benefits but this information will be used by the district and ministry for policy making to improve immunization services.

Your identity will not be disclosed. If you agree to participate in the survey, you may be asked questions related to measles immunization.

You are free to choose to participate or not to take part in this research, or withdraw at any time of the interview. You will be given an opportunity to ask questions after the interview. Refusal to participate will not in any way affect your access to health care services in your area. Do you have any questions?

(A) DISTRICT HEALTH TEAM MEMBERS BUSIA DISTRICT

1) Are the health workers adequate for the required immunization services at the facility and outreaches?

2) What can you say about vaccines supplies at the District level? _____

3) How are the vaccinators involved in immunization services both static and outreaches motivated? _____

4) How often is the immunization support supervision done? _____

5) How is mobilization done for vaccination activities? _____

6) How is information concerning vaccination disseminated to the general public? _____

(B) HEALTH WORKERS

1) How are the immunization activities facilitated? _____

2) What happens during an immunization session are the cards and others services related to vaccination given to mothers without a cost? _____

3) Which means of transport do you use to the outreach sites? _____

4) Do you have enough supplies (vaccines, tally sheets, icepacks and a stand by full gas cylinder) at all times? If no why? _____

5) Do you integrate information on vaccination in other activities at the facility or during outreaches? _____

6) Any other challenge affecting measles vaccination apart from the ones mentioned above? ___

Appendix 4: Work Plan

**Title: Factors associated with measles vaccination among children aged 12 to 24 months in
Busia district**

Activity	Time frame								Person (s) responsible
	Se	Dec	Jan	Feb	March	April	May - June	July	
Proposal writing									Principle investigator supervisor
IRB approval									Principle investigator
Pre Testing of Instruments									
Data collection									Principle investigator data collectors
Data analysis									Principle investigator Supervisor
Report writing									Principle investigator
Submission dissertation									Principle investigator

Appendix 5: A map of Busia district showing distribution of health facilities

