DETERMINANTS OF DEMAND FOR VOLUNTARY MEDICAL MALE CIRCUMCISION BY MALE ADULTS IN UGUNJA SUB COUNTY

BY

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DECLARATION

Declaration by the student

I declare that this project is my original work and has not been presented to any institution for academic purposes by persons known to me. Other people's work used in this proposal have been properly acknowledged and cited.

NAME: ……. Sign ……

Registration No: …….

Supervisors' approval

This project has been submitted with my approval as the university supervisor.

NAME: ……. Sign …….

Department …….....

Date ……...

DEDICATION

Dedication goes to my family and friends for their emotional support for the time I have been in school. I would also like to dedicate this to all people infected and affected with HIV/AIDS.

ACKNOWLEDGEMENT

I thank God for His grace and protection throughout my studies. Secondly, I would like to acknowledge my supervisor Prof. Kiriti Ng'ang'a for her tireless support and guidance on my chosen topic. My third acknowledgment goes to my classmates for their moral support especially Mr. Anthony Mamati, Dr. Samuel Kadivane and Mr. Ronald Mosinki.

ABBREVIATIONS AND ACRONYMS

ART	Antiretroviral Therapy
HIV	Human Immuno-Deficiency Virus
AIDS	Acquired Immuno-Deficiency Syndrome
HTC	HIV Testing and Counseling
MMC	Medical Male Circumcision
NACOSTI	National Commission for Science, Technology and Innovation
REC	Review Ethics Committee
STI	Sexually Transmitted Infection
TBP	Theory of Planned Behavior
UNAIDS	Joint United Nations Program on HIV and AIDS
UNICEF	United Nations Children Fund
VMMC	Voluntary Medical Male Circumcision
WHO	World Health Organization
SPSS	Statistical Package for Social Sciences
USA	United States of America
NACC	National AIDS Control Council
MOH	Ministry of Health
DHIS	District Health Information System

DEFINITION OF TERMS

Voluntary Male Circumcision	This is the act of removing the penis's foreskin in males either surgically or by use of a device to individuals who have voluntarily consented for the procedure
Demand	The willingness and ability to purchase goods and services
Adult	Men who are 25 years old and above according to NASCOP in regards to VMMC
Determinants	A factor or a circumstance that influences an event

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Voluntary Medical Male Circumcision (VMMC) is the removal of the foreskin of the penis either surgically or by use of a device to males who have voluntarily consented. VMMC has been shown to be an effective strategy in the prevention of Human Immunodeficiency Virus (HIV) by around 60% according to World Health Organization. Kenya has made progress in VMMC scale up effectively nearing the achievement of the set target.

The study investigated the determinants of demand for VMMC among the male adults in Ugunja Sub-Count. A cross-sectional analytical study was carried out among the males aged 25 to 49 years. A multi-stage sampling method was used for selection of study participants. A semi-structured questionnaire was developed for collection of data and analyzed using STATA by both descriptive and analytical methodology. Research authorization and consent of the respondents was sought before the study.

A sample size of 350 was targeted, only 349 (99.7%) were available while the remaining 0.3% respondents declined to be interviewed. Majority of the respondents were age bracket of 25-36 years (75.36%). In terms of religion, Christians were the majority (85.96%) while Muslims followed at 8.02%. Most of the participants at 46.42% had attained secondary education. 79.62% of the respondents agreed that VMMC information was readily available while 20.38% disagreed. 31.82% of the respondents had demanded for VMMC services while 68.19% of them had not. Equally 56.45% of the respondents believed that VMMC had medical benefits while 43.55% of them did not. Lastly, 71.92% of the respondents believed that VMMC had adverse effects on the circumcised person. The findings pointed out that male adults not married are more likely to demand for VMMC as opposed to those married.

Conclusively, it is evident that accessibility to VMMC information is likely to increase the demand of VMMC. Demand for VMMC will increase if the income range is stable, this would translate to indirect affordability meaning male adults are able to meet the costs associated with it. The study revealed that male adults who are in informal employment and other means of getting income, are more placed to demand for VMMC services probably due to the flexibility of their schedules. Most men agree that circumcision offers partial protection against HIV which in turn influences positively their demand for the VMMC. All stakeholders should introduce economic incentives compensations to woo men for the services.

CHAPTER ONE

1.1 Background Information

History of circumcision dates back to ancient times whereby the practice of male circumcision was borrowed by the Jewish people from the Egyptians, a practice meant to be a ritual that transformed boyhood into adulthood. (Gollaher, 2000).

Among the Britain people, medically rationalized circumcision started in 1840s, when British medical doctors began to think about medical management for physical and mental illnesses, as well as for various socially disapproved habits like masturbation among the teens. As a belief to reduce on the rates of venereal disease and other infections in USA, soldiers in America were encouraged to undergo circumcisions during World War II. This was especially among the soldiers working in North Africa, where the troops went through harsh conditions during the war (Darby, 2015).

In Australia, the practice of circumcision was introduced by the British since most of them were medical doctors and teachers. In the late 19th Century, circumcision was recommended for management of spermatorrhoea in men and as a preventive measure of masturbation among the teens. It was also recommended around 1900 as a treatment for congenital phimosis in children and as prevention against venereal disease and other STIs (Darby, 2015).

1.2 Voluntary Medical Male Circumcision

Male circumcision involves the removal of the foreskin surgically which consists of the retractable fold covering the penis head in male. Voluntary Medical Male Circumcision (VMMC) is the process of removing the penis foreskin either surgically or by use of a device to individuals who have voluntarily consented for the procedure (World Health Organization, 2011).

VMMC has been reported to minimize the acquisition of heterosexual HIV by approximately 60% according to the results of clinical trials carried out in different countries (Auvert et al., 2005; Gray et al., 2007; Bailey et al,. 2007). Basing on the findings of these clinical studies, WHO working with United Nations Program on HIV/AIDS (UNAIDS) recommended VMMC as one of the HIV reduction intervention in heterosexual men alongside other effective HIV prevention measures in areas where a substantial number of male are not circumcised (WHO & UNAIDS, 2007).

VMMC has the potential of reducing HIV prevalence and transmission (Gray et al., 2007). For every 5 to 15 VMMC performed, one HIV infection could be reduced (WHO & UNAIDS, 2007). In addition, increasing access to VMMC services is cheaper than treatment services for HIV (Njeuhmeli et al., 2011).

Apart from its ability to reduce HIV, VMMC has been clinically proved to offer protection against some of the Sexually Transmitted Infections (STIs) in both men and women. Its ability to reduce human papillomavirus in men (Serwadda et al., 2010) and their female counterparts (Wawer et al., 2011), and herpes simplex virus-2 in men has been shown (Tobian et al., 2009). It is also linked to risk minimization for genital cancers (Morris et al., 2011) and genital ulcer (Gray et al., 2010) in both genders.

Basing on the findings of studies on VMMC, WHO and UNAIDS came up with a priority list of countries in which to scale up VMMC services in the year 2007. The list included Kenya (in parts of the former Nyanza province), Lesotho, Zimbabwe, Uganda, Tanzania, Botswana, Malawi, Zambia, Swaziland, Mozambique, South Africa, Malawi, Rwanda and Namibia. Progress has been noted in these countries with most developing plans and taking measures to scale up VMMC services. Each country has been noted to have made some progress in the implementation of the prepared programs but the process of expanding the VMMC services has continued to move at a slower pace in some of the countries (WHO, 2011).

The scaling up of VMMC to a coverage of 80% in the countries that has been placed on priority list has been predicted to have the ability of preventing around 22 percent of HIV infections by the year 2025 hence being able to save US$16.51 billion that could have been spend on the patients management process (Njeuhmeli et al., 2011). However, more than 20 million circumcision of male aged between 15 to 49 years in fourteen priority African countries is required to achieve this target (Gray et al., 2007).

Other concerns that have been reported to be barriers to VMMC uptake are the costs involved , especially transportation to the facility, pain associated with the circumcision process, adverse surgical outcomes that might result from the procedure, long healing periods and the condition of staying away from sex during the healing period, with 42 days having been recommended by WHO (WHO & UNAIDS, 2007; Mugavero et al., 2009). Other concerns have been resistance from the female partners and fear of impotence (Herman-Roloff et al., 2011; Ghaemi et al., 2010).

With the hurdles faced in the process, it calls for new demand generating measures which will attract men to seek for VMMC services. However, there is little research that has been carried out to assess the process of creating demand (Thirumurthy et al., 2014; Chinkhumba, Godlonton, & Thornton, 2014). This has been prioritized as an area that requires urgent research intervention (Gray, Wawer, & Kigozi, 2013; Sema K. Sgaier, Reed, Thomas, & Njeuhmeli, 2014).

1.3 Components of VMMC

VMMC is an integration into HIV prevention strategy which include testing and counseling on HIV; screening and management of STI's; distribution of condoms and promotion of safe sex (WHO/UNAIDS, 2007). It also includes Antiretroviral Therapy (ART) provision to people living with HIV for viral load suppression which would in turn reduce transmission, counseling on risk reduction and explanation on the procedure and obtaining of informed consent. Clinical and surgical care which includes preoperative assessments and postoperative review and counseling are also offered (UNAIDS, 2016).

Demand generation requires component of communication activities which include client and partner education, benefits and disadvantages of VMMC and reinforcement on the importance of safe healing (WHO, 2016). These activities have expanded beyond community mobilization and to broader campaigns using social media and mass media such as radio, TV, billboards, and posters (Hatzold et al, 2014).

1.4 VMMC Program in Kenya

VMMC program was started in Kenya in the year 2008 and its aim was to circumcise 860,000 men by July 2013, which translates to 80 percent coverage. Kenya has shown great success in VMMC scale up after it was shown to be effective in HIV acquisition risk reduction (Bailey et al. 2007). Between the period covering October 2008 to March 2012, 430,000 men were circumcised in Kenya and a 66 percent of the target for Nyanza was attained (Mwandi et al., 2011) . The numbers of annual VMMC were reported to have increased between the year 2008 and 2013 from 8,000 to 190,000 (NACC, 2014). The country was about to achieve its 800,000 target, however, the coverage in Nyanza region met the set targets (MOH, 2014). The annual target of 940,000 for the country was surpassed in 2015 during the new phase of the program implementation. The numbers were higher than the target set by 100,000 men (SHARE, 2015).

According to Ministry of Health, District Health Information System (2017) report, 932,044 male circumcisions were done between 2012 and 2016 in Kenya. However, only 11.7% were male adults above 25 years of age. Out of the four counties among non-circumcising communities in Nyanza, Siaya County reported the least, 5.17% of male adults above 25 years of age. Ugunja Sub-County in Siaya reported the least, 2.9% of male adults above 25 years of age (DHIS, 2017). According to Ugunja Strategic Plan, (2013-2018), the current HIV prevalence in Ugunja Sub-County is at 15%. National Aids Control (2018) states that Siaya County HIV prevalence is at 21% while of the National is at 4.9 %.

In the next phase of VMMC implementation, Kenya seeks to achieve 95% male circumcision by the year 2019. There has been a shift to targeting of adolescents and infant for male circumcision. The targeted infants are aged 0 to 60 days and are adolescents aged 10 to 14 years. There is also efforts to promote safe traditional circumcision practices among the communities practicing it (Ministry of Health, 2015).

A number of varying demand creation activities have resulted in the progress and improvement of scale-up of VMMC (AIDS Vaccine Advocacy Coalition, 2015). Increase in VMMC services demand is therefore vital in addition to capacity building for VMMC and funding.

1.5 Problem Statement

In 2007, voluntary medical male circumcision was endorsed as one of the strategies of HIV prevention for countries with high prevalence of HIV and where the spread of HIV was predominantly heterosexual. This led to the launching of a national program of VMMC in Kenya, in November 2008. The demand generation of VMMC faces some unique challenges whereby men rarely seek for healthcare when compared to their female counterparts (Galdas, Cheater, & Marshall, 2005). VMMC requires men who are healthy to undergo circumcision which is associated with inconveniences, some degree of pain and discomfort but offers some degrees of HIV protection even though partial (WHO, 2011).

Many studies like (Omollo, 2014; Saye, 2012) have already been carried out on VMMC among the health stakeholders in Kenya. However, to the best of my knowledge, little has been documented about how non-circumcising communities conceptualize determinants of demand of VMMC among the male adults in Kenya.

There is also little empirical researched literature on the subject of VMMC in Kenya (Bailey, Muga, Poulussen, & Abicht, 2002). It is therefore necessary to carry out a study on determinants of demand for VMMC among the adults in Ugunja Sub-County, Siaya County.

There is now a general agreement among players for the strategic use of resources and opportunities for demand creation, while taking into account the new perspectives to increase VMMC uptake (AIDS Vaccine Advocacy Coalition, 2015). This calls for the need to understand the determinants of the VMMC demand. There is a dearth of information on the determinants of demand with the area having been given little research focus.

1.6 Research questions

1. What are the factors influencing demand for VMMC among male adults in Ugunja Sub-County?
2. Which policy recommendations can be developed from the study findings?

1.7 Objectives

I. To investigate the factors influencing demand for VMMC among male adults in Ugunja Sub-County.

II. To develop policy recommendations from the findings of the study.

1.8 Significance of the study

This study, seeks to investigate the determinants of demand for VMMC services among the male adults aged 25 years and above so as to avert the prevalence of HIV of Ugunja inhabitants. The outcome of this study will be of paramount value to all stakeholders in scaling up of VMMC programs which in turn will enhance the war against HIV/AIDS in Ugunja Sub-County.

Ugunja Sub County is part of Siaya County occupied by the Luo tribe of Kenya. Traditionally, the community did not practice male circumcision. It is also a region where HIV prevalence is high in Kenya at 15% (Ugunja Strategic Plan, 2013-2018). Even though great progress has been observed with regards to uptake of VMMC, more needs to be done to increase its demand so as to achieve the targeted 95% VMMC prevalence. One of the ways of doing this is by investigating the factors that determine demand for VMMC services. This will help the policy makers device ways of overcoming the challenges and barriers of increasing demand and uptake.

1.9 Organization of the study

The study is organized in four chapters: Chapter one entails the background of the study, statement of the problem, research questions, objectives of the study, significance of the study, and organization of the study.

Chapter two covers literature review, broken into themes and sub-themes according to the study objectives. The theoretical framework of the study has been discussed and the conceptual framework also brought out. The knowledge gap was identified and literature review summary given out.

Chapter three contains research methodology which includes the research design, the target population, sample size and sample selection, as well as methods of data collection. Under these methods, the procedure of data collection was described. The methods of data analysis were then identified. The chapter finally ends with the operational definition of variables and a statement of the ethical issues.

Chapter four discusses the analysis of the findings and finally the interpretation of the results inform of tables and figures as well as the discussions

Chapter five entails the summary of the findings, conclusions made and finally the recommendations made of the study findings. References and appendixes finally come at the end.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter covers theoretical and empirical literature on VMMC. The purpose of this chapter therefore is to build the foundation of this work and help select a framework fitting this study where the primary data would be interpreted.

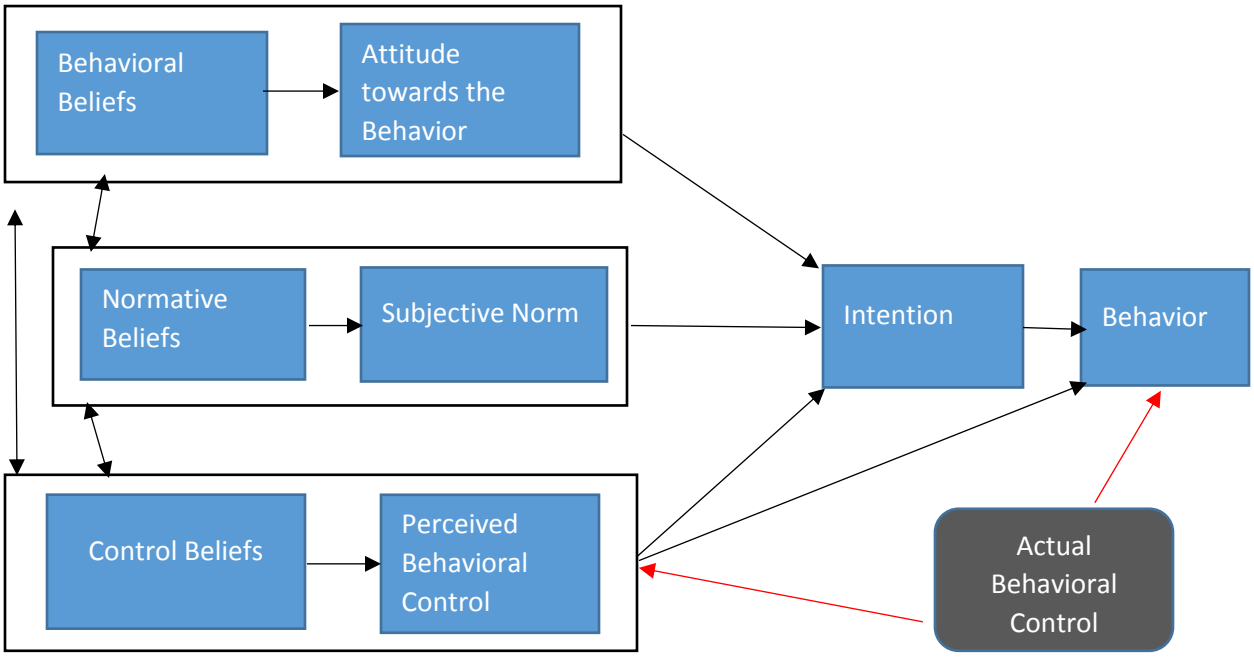
2.2 Theoretical Literature Review

2.2.1 Theory of Planned Behavior

This theory was established in 1980s as the Theory of Reasoned Action. It was used to make a prediction on an individual's intention to behave in a certain way at a specific place and time. Intentions of a behavior are influenced by attitude that the behavior will result in expected outcome (Conner & Sparks, 2005).

TPB has been applied widely in the health sector, being used to explain smoking, drinking and substance use among other health issues. The theory holds that achieving a given behavior is dependent on intent and behavior control. Three forms of belief consisting of normative, behavioral and control are well distinguished by this theory (Schwarzer, 2008).

Figure 1: Theory of Planned Behavior



Source: Own, adopted from Ajzen, I. (1991).

Figure 2 above is a TPB which has six main components which represents an individual's behavior control. Attitudes which refers to a person's evaluation on whether to favor a given behavior by considering the outcomes of performing it. Social norms refer to existing cultural code of conduct or behavior in a given group. They are considered normative in a particular group. Perceived power concerns with the perception on the presence of behavior facilitating or impeding factors. Perceived behavior control is influenced by the perceived power. Behavioral intention is the factors that motivate a certain behavior with the behavior being performed when the intend to perform it is greater. Subjective norms are the beliefs on people's approval or disapproval of the behavior. It is all about what other people think and their approval or disapproval of the behavior. Perceived behavioral control deals with an individual's perception on how easy or difficult it is to control a given behavior. This varies from one situation to another. Perceived behavioral control was added to this model last marking the shift of the theory from theory of reasoned action to TPB.

2.2.2 Grossman Model

The theory of health demand is underlined by four basic premises; health is required but does not have more value than other needs, health of individuals are determined at the margin by their health consumption inputs, the consumption of good things in life and health inputs consists of a cost that is positive to the consumer, and there are only limited resources at peoples' disposal (Grossman, 1972; Wagstaff, 1986). The first construct means that preferences are non-lexicographic: Expressing it using the assumption that there exists a quasiconcave utility function U(-), which is defined over health, H, and consumption C.

The second construct can also be shown using a 'health production function': health inputs, M, are changed into health according to the function H(M), where H, (0) > 0 and HI I (a) < 0. Whereby product margin of M is a technical knowledge function which is increasing: in medicine, technical knowledge therefore tends to increase H,(-), the well-educated are expected to have a large value of H,(.) when compared to those with low education level as the more educated are expected or assumed to have more knowledge on matters concerning health.

The budget constraint; P,C+P,M=Y can be used to express the last two premises. Where P and P represent the prices of C and M respectively and Y is the income (which is taken to be a proxy of resources command). A person selects M and C in order to maximize U(-) depending on budget constraint and production function of health.

At the optimum

U,(*)/U,(*) = 4pc = [Pm/H,(.)l/Pc where K is the cost of producing an extra health unit to the consumer (Wagstaff, 1986).

2.2.3 VMMC Demand Generation Framework

This is drawn from building blocks of other existing behavior change frameworks and theories. It is made up of the following components: intervention design; insight development; implementation & coordination to achieve scale; learning, measurement & evaluation. Intervention design, insight development and implementation and coordination are interdependent in nature and might overlap while learning, measurement and evaluation underpins all the other components as it is vital in all demand generation stages (Sgaier et al., 2015).

Insight development. It is a fundamental step in VMMC demand creation to conduct research so as to have understanding factors that influence VMMC demand and how to present VMMC to make it appealing to people in the general population and individuals. The theories of behavior change offer a way on people in need for VMMC services move the level of not requiring the services, to awareness, development of interest to the point of deciding to seek for the VMMC services. This is usually associated with some points of resistance and indecision (Montaño, Tshimanga, Hamilton, Gorn, & Kasprzyk, 2018).

Intervention design is a component which innovative solutions to create VMMC demand do not necessarily focus on the aspects of public health benefits alone, but also takes into consideration the cultural, emotional, cognitive and structural barriers that can act as hindrances to the decision of getting circumcised. For successful interventions, well designed and coordinated messages are applied using different Medias.

Component of implementation and coordination of achieving scale, is an effective demand creation activity which make use of a combination of high level intensity and coverage. It involves better implementation management providing better stakeholder coordination.

Component of measurement, learning, and evaluation involves the working environment where the public health interventions work is very complex and constantly evolving hence VMMC demand also changes. There is need for a well-designed and coordinated data collection on demand and the effectiveness of the demand creation programs. With the need for scale-up of VMMC

services, the global and country specific targets were developed with little or no consideration of the relationship between supply and demand. The main questions for VMMC intervention programmes are; what is considered reasonable demand with regards to the existing supply and the existing interest at a particular time, and what are the ways in which the demand will be measured? Having an established demand-based denominator is useful in determining and coming up with feasible targets and offers metrics which can be used to measure the effectiveness of given demand generation programs(Sgaier et al., 2015).

2.2.4 Young's Choice- making model

This model was developed basing on ethnographic studies conducted in Mexico on health services utilization. The model is used for making health care choices and was developed by Young in 1982. The model is made up of four components which are important for healthcare choice making First is the perceptions of gravity which involves a person's perceptions and that of his/her social networks on the severity of the illness. It is assumed that people and societies classify illnesses basing on their severity. Secondly is the home treatment knowledge where people will tend to turn to local home-based remedy they know if it is effective and only turn to professional healthcare as the second option. Lay referral is the basis of the knowledge about home remedy. Third is the faith in remedy and this is the person's belief in the efficacy of a given remedy and people will use it if they believe in its efficacy. Fourth is the accessibility of treatment whereby the cost and availability of the health services will influence a person's choice. Access was considered to be very important determinant of utilizing health care (Young & Garro, 1982).

The three factors influencing healthcare seeking which are common in healthcare utilization theories and models are culture, social networks and access to healthcare. Access means the ability to make use of health services and involves geographical location, physical and social resources, economics and the abundance of the health services (Sgaier et al., 2015).

On the other hand, culture has complexities. It means the beliefs, meanings, practices and values which are passed from one generation to the next by a process of enculturation. Culture plays a great role in influencing knowledge and beliefs on illness and their treatment and it is considered a barrier to healthcare. Social networks also have an influence on whether a person will take up health care or avoid it. Understanding these three factors is very important in understanding what

determines healthcare utilization even though there exist other factors that influence healthcare utilization (Garro, 1982)

The economic costs of healthcare are not just about payment for healthcare services but also entails other costs like transport costs and productive time lost. The poor or low-income earners suffer the most being unable to pay for the healthcare costs, unless they receive subsidies, hence rarely utilizing the healthcare services. There is also increase in inaccessibility of healthcare services where the facility distance is long and the transport cost high (Young & Garro, 1982). Social and physical resources also influence the accessibility of healthcare. People with serious injuries can be hampered from accessing healthcare by the geographical location (Garro, 1982).

2.3 Empirical Literature

Unreliable media information, not based on any evidence in some countries from Southern and East Africa have reported the presence of high demand for VMMC. (PlusNews, 2010; Thom, 2009). From focus discussion groups results in Malawi, carried out in the year 2003, it was reported that both men were willing to undergo circumcision if they were confidential, safe and affordable (Ngalande, Levy, Kapondo, & Bailey, 2006). However, the demand cannot be quantified from focus group discussions as is the case with media reports.

An approach that has been suggested for quantifying VMMC demand is the questioning of the uncircumcised men only if they will accept to be circumcised. The willingness of getting circumcised was reported to be 65 percent, with a range of 29-87 percent, from a meta-analysis of data from 13 African countries (Westercamp & Bailey, 2007). In a study in Malawi, the willingness to get circumcised in uncircumcised men was reported to be 37% (Bengo et al., 2010). However, the limitation of this method was that responses on being willing to get circumcised might not be a true reflection of the truth and behavior (Westercamp & Bailey, 2007).

The effectiveness of male circumcision scale-up is dependent on the profile of HIV risk of males who accept to undergo circumcision. Advantages of male circumcision are more in men with high HIV infection risks. Targeting this group first and having them circumcised increases the health benefits of the services scale-up. In a situation where those with low risk of HIV infection take up the circumcision services, then the cost-effective estimate currently presented will be considered to have overestimated the real benefits of the program scale-up. This is related to a debated

literature in health economics on asymmetric information and selection into health insurance (Arrow, 2001; Pauly, 1974). In this literature, Individuals with private information about their type of insurance who face high ex-ante risk of negative shocks are those who are likely to gain the most from purchasing insurance; this predicts a positive correlation between risk or adverse selection and insurance coverage (Rothschild & Stiglitz, 1976). If men who are most risk averse are more likely to select into insurance coverage, this predicts advantageous selection.

The demand for male circumcision has some parallels to this literature: heterogeneity in preferences as well as heterogeneity in risk may both be important for predicting the take up of male circumcision. In the end, the selection direction will have useful implications on the effectiveness of global VMMC roll-out (Sgaier et al., 2015).

The use and uptake of VMMC in adult men has been shown to be low (Herman-Roloff et al., 2011; Mwandi et al., 2011) and this calls for promotion of VMMC uptake in men especially those involved in HIV risk behaviors. With the risk of HIV infection being high in men older than 20 years (Kimanga et al., 2014) and those engaged in risky sexual behavior, scaling up VMMC among them is likely to result in reduced HIV incidence in the population. Male circumcision has been shown to be accepted in many communities in Africa that did not practice it previously (Westercamp & Bailey, 2007), but there are barriers on its uptake that still exist. There have been concerns that circumcision limits the ability of men to perform their daily activities and work for the days they will be healing hence loss of wages (Herman-Roloff et al., 2011).

Counting the number of male circumcisions in a region or country is the other method of quantifying male circumcision. Nearly 555,000 male circumcision were conducted in the prioritized countries by the end of 2010 for the purpose of HIV prevention which was nearly 2.7 percent of the target. Of these circumcisions conducted, half of them were done in Kenya representing 27% of national goal of Kenya (WHO, 2011). There are several different estimates for circumcisions conducted in Malawi. Malawi Ministry of Health reported 3,119 VMMC which were done in health facilities between 2008-2010, of which 1,296 were conducted in 2010 (WHO, 2011). Estimates of 2012 provided by the Ministry of Health officials showed that 5,000 men and more had undergone circumcision (IRIN Plus News, 2012).

However, circumcisions being conducted in clinical settings in Malawi are likely among groups that typically circumcise and merely act as a substitute for traditional circumcisions. The Malawi

Circumcision Situational Analysis collected records of circumcisions carried out in 2010 in health facilities showed that 14.8 percent of those circumcised were male adults with others being adolescents, infants and children, suggesting substitution from traditional circumcisions (Bengo et al., 2010).

In total, these numbers show a substantially low demand for circumcision services in male. However, rather than indicating a low demand, the low number of circumcisions may simply reflect limited supply. Information from the hospital and facility records and reports on the circumcised male numbers do not offer adequate information to show the number of males who chose to avoid being circumcised hence the denominator required to calculate demand is left out.

Another way to estimate demand is to examine take-up where supply is unconstrained. In 2010, a pilot program implemented near a hospital in Lilongwe offered free MMCs. A campaign for three months raised circumcision levels from around 5 men per month before the campaign, to 4 men weekly during the campaign period. The total number of circumcisions done were 99 (Jung, 2012). Extensive sensitization had been carried out in the local market using sessions of question and answer, brochures on MMCs, small dramas and songs for this uptake level to be achieved. It was not possible to determine the number of men who demanded for the VMMC services to be the number reached through the campaign. Although the number is likely to have been high, it was not provided.

In a study in Malawi, (Chinkhumba et al., 2014) measured the demand for VMMC services using a methodology where price subsidies were given to 1,600 uncircumcised men in varying amounts. Overall, 3.3 percent of them were circumcised over three months. Evidence of advantageous selection was observed: men who initially engaged in unsafe sex were significantly less likely to get circumcised. These men were also the least responsive to prices. The study suggested that 61 percent HIV infections were averted and a 42 percent raise in individual cost per HIV infection was averted as compared to previous cost-benefit estimates of male circumcision scale-up (Chinkhumba et al., 2014).

Not only is it difficult to quantify the willingness to get circumcised, it is also difficult to quantify the willingness to pay for circumcision. In a situational analysis of circumcision in Malawi, nearly two thirds of the male who were uncircumcised reported that they were willing to pay up to MK1,000 (US$7) for a circumcision; when asked on their willingness to pay for the services. This

data, however, tell us little about actual willingness to pay and how demand varies with price or by risk type (Bengo et al., 2010).

In another study that estimates willingness to pay carried out in Kenya; the authors found that circumcisions increased with the reduction in price from Ksh.250 to Ksh.100 (Bailey, Muga, Poulussen, & Abicht, 2002). The limitation of the study was that there was no random assignment of price making it difficult to associate increased circumcision with the price change. In contrast, this study measures the effects of exogenous variation in the price of circumcision.

2.4 Literature Review Overview

Theoretical literature review in this study is heavily anchored on Theory of Planned Behavior, Grossman Model, Framework for VMMC Demand Generation and Young's Choice-Making Model. A study by (Bailey, Muga, Poulussen, & Amp; Abicht, 2002) on estimates willingness to pay for VMMC carried out in Kenya, found out that circumcisions increased with the reduction in price from Ksh.250 to Ksh.100. Chinkhumba et al. (2014) measured the demand for VMMC services using a methodology where price subsidies were given to 1,600 uncircumcised men in varying amounts and the outcome were that, 3.3% were circumcised over 3 months, 61% HIV infections were averted and 42% raise in individual cost per HIV infection was averted as compared to previous cost-benefit estimates of male circumcision scale-up.

Ngalande, Levy, Kapondo, & Amp; Bailey (2006) studied 'Acceptability of Male Circumcision for Prevention of HIV/AIDS in Sub-Saharan Africa' from focus discussion groups results in Malawi, with 159 men and 159 women aged 16 to 80 years. It was reported that both groups were willing to undergo circumcision if they were confidential, safe and affordable. Bengo et al. (2010) also did 'The piloting program of male circumcision in Lilongwe, Malawi' and only 14.8% of those circumcised were adults with others being adolescents, infants and children, suggesting substitution from traditional circumcisions.

CHAPTER 3: METHODOLOGY

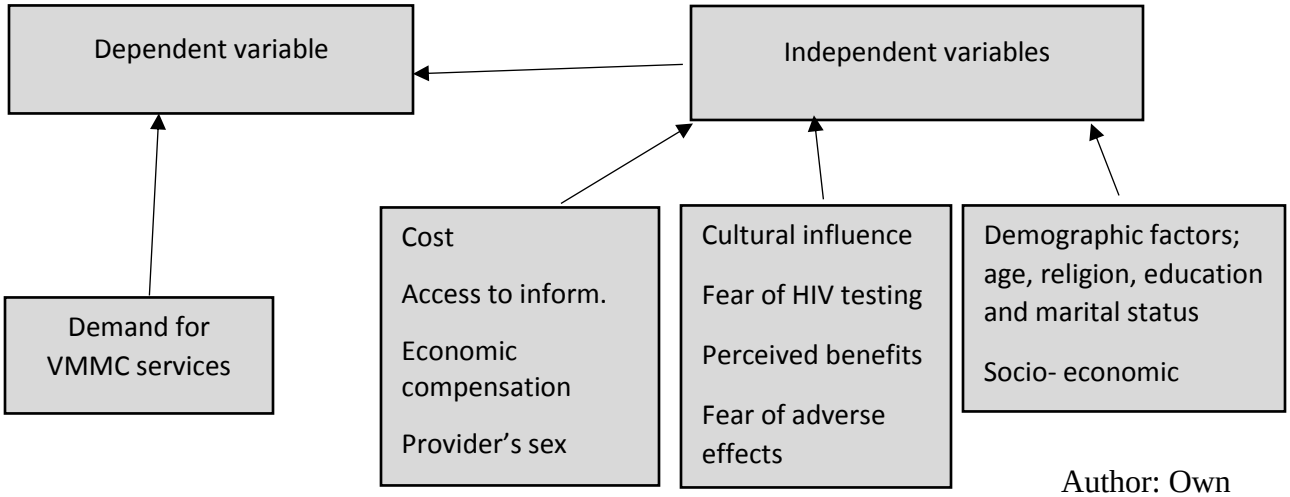
3.1 Introduction

This section presents the conceptual framework and the empirical model to be adopted in this study. Measurement of variables, the econometric approach and data sources are also presented.

3.2 Conceptual Framework

Social factors, knowledge, cultural practices and costs hypothetically influence the demand of VMMC services. Hence the dependent variable in the study was the demand of VMMC services while the independent variables on which the demand of VMMC services depends on were cultural practices, accessibility, demographic, cost, among other factors.

Figure 3: Conceptual Framework



Author: Own

Figure 3 above is a conceptual framework which illustrates the relationships between the independent variables under study and the dependent variable. The demand of VMMC by male adults was the dependent variable and was hypothesized to be determined by independent variables such as demographic factors like religion, status of marriage, age, and the levels of educational. It also depended on the availability of VMMC services, access to information, the distance of health facilities offering VMMC services, the provider's sex, economic compensation and the associated costs. Culture, Fear of HIV testing, the perceived benefits and fear of experiencing adverse effects was included as independent variables.

3.3 Econometric Model Specification

Basing on the theoretical framework, the determinants of demand for VMMC services in Kenya are expressed by the use of binary probit a regression model which normally lies on an interval between 0 or 1. This is a probabilistic distribution from whereby there is a probability of either seeking VMMC services or not.

An assumption therefore was made that the error term was to take a standard normal distribution. Since the latent variable y* cannot be observed, similarly Green, (2008) asserts that we cannot be able to estimate its variance. However, as shown in equation 1, there exists a linear relationship between the unobservable variable y* and explanatory variable (Xi) represented as:

1. $y^* = Xi\beta + \mu$………………………………………………………….. *k.*

Where,

y* is unobserved/latent variable (probability of seeking VMMC services)

Xi is a pool of independent variables (both demographic and socio-economic factors among others)

B are the coefficient to be estimated

μ is the random error term

From the above equation unobservable variable y* was linked to the observed binary variable y as expressed in equation 2;

2. $$y = \begin{cases} 1 \quad if \quad y^* > k \\ 0 \quad if \quad y^* \leq k \end{cases}$$ ……………………………………………………………

Where y is the probability of seeking VMMC services, 1 if one has utilized and 0 if otherwise; k represents the threshold beyond which one is said to be seeking VMMC services. Since the assumption of a probit model is a normal distribution with a mean zero and a variance of one, in order to interpret the results of the model, marginal effects was estimated in the study. This was to

reflect the change in the probability of experiencing the event that is seeking services form the providers given a unit change in any of the explanatory variables in specifying our model, a general multiple model to explore the relationship was represented as follows as shown in equation 3;

3. $y = \beta_s X_s + \varepsilon_i$.....

Where y is dependent variable (demand for VMMC services) as shown in the theoretical framework while Xs are the explanatory variables; demographic factors, socio economic among other moderating factors.

3.4 Study Location

The study was executed in Ugunja Sub-County located in Siaya County. Siaya County is located in the former Nyanza province of the southwestern part of Kenya. The county measures approximately 2,496.1km^2. From the 2009 census results, 842, 304 was the county's total population. Data by Kenya Health Information System stated that in the year 2015, 175, 754 people had undergone HIV testing in the county and people living with HIV who were on ARV treatment were 48,782. The total area of Ugunja Sub-county is approximately 198.8 sq.km. The sub county is divided into two administrative divisions namely; Ugunja Sigomere. The divisions are divided into 4 locations and 21 sub-locations. It has 3 county wards namely: Sidindi, Sigomre and Ugunja.

3.5 Study design

Analytical cross-sectional study design was adopted in this study.

3.6 Sampling

The study population consisted all males between 25- 49 years in Ugunja Sub-County. Fischer's formula was used in calculation of sample size. The P of the study was determined from a study done by (Westercamp & Bailey, 2007) where median willingness to get circumcised in Africa was reported to be 65%. The required number of sample size was therefore determined using the formula shown below:

$$n = \frac{z^2 pq}{d^2}$$

Whereby:

n = sample size desired

z = the value confidence level of 1.96 (95%) in the normal distribution table.

p = this is the proportion of willingness to get circumcised (0.65)

q = 1 – p

d = the amount of discrepancy tolerated on q, 0.05

1.96^2 x 0.65 x 0.35/ 0.05^2 = 349.6

Hence, a sample size of 350 will be used in the study.

Multi-stage sampling frame was used in the study. Ugunja sub-county was randomly selected as the representative sub-county. Stratification of the sub-county male population into respective divisions. (Ugunja & Sigomere). The number of respondents per division were stratified into the four locations from which the sample will be randomly selected using simple random sampling. The starting household in in each location was randomly selected.

3.7 Eligibility Criteria

The inclusion criteria were males between the ages of 25 - 49 years who consent to the study while the exclusion criteria were males who do not consent to participate.

3.8 Data Source, Collection, Analysis and Presentation

This primary data was used in this study. The secondary data, or information got from already published sources (Wrenn *et al* 2006), was accessed from government information, journals and other publications both online and through libraries. The primary phase was shaped by information collected in the secondary phase.

A semi-structured standardized questionnaire was used for data collection. The questionnaire was divided into two sections. Section A was on the demographic characteristics of the respondent while section B covered questions on VMMC demand and its factors.

The collected data was entered into STATA for analysis. Descriptive and summary statistics was used to summarize the data using measures of central tendency, figures and tables. Inferential analysis was used to determine statistically significant factors that determine the demand for VMMC. Regression modeling was used with a p value of 0.05 considered statistically significant. The analyzed data was then presented in form of tables, figures including pie charts, statistical models and in prose form.

3.9 Measurement of Variables

Variable	Measurement	Expected Sign
Dependent Variable		
Demand for VMMC services		Utilization
Independent Variables		
Age	Age in years	Uncertain
Religion	1. Christian 2. Islam 3. Others	Indeterminate
Marital status	1- Married 2- Not married 3- Otherwise	Indeterminate
Source of Income	1- Formal Employment 2- Informal employment 3- Otherwise	Positive
Education	1- Primary 2- Secondary 3- Tertiary	Uncertain
Cost and Accessibility	1- Affordable 0- Otherwise	Positive
Access to information	1- Readily available 0- Otherwise	Positive
Cultural Influence	1- Yes 0- No	Indeterminate
Provider's gender	0- Male 0- Female	Positive
Perceived benefits	1-Yes 0-No	Positive
Fear of adverse effects	1-Yes 0-No	Negative
Fear of HIV testing	1-Yes 0-No	Negative
Economic compensation	1-Yes 0-No	Positive

3.10 Diagnostic Tests

These are statistical tests done on data to get information on how the study might be modeled. The diagnostic tests were therefore done to ensure stability and the statistical appropriateness of the model being used. The pre-estimation tests used were; Normality Test, Heteroscedacity Test and Multicolliearity Test.

3.11 Ethical considerations

According to Polit and Beck (2010), ethical issues must be addressed by researchers who carry out research studies in which human subjects are involved. Approval for this study was acquired from the relevant authorities before its commencement. Both oral and written consent was acquired from the individual study participants after explaining to them the nature and purpose of the study. Ethical principles of autonomy, confidentiality and respect of persons was adhered to. No participant was coerced to participate in the study and their confidentiality was protected.

CHAPTER 4: ANALYSIS AND INTERPRETATION OF RESULTS

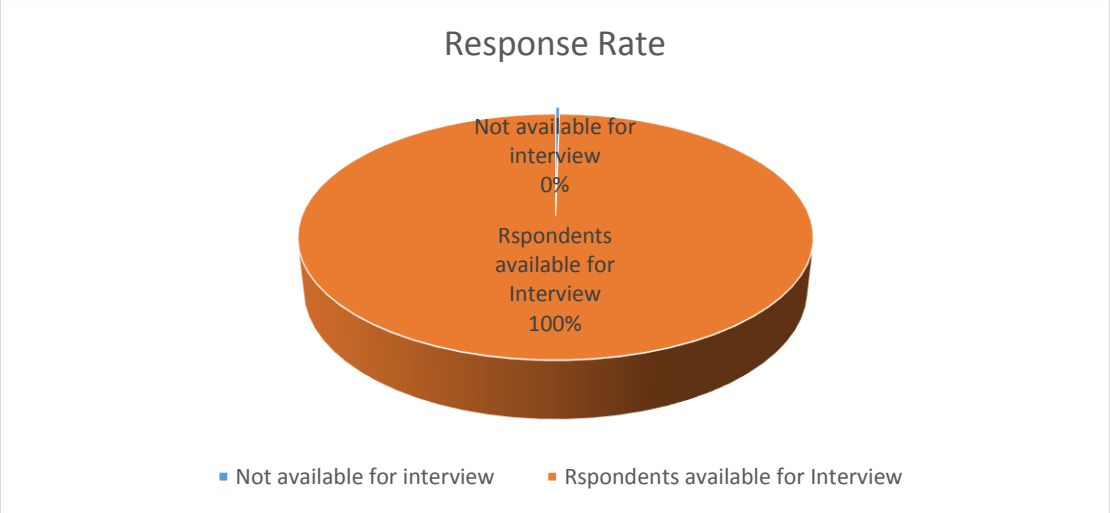
4.1 Introduction

This chapter discusses the analysis of the findings and the interpretation of the results inform of tables and figures as well as the discussions.

4.2 Descriptive statistic

The study's aim was to establish the determinants of demand for VMMC among male adults in Ugunja Sub-County, Siaya County. In order to answer the set research questions, a primary data was collected using a Multi-stage sampling frame in which Ugunja sub-county was randomly selected as the representative sub-county. Then Stratification of the sub-county male population into respective divisions was done. The study targeted a sample size of 350 respondents. However, only 349 respondents representing 99.7% were available for interview while the remaining 0.3% respondents declined to be interviewed for personal reasons (See figure 4.0). According to Mugenda and Mugenda (2003) and Dixon (2012), this study's response rate is acceptable since it was above 50%, threshold for adequate response rate. Thus this response rate can provide a basis for statistical analysis as presented in subsequent subsections.

Figure 4: Response rate



The descriptive statistic, in which maximum, minimum, mean and standard deviation was computed is shown in Table 1 and more information in Appendix A1.

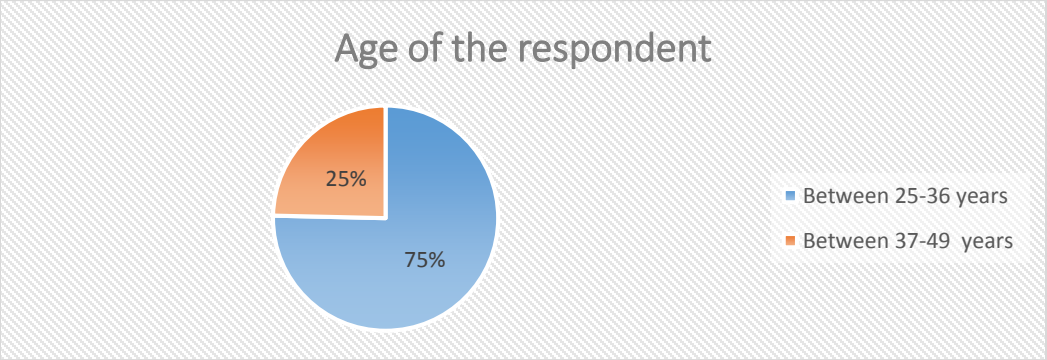
Table 1: Descriptive statistic

Variable	Obs	Mean	Std deviation	Min	Max
Religion	349	1.200573	.53056	1	3
Education_status	349	2.203438	.7041663	1	3
Age bracket	349	1.246418	.4315437	1	2
Income sources	349	1.547278	.6662425	1	3
Heard_VMMC	349	1.08596	.2807073	0	1
Access_Info	319	1.203762	.4034267	0	1
Demand_VMMC	349	.3180516	.4663883	0	1
Distance_VMMC	342	1.122807	.3286965	0	1
Economic_	342	1.102339	.3035379	0	1
Cost	238	1.243697	.430217	0	1
Culture	238	1.789916	.4082266	0	1

Age of the Respondents

From Table 1, on average, majority of the respondents of age bracket of between 25-36 years old (75.36%) while those between 37-49 years old were the minority (24.64%). See figure 5

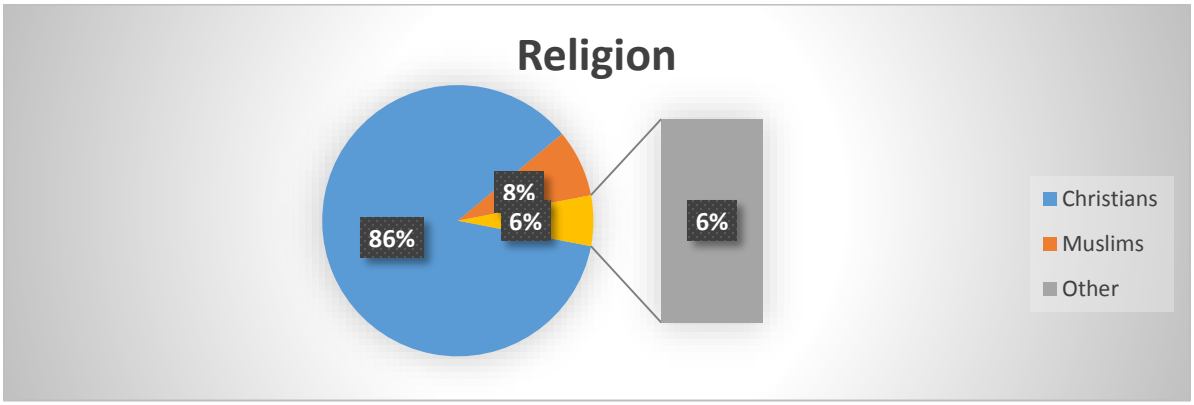
Figure 5: Age of the Respondents



Religion of the Respondents

From Table 1, we also observed that in terms of faith of the respondents, Christians were the majority (85.96%) followed by the Muslims (8.02%). See Figure 6

Figure 6: Religion of the Respondent



Educational level

Further, our study revealed that a good number of the participants had acquired secondary education (46.42%) while a minority had primary level of education (16.62%). See Figure 7

Figure 7: Educational status of the Respondent

```
. tab education_level

education_l
      evel |      Freq.     Percent        Cum.
-----------+-----------------------------------
   Primary |         58       16.62       16.62
 Secondary |        162       46.42       63.04
  Tertiary |        129       36.96      100.00
-----------+-----------------------------------
     Total |        349      100.00
```

Access to information on VMMC

As regard to access to information on VMMC, about 79.62% of the respondents said that the information was readily available while 20.38% of them said otherwise. See figure 8

Figure 8: Access to information on VMMC

```
. tab Access_nformation

Access_nformation |      Freq.     Percent        Cum.
------------------+-----------------------------------
Readily_available |        254       79.62       79.62
        Otherwise |         65       20.38      100.00
------------------+-----------------------------------
            Total |        319      100.00
```

Demand for VMMC

We also found out that only 31.82% of the respondents had demanded for VMMC services while 68.19% of them had not demanded for the services. See figure 9 below.

Figure 9: Demand for VMMC

```
. tab demand_vmmc

Demand_vmmc |      Freq.     Percent        Cum.
------------+-----------------------------------
         No |        238       68.19       68.19
        Yes |        111       31.81      100.00
------------+-----------------------------------
      Total |        349      100.00
```

Equally 56.45% of the respondents believed that VMMC had medical benefits while 43.55% of them did not. Lastly, about 71.92% of the respondents believed that VMMC have adverse effects on the circumcised person.

4.3 Pre-estimation Tests

4.3.1 Normality Test

For this test, Shapiro Wilk test was used. According to this test, the **H0**: The variable is normal and **Ha**: The variable is not normal. We use the P-Values to make our conclusion. If the P-values are smaller than the crical values, then we conclude that the variable id not normal, otherwise it is normal. The Table 4.1 shows the result from our regression

Table 2: Normality test

Variable	Obs	W	V	z	Prob>z	Status
Access_information	319	0.98105	4.262	3.413	0.00032	Non-normal
Income_source	349	0.98580	3.462	2.936	0.00166	Non-normal
Income_range	349	0.99310	1.682	1.229	0.10957	Normal
Marital_Status	349	0.95592	10.743	5.614	0.00000	Non-normal
Age_bracket	349	0.98812	2.896	2.514	0.00597	Normal
Educational_level	349	0.99832	0.409	-2.116	0.98283	Non-normal
Religion	349	0.92550	18.157	6.854	0.00000	Non_normal
VMMC_medical_benefit	349	0.99883	0.285	-2.965	0.99849	Normal
VMMC_adverse_effect	349	0.99136	2.105	1.760	0.03920	Non_normal
VMMC_protect_hiv	349	0.99912	0.213	-3.653	0.99987	Normal

From Table 2, we observed that only four variables were normal (Income range, age bracket, VMMC_medical benefit and VMMC_protect_Hiv) the rest of the variables were non-normal. For stata output see Appendix A3

4.3.2 Heteroscedasticity Test

To test for the presence of heteroscedasticity, our study utilized Breusch-Pagan test. According to this test

H0: Constant variance (Homoscedasticity)

Ha: Varying Variance (Heteroscedasticity)

The result in Appendix A3 shows that the P-Value = 0.000 implies that we reject the null hypothesis of constant variance and conclude that there is presence of heteroscedasticity. Since the problem associated with presence of heteroscedasticity is inefficient regression result, we solve this problem using robust standard errors.

4.3.3 Multicollinearity Test

To test for multicollinearity, we used VIF method. According to this method, any variable with more than a VIF of 10 or overall a mean of VIF greater than 10 implies that variables in the dataset

are linearly dependent and cannot be relied upon to produced unbiased result. The results are shown in Appendix A3. From the result, all variables were found to have VIF of less than 10. We thus conclude that multicollinearity is not a serious problem in data set.

4.4 Estimation Results

4.4.1 Probit Regression

Since our dependent variable was a binary outcome (that is assuming 1 if we observed demand for VMMC among male adults in Ugunja Sub-County, 0 otherwise), we had two modeling options: either a binary logit model or a binary probit model. We choose a binary probit model since the error terms were found to be normally distributed against the logistic distribution of the error term that the binary logit model is based on. The results are presented in Table 3 and stata outcome is shown in Appendix A4.

Table 3: Probit regression analysis

Variable	Coef.	Robust Std. error	Z	P>z
Access_nformation	-.7863102**	.2755724	-2.85	0.004
Income_range				
• Below KShs.10000	Base category			
• Above KShs.10000	.901692***	.2367212	3.81	0.000
Income_sources				
• Formal	Base category			
• Informal	.8271992***	.2444321	3.38	0.001
• Others	.9206872*	.4784326	1.92	0.054
Marital status				
• Married	Base category			
• Not married	-.9917046***	.3117995	-3.18	0.001
• Otherwise	-1.021612	.844854	-1.21	0.227
age_bracket				
• Between 25-36 yrs	Base category			
• Between 37-49 yrs	-.443826	.3039426	-1.46	0.144
education_level				
Primary	Base category			
Secondary	-.5884182	.3282517	-1.79	0.073
Tertiary	-.9642032	.3405708	-2.83	0.005
Religion				
Christian				
Islam	.541735	.2961893	1.83	0.067
Others	0 (empty)			
vmmc_medical_benefits	-.6179755	.5140963	-1.20	0.229
vmmc_protects_hiv_sti	-2.316739**	.8038876	-2.88	0.004
vmmc_adverse_effects	.217625	.2366774	0.92	0.358
_cons	4.395263***	.9367075	4.69	0.000

From the regression analysis in Table 3, the study revealed that seven variables were influencing demand for VMMC among male adults in Ugunja Sub-County (Income source, income range, religion, accessibility of information, marital status, educational level as well as perception on Male Circumcision offers partial protection against HIV and other STIs).

For instance, those in income range above KES 10,000 were found to have a positive significant impact on influencing the decision to demand for VMMC among male adults in Ugunja Sub-County as compared to those in income rage below KES 10,000.

Equally, if the income source was either in the category formal or others raised the expectations of demanding for VMMC among male adults in Ugunja Sub-County as compared to formal income sources. We also found out that, as compared to being a Christian faithful, an Islam faithful increased the expectations of demanding for VMMC among male adults in Ugunja Sub-County.

However, our study revealed that information readily available reduced the expectations of demanding for VMMC among male adults in Ugunja Sub-County. Equally, compared to married men, being not married reduced the expectations of demanding for VMMC among male adults in Ugunja Sub-County. We also observed that compared to primary education, having a secondary or tertiary education reduced the expectations of observing demand for VMMC among male adults in Ugunja Sub-County.

Lastly, the perception on whether male circumcision gives partial protection against HIV and other STIs reduced the expectation of observing demand for VMMC among male adults in Ugunja Sub-County. Since the coefficients of probit model cannot be interpreted directly, we computed the marginal effects. See Table 4.

4.4.2 Marginal effects

Table 4: Marginal effects

Variable	Coef.	Robust Std. Error	Z	P>z
Access_nformation	-.1279831***	.0405326	-3.16	0.002
Income_range				
• Below KShs.10000	Base level			
• Above KShs.10000	.1636135***	.0444693	3.68	0.000
Income_sources				
• Formal	Base level			
• Informal	.140389***	.0401547	3.50	0.000
• Others	.1550364**	.0728853	2.13	0.033
Marital status				
• Married	Base level			
• Not married	-.1727477***	.0524263	-3.30	0.001
• Otherwise	-.178037	.1479798	-1.20	0.229
age_bracket				
• Between 25-36 yrs	Base level			
• Between 37-49 yrs	-.0709243	.0477	-1.49	0.137
education_level				
Primary	Base level			
Secondary	-.0904765**	.046056	-1.96	0.049
Tertiary	-.1532769***	.0482016	-3.18	0.001
Religion				
Christian	Base level			
Islam	.0873517*	.0471283	1.85	0.064
Others	(not estimable)			
vmmc_medical_benefits	-.1005842	.0842995	-1.19	0.233
vmmc_protects_hiv_sti	-.377082***	.1203018	-3.13	0.002
vmmc_adverse_effects	.0354215	.0383524	0.92	0.356

Analysis of the regression in Table 4 revealed that holding all other factors constant, belonging to an income range above KES 10,000 increased the likelihood of influencing the demand for VMMC among male adults in Ugunja Sub-County by 16.36%. Equally, if all factors were held constant, having an income source from either formal or others increased the likelihood of demanding for VMMC among male adults in Ugunja Sub-County by 14.04% and 15.503% respectively. Further, the study revealed that being a Muslim faithful increased the probability of demanding for VMMC among male adults in Ugunja Sub-County by 0.87% when all other factors were held constant.

We also found out that, when all other factors were hold constant, having information readily available reduced the likelihood of demanding for VMMC among male adults in Ugunja Sub-County by 12.79%. Equally, being not married reduced the likelihood of demanding for VMMC among male adults in Ugunja Sub-County by 17.27% holding all other factors constant. We also observed that compared to primary education, having a secondary or tertiary education reduced the expectations of observing demand for VMMC among male adults in Ugunja Sub-County by 0.9% and 15.32% respectively.

Lastly, the perception on whether male circumcision offers partial protection against HIV and other STIs reduced the likelihood of observing demand for VMMC among male adults in Ugunja Sub-County by 37.71% when all other factors were held constant.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENATIONS

5.1 Introduction

This chapter provides the summary of discussion of the results in chapter 4 as well as the conclusions against the backdrop of the main variables of the study. It will also include recommendations on policy and areas requiring further research.

5.2 Summary of the Findings

The main aim of the study was to establish the determinants of demand for VMMC among male adults in Ugunja Sub-County. Specific objectives were; to evaluate the factors influencing demand for VMMC among male adults in Ugunja Sub-County and finally develop policy recommendations from the findings of the study.

350 respondents were the sample size targeted in the study. However, only 349 respondents representing 99.7% were available for interview, this was an acceptable response rate according to Dixon (2012). From the regression analysis, the study revealed that income source, income range, religion, accessibility of information, marital status, educational level as well as perception on male circumcision reducing the chances of getting HIV and other STIs were influencing demand for VMMC among male adults in Ugunja Sub-County.

For instance, those in high income range were found to be positively significant impact on influencing the decision to demand for VMMC among male adults in Ugunja Sub-County as compared to those in low income rage. This reflected a study done by Ngalande, Levy, Kapando & Bailey (2006) who reported that willingness to accept male circumcision was based on affordability. Equally, if the income source was either in the category formal or others, raised the expectations of demanding for VMMC among male adults in Ugunja Sub-County as compared to formal income sources. We also found out that, as compared to being a Christian faithful, an Islam faithful increased the expectations of demanding for VMMC among male adults in Ugunja Sub-County.

From the findings, only 31 percent of male adults had demanded for VMMC services. This is supported by a study done by Herman–Roloff et al (2011) on the use of uptake of VMMC in adult men which reported to be extremely low.

However, our study revealed that information readily available reduced the expectations of demanding for VMMC among male adults in Ugunja Sub-County. Equally, compared to married men, being not married reduced the expectations of demanding for VMMC among male adults in Ugunja Sub-County. We also observed that having a secondary or tertiary education reduced the expectations of observing demand for VMMC among male adults in Ugunja Sub-County.

The perception on whether male circumcision offers partial protection against HIV and other STIs reduced the expectation of observing demand for VMMC among male adults in Ugunja Sub-County. This contradicts a study done by Chinkhumba et al (2014) on HIV reduction.

Probit model was used which showed that most of the factors had a positive effect on the determinants of demand for VMMC services by male adults in Ugunja Sub-County. However, its only access to information, income range, sources of income, marital status, benefits of VMMC against protection of HIV/STIs and economic compensation that were significant in determining the demand of VMMC by male adults in Ugunja Sub-County.

5.3 Conclusions

Relying on the findings, a number of conclusions can be drawn which can therefore be used in informing policy recommendations. Demographic characteristics played a major role in determining demand of VMMC services. The findings pointed out that male adults not married are more likely to demand for VMMC as opposed to those married.

It is evident that accessibility to VMMC information is likely to increase the demand of the service among the male adults. The same population are more likely to demand for VMMC if their income range is above KShs. 10,000. This would translate to indirect affordability which means that male adults with high income are more likely to access the services since they are able to meet the costs associated with it.

As opposed to formal employment, the findings indicated that male adults who are in informal employment and other means of getting income, are more placed to demand for VMMC services probably due to their flexibility of their schedule. Most men agree that male circumcision offers partial protection against HIV and STIs which in turn influence positively their demand for the VMMC.

Finally, on provision of economic incentives, most male adults in Ugunja Sub-County are likely increase the demand for VMMC services. This is heavily anchored in a study done by Mwandi et al (2011) which states that circumcision limits the ability of men to perform their daily activities and work for the days they will be healing hence loss of wages.

5.4 Policy Recommendations

Ministry of Health and County Health Services should ensure that VMMC services are packaged to cater for everyone irrespective of their income range or source of income.

National programs and those of counties should create a coordinated friendly services on VMMC in every health facility specifically tailored to promote and encourage adult men especially those who are not married to utilize these services for the benefits accrued to it.

All stakeholders in VMMC should ensure that latest technologies of social media are employed disseminating the benefits of VMMC against protection of HIV/STIs to all men.

Ministry of Health in collaboration with County Governments, should ensure that access to VMMC information should be made readily available, a topic which can then be introduced and incorporated in school syllabuses. There is need to disseminate VMMC information to everyone through public forums, social media and other readily available media to achieve the creation of demand.

All the stakeholders involved should consider budgeting for economic compensation to cover for the loss of time and cost incurred seeking the VMMC services. This will in turn encourage more men to turn up for the program without worrying for their daily income.

5.5 Fields recommended for further Research

This study recommends the following domains for further research:

i. Impact of economic compensation on the demand for VMMC
ii. Influence of women partners on the demand for VMMC
iii. Service provider's sex and the effect on demand for VMMC

REFERENCES

AIDS Vaccine Advocacy Coalition. (2015). *Clearinghouse on Male Circumcision for HIV Prevention. Eastern and Southern Africa Regional Meeting on Demand Creation for Voluntary Medical Male Circumcision.*

Arrow, K. J. (2001). Uncertainty and The Welfare Economics of Medical Care. *Journal of Health Politics, Policy and Law*, *26*(5), 851–883. https://doi.org/10.1215/03616878-26-5-851

Auvert, B., Taljaard, D., Lagarde, E., Sobngwi-Tambekou, J., Sitta, R., & Puren, A. (2005). Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: The ANRS 1265 trial. *PLoS Medicine*, *2*(11), 1112–1122. https://doi.org/10.1371/journal.pmed.0020298

Bailey, R. C., Moses, S., Parker, C. B., Agot, K., Maclean, I., Krieger, J. N., … Ndinya-Achola, J. O. (2007). Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial. *The Lancet*, *369*(9562), 643–656. https://doi.org/10.1016/S0140-6736(07)60312-2

Bailey, R. C., Muga, R., Poulussen, R., & Abicht, H. (2002). The acceptability of male circumcision to reduce HIV infections in Nyanza Province, Kenya. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV*, *14*(1), 27–40. https://doi.org/10.1080/09540120220097919

Bengo, J. M., Chalulu, K., Chinkhumba, J., Kazembe, L., Maleta, K. M., Masiye, F., & Mathanga, D. (2010). *Situation analysis of male circumcision in Malawi*. *malecircumcision.org*. Retrieved from https://www.malecircumcision.org/sites/default/files/document_library/Malawi_Male_Circumcision_Situation_Analysis_Report_2010-04-21.pdf

Chinkhumba, J., Godlonton, S., & Thornton, R. (2014). The demand for medical male circumcision. *American Economic Journal: Applied Economics*, *6*(2), 152–177. https://doi.org/10.1257/app.6.2.152

Conner, M., & Sparks, P. (2005). Theory of planned behaviour and health behaviour. In

Predicting Health Behavior (pp. 171–222). Retrieved from http://soh.iums.ac.ir/uploads/32_282_44_13.pdf#page=187

Galdas, P. M., Cheater, F., & Marshall, P. (2005, March). Men and health help-seeking behaviour: Literature review. *Journal of Advanced Nursing*. https://doi.org/10.1111/j.1365-2648.2004.03331.x

Garro, L. Y. (1982). Introduction. The ethnography of health care decisions. *Social Science and Medicine*, *16*(16), 1451–1452. https://doi.org/10.1016/0277-9536(82)90059-4

Ghaemi, S. N., Ostacher, M. M., El-Mallakh, R. S., Borrelli, D., Baldassano, C. F., Kelley, M. E., … Baldessarini, R. J. (2010). Antidepressant discontinuation in bipolar depression: a Systematic Treatment Enhancement Program for Bipolar Disorder (STEP-BD) randomized clinical trial of long-term effectiveness and safety. *The Journal of Clinical Psychiatry*, *71*(4), 372–380. https://doi.org/10.4088/JCP.08m04909gre [doi]

Gray, R. H., Kigozi, G., Serwadda, D., Makumbi, F., Watya, S., Nalugoda, F., … Wawer, M. J. (2007). Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. *Lancet*, *369*(9562), 657–666. https://doi.org/10.1016/S0140-6736(07)60313-4

Gray, R. H., Serwadda, D., Kong, X., Makumbi, F., Kigozi, G., Gravitt, P. E., … Wawer, M. J. (2010). Male Circumcision Decreases Acquisition and Increases Clearance of High- Risk Human Papillomavirus in HIV- Negative Men: A Randomized Trial in Rakai, Uganda. *The Journal of Infectious Diseases*, *201*(10), 1455–1462. https://doi.org/10.1086/652184

Gray, R. H., Wawer, M. J., & Kigozi, G. (2013). Programme science research on medical male circumcision scale-up in sub-Saharan Africa. *Sexually Transmitted Infections*, *89*(5), 345–349. https://doi.org/10.1136/sextrans-2012-050595 [doi]

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*, *80*(2), 223–255. https://doi.org/10.1086/259880

Herman-Roloff, A., Llewellyn, E., Obiero, W., Agot, K., Ndinya-Achola, J., Muraguri, N., & Bailey, R. C. (2011). Implementing voluntary medical male circumcision for HIV prevention in Nyanza Province, Kenya: Lessons learned during the first year. *PLoS ONE*, *6*(4), e18299. https://doi.org/10.1371/journal.pone.0018299

IRIN Plus News. (2012). Government finally moves on Male Circumcision.

Jung, J. (2012). Male Circumcision Pilot Program in Lilongwe , Malawi. *The Journal of Sustainable Development*, *7*(1), 103–114. Retrieved from https://www.jstor.org/stable/26167840

Kenya Ministry of Health. (2015). *National Voluntary Medical Male Circumcision Strategy 2014/15 - 2018/19'[pdf]*.

Kimanga, D. O., Ogola, S., Umuro, M., Ng'ang'a, A., Kimondo, L., Murithi, P., … Kim, A. A. (2014). Prevalence and incidence of HIV infection, trends, and risk factors among persons aged 15-64 years in Kenya: results from a nationally representative study. *Journal of Acquired Immune Deficiency Syndrome*, *66 Supplem*, S13-26. https://doi.org/10.1097/qai.0000000000000124

Montaño, D. E., Tshimanga, M., Hamilton, D. T., Gorn, G., & Kasprzyk, D. (2018). Evidence-Based Identification of Key Beliefs Explaining Infant Male Circumcision Motivation Among Expectant Parents in Zimbabwe: Targets for Behavior Change Messaging. *AIDS and Behavior*, *22*(2), 479–496. https://doi.org/10.1007/s10461-017-1796-4

Mugavero, M. J., Lin, H., Willig, J. H., Westfall, A. O., Ulett, K. B., Routman, J. S., … Allison, J. J. (2009). Missed Visits and Mortality among Patients Establishing Initial Outpatient HIV Treatment. *Clinical Infectious Diseases*, *48*(2), 248–256. https://doi.org/10.1086/595705

Mwandi, Z., Murphy, A., Reed, J., Chesang, K., Njeuhmeli, E., Agot, K., … Bock, N. (2011). Voluntary medical male circumcision: Translating research into the rapid expansion of services in Kenya, 2008-2011. *PLoS Medicine*, *8*(11), e1001130. https://doi.org/10.1371/journal.pmed.1001130

Ngalande, R. C., Levy, J., Kapondo, C. P. N., & Bailey, R. C. (2006). Acceptability of male circumcision for prevention of HIV infection in Malawi. *AIDS and Behavior*, *10*(4), 377–385. https://doi.org/10.1007/s10461-006-9076-8

Njeuhmeli, E., Forsythe, S., Reed, J., Opuni, M., Bollinger, L., Heard, N., … Hankins, C. (2011). Voluntary medical male circumcision: Modeling the impact and cost of expanding male circumcision for HIV prevention in Eastern and Southern Africa. *PLoS Medicine*, *8*(11),

e1001132. https://doi.org/10.1371/journal.pmed.1001132

Pauly, M. V. (1974). Overinsurance and Public Provision of Insurance: The Roles of Moral Hazard and Adverse Selection. *The Quarterly Journal of Economics*, *88*(1), 44. https://doi.org/10.2307/1881793

PlusNews. (2010). Strong turnout as male circumcision kicks off in the north. Retrieved from http://www.irinnews.org/report.aspx?ReportID=91433

Rothschild, M., & Stiglitz, J. (1976). Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information. *The Quarterly Journal of Economics*, *90*(4), 629. https://doi.org/10.2307/1885326

Schwarzer, R. (2008). Modeling Health Behavior Change: How to Predict and Modify the Adoption and Maintenance of Health Behaviors. *Applied Psychology*, *57*(1), 1–29. https://doi.org/10.1111/j.1464-0597.2007.00325.x

Serwadda, D., Wawer, M. J., Makumbi, F., Kong, X., Kigozi, G., Gravitt, P., … Gray, R. H. (2010). Circumcision of HIV- Infected Men: Effects on High- Risk Human Papillomavirus Infections in a Randomized Trial in Rakai, Uganda. *The Journal of Infectious Diseases*, *201*(10), 1463–1469. https://doi.org/10.1086/652185

Sgaier, S. K., Baer, J., Rutz, D. C., Njeuhmeli, E., Seifert-Ahanda, K., Basinga, P., … Laube, C. (2015). Toward a systematic approach to generating demand for voluntary medical male circumcision: insights and results from field studies. *Glob Health Sci Pract*, *3*(2), 209–229. https://doi.org/10.9745/ghsp-d-15-00020

Sgaier, S. K., Reed, J. B., Thomas, A., & Njeuhmeli, E. (2014). Achieving the HIV Prevention Impact of Voluntary Medical Male Circumcision: Lessons and Challenges for Managing Programs. *PLoS Medicine*, *11*(5), e1001641. https://doi.org/10.1371/journal.pmed.1001641

SHARE. (2015). *Kenya male circumcision program surpasses target by 100000.*

Thirumurthy, H., Masters, S. H., Rao, S., Bronson, M. A., Lanham, M., Omanga, E., … Agot, K. (2014). Effect of providing conditional economic compensation on uptake of voluntary medical male circumcision in Kenya a randomized clinical trial. *JAMA - Journal of the American Medical Association*, *312*(7), 703–711. https://doi.org/10.1001/jama.2014.9087

Thom. (2009). South Africa: High Demand for Male Circumcision. Retrieved from http://allafrica.com/stories/200907220206.html

Tobian, A. A. R., Serwadda, D., Quinn, T. C., Kigozi, G., Gravitt, P. E., Laeyendecker, O., … Gray, R. H. (2009). Male Circumcision for the Prevention of HSV-2 and HPV Infections and Syphilis. *New England Journal of Medicine*, *360*(13), 1298–1309. https://doi.org/10.1056/NEJMoa0802556

Wagstaff, A. (1986). THE DEMAND FOR HEALTH: A SIMPLIFIED GROSSMAN MODEL. *Bulletin of Economic Research*, *38*(1), 93–95. https://doi.org/10.1111/j.1467-8586.1986.tb00206.x

Wawer, M. J., Tobian, A. A., Kigozi, G., Kong, X., Gravitt, P. E., Serwadda, D., … Gray, R. H. (2011). Effect of circumcision of HIV-negative men on transmission of human papillomavirus to HIV-negative women: A randomised trial in Rakai, Uganda. *The Lancet*, *377*(9761), 209–218. https://doi.org/10.1016/S0140-6736(10)61967-8

Westercamp, N., & Bailey, R. C. (2007). Acceptability of male circumcision for prevention of HIV/AIDS in sub-Saharan Africa: A review. *AIDS and Behavior*, *11*(3), 341–355. https://doi.org/10.1007/s10461-006-9169-4

WHO. (2011). *Joint United Nations Programme on HIV/AIDS (2010) Progress in male circumcision scale-up: country implementation and research.*

WHO, & UNAIDS. (2007). New Data on Male Circumcision and HIV Prevention : Policy and Programme Implications. *WHO /UNAIDS*, (March), 1–10. Retrieved from http://apps.who.int/iris/bitstream/handle/10665/43751/?sequence=1

Young, J. C., & Garro, L. Y. (1982). Variation in the choice of treatment in two Mexican communities. *Social Science and Medicine*, *16*(16), 1453–1465. https://doi.org/10.1016/0277-9536(82)90060-0

APPENDICES

Appendix A1: Descriptive Statistic

Marital status

```
. tab marital_status

marital_sta
         tus |      Freq.     Percent        Cum.
-------------+-----------------------------------
     Married |        160       37.83       37.83
Not married |        259       61.23       99.05
  Otherwise |          4        0.95      100.00
-------------+-----------------------------------
       Total |        423      100.00
```

Age bracket

```
. tab age_bracket

  age_bracket |      Freq.     Percent        Cum.
--------------+-----------------------------------
between 25-36 |        263       75.36       75.36
between 37-49 |         86       24.64      100.00
--------------+-----------------------------------
        Total |        349      100.00
```

Educational status

```
. tab education_level

education_l
        evel |      Freq.     Percent        Cum.
-------------+-----------------------------------
     Primary |         58       16.62       16.62
   Secondary |        162       46.42       63.04
    Tertiary |        129       36.96      100.00
-------------+-----------------------------------
       Total |        349      100.00
```

Access to information

```
. tab Access_nformation
```

Access_nformation	Freq.	Percent	Cum.
Readily_available	254	79.62	79.62
Otherwise	65	20.38	100.00
Total	319	100.00	

Demand for VMMC

```
. tab demand_vmmc
```

Demand_vmmc	Freq.	Percent	Cum.
No	238	68.19	68.19
Yes	111	31.81	100.00
Total	349	100.00	

Provider's Gender

```
.
```

vmmc_provider_sex	Freq.	Percent	Cum.
Male	304	72.73	72.73
Femal	114	27.27	100.00
Total	418	100.00	

Perceived Benefits

```
.
```

vmmc_medical_benefits	Freq.	Percent	Cum.
Yes	256	60.52	60.52
No	167	39.48	100.00
Total	423	100.00	

Fear of adverse effects & long healing period

```
. tab vmmc_adverse_effects

vmmc_advers
  e_effects |      Freq.     Percent        Cum.
------------+-----------------------------------
        Yes |        303       71.63       71.63
         No |        120       28.37      100.00
------------+-----------------------------------
      Total |        423      100.00
```

Fear of HIV testing

```
. tab vmmc_protects_hiv_sti

vmmc_protec
 ts_hiv_sti |      Freq.     Percent        Cum.
------------+-----------------------------------
        Yes |        253       59.81       59.81
         No |        170       40.19      100.00
------------+-----------------------------------
      Total |        423      100.00
```

Religion

```
. tab religion

   religion |      Freq.     Percent        Cum.
------------+-----------------------------------
  Christian |        300       85.96       85.96
      Islam |         28        8.02       93.98
     Others |         21        6.02      100.00
------------+-----------------------------------
      Total |        349      100.00
```

Cultural influence

```
. tab culture_infl

if_not_circ
umcised:hin
derance_cul
       ture |      Freq.     Percent        Cum.
------------+-----------------------------------
        Yes |         63       23.60       23.60
         No |        204       76.40      100.00
------------+-----------------------------------
      Total |        267      100.00
```

Do you believe that VMMC has Medical Benefit?

```
. tab vmmc_medical_benefits

vmmc_medica
 l_benefits |      Freq.     Percent        Cum.
------------+-----------------------------------
        Yes |        197       56.45       56.45
         No |        152       43.55      100.00
------------+-----------------------------------
      Total |        349      100.00
```

Does VMMC have any adverse effects on the circumcised person

```
. tab vmmc_adverse_effects

vmmc_advers
  e_effects |      Freq.     Percent        Cum.
------------+-----------------------------------
        Yes |        251       71.92       71.92
         No |         98       28.08      100.00
------------+-----------------------------------
      Total |        349      100.00
```

Appendix A2: Regression Result

Probit regression

Probit regression — Number of obs = 389
LR chi2(10) = 261.73
Prob > chi2 = 0.0000
Log likelihood = -129.84792 — Pseudo R2 = 0.5019

demand_vmmc	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Access_nformation	-.4669018	.2087723	-2.24	0.025	-.8760878	-.0577157
income_range	1.063527	.1935547	5.49	0.000	.6841671	1.442887
income_source	.4067245	.1486616	2.74	0.006	.1153531	.6980959
marital_status	-.6825755	.2027398	-3.37	0.001	-1.079938	-.2852128
age_bracket	-.1175022	.2220668	-0.53	0.597	-.5527451	.3177407
education_level	-.3929886	.1427186	-2.75	0.006	-.672712	-.1132653
religion	-.2797371	.2178934	-1.28	0.199	-.7068004	.1473261
vmmc_adverse_effects	.1491493	.1985709	0.75	0.453	-.2400425	.5383411
vmmc_protects_hiv_sti	-1.703069	.4281028	-3.98	0.000	-2.542135	-.8640032
vmmc_medical_benefits	-1.278031	.357145	-3.58	0.000	-1.978023	-.5780401
_cons	3.986666	1.028349	3.88	0.000	1.971139	6.002194

Marginal effects

```
. mfx

Marginal effects after probit
      y  = Pr(demand_vmmc) (predict)
         =  .19559573
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Access~n	-.1289678	.06079	-2.12	0.034	-.248107	-.009828	1.26735
incom~ge	.2937679	.06295	4.67	0.000	.17038	.417156	1.36247
incom~ce	.1123456	.04089	2.75	0.006	.032205	.192487	1.50386
marita~s	-.1885413	.0593	-3.18	0.001	-.304762	-.072321	1.61954
age_br~t	-.0324565	.06149	-0.53	0.598	-.152973	.08806	1.27249
educat~l	-.1085515	.04101	-2.65	0.008	-.188922	-.028181	2.14396
religion	-.0772691	.06016	-1.28	0.199	-.195186	.040648	1.15424
vmmc_a~s	.0411981	.05516	0.75	0.455	-.066922	.149318	1.27249
vmmc_p~i	-.4704225	.09704	-4.85	0.000	-.660613	-.280232	1.37275
vmmc_m~s	-.3530183	.09708	-3.64	0.000	-.543296	-.162741	1.36504

Appendix A3: Pre-estimation Tests

Normality Test

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
Access_nfo~n	319	0.98105	4.262	3.413	0.00032
income_sou~e	349	0.98580	3.462	2.936	0.00166
income_range	349	0.99310	1.682	1.229	0.10957
marital_st~s	349	0.95592	10.743	5.614	0.00000
age_bracket	349	0.98812	2.896	2.514	0.00597
education_~l	349	0.99832	0.409	-2.116	0.98283
religion	349	0.92550	18.157	6.854	0.00000
vmmc_medic~s	349	0.99883	0.285	-2.965	0.99849
vmmc_adver~s	349	0.99136	2.105	1.760	0.03920
vmmc_prote~i	349	0.99912	0.213	-3.653	0.99987

Heteroscedasticity

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of demand_vmmc

         chi2(1)      =    40.47
         Prob > chi2  =   0.0000
```

Multicollinearity

```
. vif
```

Variable	VIF	1/VIF
vmmc_prote~i	3.09	0.323377
vmmc_medic~s	2.84	0.352595
marital_st~s	1.75	0.572460
age_bracket	1.61	0.622280
income_range	1.28	0.780943
education_~l	1.19	0.843721
income_sou~e	1.11	0.897286
religion	1.10	0.908272
Access_nfo~n	1.07	0.932393
vmmc_adver~s	1.05	0.948240
Mean VIF	1.61	

Appendix A4: Regression Analysis

Probit Regression Analysis

Probit regression — Number of obs = 303; Wald chi2(13) = 87.96; Prob > chi2 = 0.0000; Log pseudolikelihood = -87.694344 — Pseudo R2 = 0.5582

demand_vmmc	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Access_nformation	-.7863102	.2755724	-2.85	0.004	-1.326422	-.2461983
income_range						
Between37-49 years	.901692	.2367212	3.81	0.000	.4377271	1.365657
income_source						
Informal	.8271992	.2444321	3.38	0.001	.3481211	1.306277
others	.9206872	.4784326	1.92	0.054	-.0170236	1.858398
marital_status						
Not married	-.9917046	.3117995	-3.18	0.001	-1.60282	-.3805887
Otherwise	-1.021612	.844854	-1.21	0.227	-2.677495	.6342714
age_bracket						
between 37-49	-.443826	.3039426	-1.46	0.144	-1.039543	.1518906
education_level						
Secondary	-.5884182	.3282517	-1.79	0.073	-1.23178	.0549433
Tertiary	-.9642032	.3405708	-2.83	0.005	-1.63171	-.2966967
religion						
Islam	.541735	.2961893	1.83	0.067	-.0387855	1.122255
Others	0	(empty)				
vmmc_medical_benefits	-.6179755	.5140963	-1.20	0.229	-1.625586	.3896347
vmmc_protects_hiv_sti	-2.316739	.8038876	-2.88	0.004	-3.89233	-.7411482
vmmc_adverse_effects	.217625	.2366774	0.92	0.358	-.2462542	.6815043
_cons	4.395263	.9367075	4.69	0.000	2.55935	6.231176

a .

Marginal effects

```
.  margins, dydx(*)

Average marginal effects                        Number of obs     =        303
Model VCE    : Robust

Expression   : Pr(demand_vmmc), predict()
dy/dx w.r.t. : Access_nformation 2.income_range 2.income_source 3.income_source 2.marital_s
               2.education_level 3.education_level 2.religion 3.religion vmmc_medical_benef
               vmmc_adverse_effects
```

	Delta-method dy/dx	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Access_nformation	-.1279831	.0405326	-3.16	0.002	-.2074254	-.0485407
income_range						
Between37-49 years	.1636135	.0444693	3.68	0.000	.0764553	.2507717
income_source						
Informal	.140389	.0401547	3.50	0.000	.0616873	.2190908
others	.1550364	.0728853	2.13	0.033	.0121838	.297889
marital_status						
Not married	-.1727477	.0524263	-3.30	0.001	-.2755013	-.0699941
Otherwise	-.178037	.1479798	-1.20	0.229	-.468072	.111998
age_bracket						
between 37-49	-.0709243	.0477	-1.49	0.137	-.1644146	.0225659
education_level						
Secondary	-.0904765	.046056	-1.96	0.049	-.1807446	-.0002084
Tertiary	-.1532769	.0482016	-3.18	0.001	-.2477503	-.0588034
religion						
Islam	.0873517	.0471283	1.85	0.064	-.0050181	.1797215
Others	.	(not estimable)				
vmmc_medical_benefits	-.1005842	.0842995	-1.19	0.233	-.2658081	.0646397
vmmc_protects_hiv_sti	-.377082	.1203018	-3.13	0.002	-.6128692	-.1412947
vmmc_adverse_effects	.0354215	.0383524	0.92	0.356	-.0397478	.1105909

Note: dy/dx for factor levels is the discrete change from the base level.

Appendix A5: Questionnaire

Questionnaire No. ----------

I am a student of University of Nairobi undertaking MSc. Health Economics & Policy. The purpose of this study is to 'Determine the Factors That Influence Demand of Voluntary Medical Male Circumcision by Male Adults in Ugunja Sub-County'. All your responses will be termed to be correct and strictly kept confidential.

A. Demographic Information

Put a tick in the appropriate box or fill the spaces provided appropriately and correctly.

1. What is your religion? a) Christianity ☐ b) Islam ☐ c) Others ☐
2. What is your education level? a) Primary ☐ b) Secondary ☐ c) Tertiary ☐
3. What is your age bracket? a) 25-36 ☐ b) 37-49 ☐
4. What is your marital status? a) Married ☐ b) Not Married ☐ c) Otherwise ☐
5. What is your main source of income?

   a) Formal Employment ☐ b) Informal Employment ☐ c) Otherwise ☐
6. What is the range of your monthly income?

   a) Below KShs.10000 ☐ b) Above KShs.10000 ☐

B. Determinants of demand for VMMC

1. Have you heard about Voluntary Medical Male Circumcision (VMMC)?

   a) Yes ☐ b) No ☐
2. If the answer above is yes, is the information readily available? a) Yes ☐ b) No ☐
3. Have you undergone circumcision? a) Yes ☐ b) No ☐
4. Do you believe VMMC has any medical benefits? Yes ☐ No ☐
5. Male Circumcision offers partial protection against HIV and other STIs. a) Yes ☐ b) No ☐

6. Does VMMC have any adverse effects on the circumcised person? Yes ☐ No ☐

7. If not circumcised,

   i. Can the fear of pain hinder you from getting circumcised? Yes ☐ No ☐

   ii. Can the fear of HIV testing hinder you from getting circumcised? Yes ☐ No ☐

   iii. Can the cost associated hinder you from getting circumcised? Yes ☐ No ☐

   iv. Do you think your culture is the main hindrance to VMMC? Yes ☐ No ☐

   v. Can complications associated hinder you from getting circumcised? Yes ☐ No ☐

8. What is your sex's preference of VMMC service provider? a) Male ☐ b) Female ☐

9. Women prefer men who are circumcised a) Yes ☐ b) No ☐

10. How far is the nearest VMMC facility from your place of residence?

    a) Less than 5kms ☐

    b) More than 10kms ☐

11. Is the distance to health facilities a hindrance to accessibility of VMMC?

    a) Yes ☐ b) No ☐

12. If provided with economic incentives, will you accept to get circumcised?

    a) Yes ☐ b) No ☐

13. Do you feel there is adequate demand for VMMC services in the county?

    a) Yes ☐ b) No ☐

Appendix A6: Research Authorization

COUNTY GOVERNEMNT OF SIAYA

Tel: +254727898309
Email: info@siaya.go.ke
Web: siaya.go.ke

County Headquarters,
P.O Box 803 – 40600,
Siaya.

COUNTY HEALTH SERVICES

PHILIP KIPROTICH MIBEI
UNIVERSITY OF NAIROBI
P.O BOX 30197 – 00100
NAIROBI
17/09/2019

COUNTY DIRECTOR OF MEDICAL SERVICES
Date: 17/9/2019
P.O. Box 803 - 40600 SIAYA

RE: RESEARCH AUTHORIZATION

This is to inform you that the Siaya County Operational Technical Working group reviewed the documents on the study titled, **'Determinants of Demand for VMMC by Male Adults in Ugunja Sub-County'.**

This office is pleased to inform you that you have been authorized to undertake the study in Ugunja Sub- County, in collaboration with Ugunja Sub-County Health Administrator Office.

The researcher will be required to adhere to ethical code of conduct for health research in accordance to the Science Technology and Innovation Act, 2013 and the approval procedure and protocol for research for Siaya County.

On completion of the study, you will be required to submit one hard copy and one copy in PDF of the findings to our operational research technical working group.

Pamela Achieng Awour

FOR COUNTY DIRECTOR OF MEDICAL SERVICES

Appendix A7: Map of Ugunja Sub County