DSPACE

https://dspace.org/

Male circumcision and HIV infection in Swaziland: is there an association?

Machava, Richard Owen

2013-09-13
http://hdl.handle.net/10539/13136

Downloaded from a DSpace repository. https://dspace.org/



UNIVERSITY OF THE WITWATERSRAND,

JOHANNESBURG,

SOUTH AFRICA

Master's Degree Research Report Submitted to the Faculty of Humanities,
in Partial Fulfilment of the Requirements for the MA Degree in
Demography and Population Studies.

Male circumcision and HIV infection in Swaziland: Is there an association?

Student Name: Richard Owen Machava

Student No: 0706919y

Supervisor: Dr Latifat Ibisomi

Department: Demography & Population Studies

DECLARATION

I **Richard Owen Machava**, declare that this research report is my own unaided work. It is submitted for the degree of Master of Arts in Demography and Population Studies at the University of the Witwatersrand, Johannesburg South Africa. To the best of my knowledge, It has not been submitted before for any other degree or examination in any other university.

Signed

Date: 14 June 2013

ACKNOWLEDGEMENTS

First and foremost, all thanks, praise, glory and honour goes to God who created the universe.

I would like to thank my supervisor, Dr. Latifat Ibisomi, for all the encouragement, support and guidance throughout the process of completion of this research report. I would further like to thank the head of Demography and Population Studies Professor Clifford Odimegwu for believing in me from honours and affording me this opportunity to realize my dream of completing my Masters degree.

Special thanks and gratitude is due to Vusi Nzimakwe for proof-reading this work, my family and friends who have encouraged and supported me throughout my entire student and academic career, and who believed in the accomplishments that I was able to complete. Lastly, but not least, I would also like to thank Hewlett Foundation and MRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt) for their financial assistance.

DEDICATION

With humility, gratitude and love, to:

Ribu

Tryphina

Busi

Hilda

Ellias

CONTENT

DECLARATION ii

ACKNOWLEDGEMENTS iii

DEDICATION iv

DEFINITION OF TERMS vii

LIST OF TABLES viii

LIST OF FIGURES ix

LIST OF ABBREVIATIONS x

ABSTRACT xi

Background: xi

Methods: xi

Results: xi

Conclusion: xi

CHAPTER 1: INTRODUCTION 1

1.1 SWAZILAND AT A GLANCE 1

1.2 BACKGROUND INFORMATION 2

1.3 STATEMENT OF THE PROBLEM 3

1.4 RESEARCH QUESTION 4

1.5. OBJECTIVES 4

1.5.1 GENERAL OBJECTIVE 4

1.5.2 SPECIFIC OBJECTIVES 4

1.6 JUSTIFICATION 5

CHAPTER 2: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK 6

2.1 LITERATURE REVIEW 6

2.1.1 MALE CIRCUMCISION 6

2.1.2 HIV INFECTION AND MALE CIRCUMCISION 8

2.1.3 SOCIO-ECONOMIC AND DEMOGRAPHIC FACTORS ASSOCIATED WITH HIV INFECTION..... 10
2.2 CONCEPTUAL FRAMEWORK 13
2.3 RESEARCH HYPOTHESIS 155
CHAPTER 3: METHODOLOGY..... 166
3.1 DATA SOURCE 166
3.2 SAMPLE SIZE AND STUDY POPULATION..... 166
3.3 STUDY DESIGN AND DATA PROCESSING 166
3.4 DATA MANGEMENT AND MEASUREMENT OF VARIABLES 166
3.4.1 DEPENDENT VARIABLE 177
3.4.2 INDEPENDENT VARIABLES 177
3.6 DATA ANALYSIS..... 188
3.7 LIMITATIONS OF THE STUDY..... 199
3.7.1 Temporality..... 199
3.7.2 Heterosexual as the sole mode of HIV/AIDS transmission 20
3.7.3 Type of male circumcision is not defined.....20
3.8 ETHICAL CONSIDERATION 20
CHAPTER 4: RESULTS 211
4.1 BIVARIATE DESCRIPTIVE ANALYSIS..... 211
4.2 BIVARIATE ANALYTICAL ANALYSIS 233
4.3 MULTIVARIATE ANALYSIS 255
CHAPTER 5: DISCUSSION OF RESULTS 288
CHAPTER 6: CONCLUSION AND RECOMMENDATIONS 333
6.1 Conclusion 333
6.2 Recommendation 333
REFERENCES 345

DEFINITION OF TERMS

1. MALE CIRCUMCISION: The surgical removal of the foreskin of the penis.
2. HIV: It is a retrovirus that infects cells of the human immune system.
3. AIDS: Is a disease of the human immune system caused by the human immunodeficiency virus
4. PREVALENCE: Is the number of cases in a defined population at a specified point in time.

LIST OF TABLES

Table 1: Independent variables of the study 188

Table 2: characteristics of respondents by HIV status 22-22

Table 3: Summary of significant and insignificant factors associated with HIV infection among men aged 15-49 in Swaziland 233-24

Table 4: Adjusted odds ratios and 95% confidence interval of predictors of HIV infection in Swaziland 255-26

LIST OF FIGURES

Figure 1: Map of Swaziland by region. (CSO, Swaziland Demographic and Health Survey 2007) 1

Figure 2: Direct and indirect socio-economic and demographic factors influencing HIV infection Source: adapted from Boerma and Weier, (2005) 14

LIST OF ABBREVIATIONS

AOR: Adjusted Odds Ratio

CI: Confidence Interval

HIV/AIDS: Human Immune Deficiency Virus/Acquired Immune Deficiency Syndrome

OR: Odds Ratio

SDHS: Swaziland Demographic and Health Survey

SSA: Sub Sahara Africa

STIs: Sexually Transmitted Infections

UNAIDS: Joint United Nations Programme on Acquired Immune Deficiency Syndrome

UOR: Unadjusted Odds Ratio

WHO: World Health Organization

ABSTRACT

Background: HIV/AIDS is the leading cause of death among sexually active adults in SSA. In Swaziland, HIV prevalence is the highest in the world. An overwhelming body of literature has suggested that male circumcision has a protective effect against HIV infection (Auvert, 2005; Bailey, 2007; Gray et al, 2007).

Methods: A total of 2479 Swaziland men who ever had sex and voluntarily tested for HIV/AIDS as part of the 2006/7 Swaziland Demographic and Health Survey were used to examine the association between male circumcision and HIV infection. Three levels of analysis were done; Bivariate descriptive was used to estimate the prevalence of male circumcision and HIV infection. Bivariate analytical using binomial logistic regression was used to examine the association between male circumcision and HIV infection, and to examine the association between HIV infection and other socio-economic and demographic factors. Multivariate analysis using binomial logistic regression was used to identify factors associated with HIV infection.

Results: Bivariate descriptive analysis showed that out of 2479 respondents used for this analysis, 25.85% were circumcised and HIV positive. While 33.36% were uncircumcised and HIV positive. The overall HIV prevalence was estimated at 32.56%. Unadjusted results showed no statistical significance between male circumcision and HIV infection (UOR=0.69, 95% CI=0.47-1.03). However, after adjusting for socio-economic and demographic factors, results showed that male circumcision was protective against HIV infection (AOR=0.58, CI=0.36-0.88)

Conclusion: There was an association between male circumcision and HIV infection among men in Swaziland after adjusting for socio-economic and demographic factors. Circumcised men were protected against HIV infection compared to uncircumcised men. Although male circumcision is found to be protective against HIV infection, male circumcision alone is not sufficient to help reduce the number of new HIV infections in Swaziland. Other HIV intervention programs such as consistent condom use, one sexual partner and sex education should be continued and even expanded.

CHAPTER 1: INTRODUCTION

This chapter introduces the background of the study; reference is made to background information, statement of the problem, justification, research question and objectives.

1.1 SWAZILAND AT A GLANCE

The Kingdom of Swaziland is a relatively small country of 17 364 square kilometres, landlocked between South Africa to the north, south and west and Mozambique to the east. In 2011 Swaziland's population was 1.19 million with an estimated annual growth rate of 1.9% (CSO, 2012). The country is divided into four regional zones, Manzini, Lubombo, Hhohho, and Shiselweni.

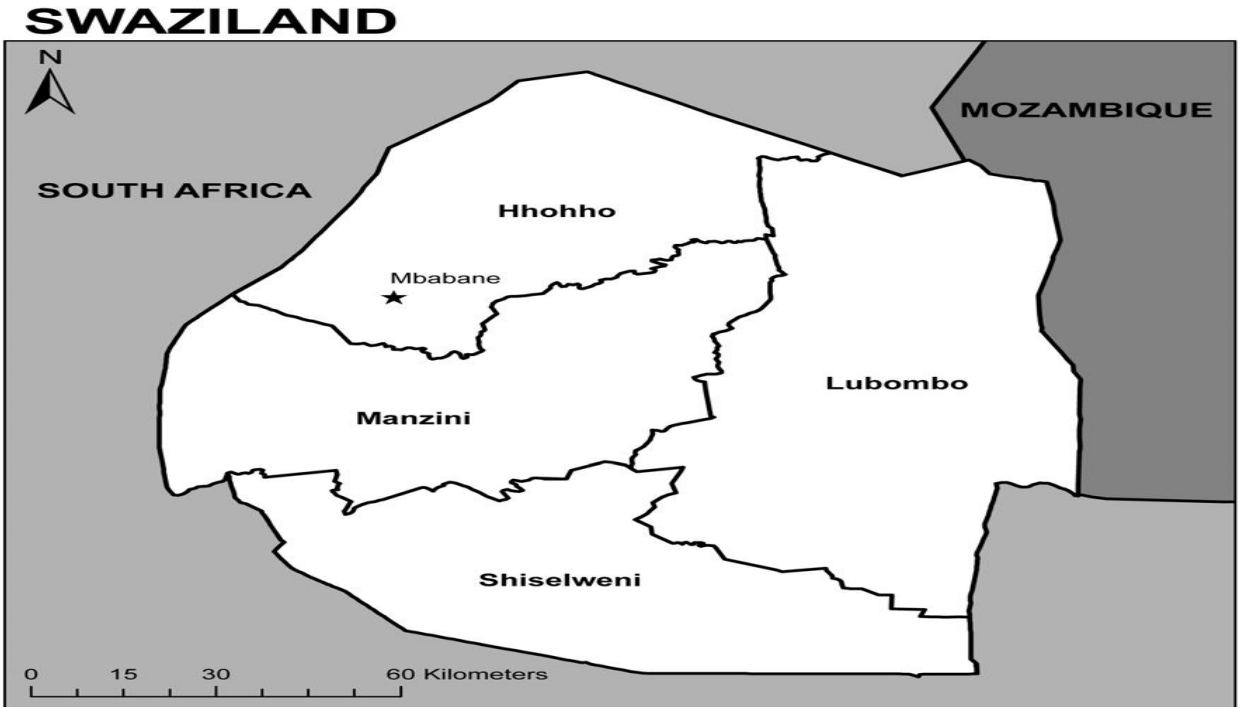


Figure 1: Map of Swaziland by region. (CSO, Swaziland Demographic and Health Survey 2007)

The majority of Swazi population lives in rural areas and practices subsistence farming. There are high levels of poverty and income inequality, while unemployment remains a considerable challenge. An estimated 66% of the population lives below the national poverty line with levels in some rural areas up to 70% (CSO, 2012). Swaziland has been faced with slow economic growth, which declined from 4.2% in 1996 to around 2.9% and lower in recent years. The severe HIV and AIDS epidemic is widely seen as contributing to poverty, compounding the impacts of unemployment and worsening the country's economic performance. An immediate challenge for the public sector is that a government budget deficit has emerged that is considered to be unsustainable. Since the first case of AIDS was reported in the country in 1986, the virus has spread at an alarming rate and now Swaziland has the highest HIV prevalence in the world (Khumalo et al, 2009).

1.2 BACKGROUND INFORMATION

About ten percent of the world's population is living in Sub-Saharan Africa; the region is home to almost two-thirds of people living with HIV/AIDS (UNAIDS, 2012). Sub-Saharan Africa continues as a leading region with high number of new HIV infection compared to other regions and Swaziland has the highest HIV prevalence in the world estimated at 25.9 per cent for the reproductive population aged 15–49 (CS0, 2008). While the overall number of new infection decreases in Sub-Saharan Africa, Swaziland still records high number of new HIV infection (CSO, 2012). This implies that a substantial threat to achieve Millennium Development Goal six which was aimed to halt and reverse the spread of HIV epidemic by two-thirds in 2015. Most of HIV transmissions in Sub- Saharan Africa and in Swaziland in particular are due to unprotected sexual intercourse amongst heterosexuals, followed by mother to child transmission during pregnancy, childbirth and breastfeeding, while transfusion of contaminated blood and sharing of contaminated needles are regarded as the least mode of transmission (Johnson, 2006).

A number of studies conducted in Sub-Saharan African countries found an association between HIV infection and male circumcision. These studies include cross-sectional studies (Kahn, 2006, Addanki et al, 2008), case-control studies, (Halperin, 2008; Hold, 2011), cohort studies (Gillum, 2010; Davis, 2010) and randomized controlled trials (Auvert, 2005: Bailey 2007).The overwhelming majority of these studies showed that, lack of circumcision was associated with increased risk of HIV infection. Although, the strength of association varied greatly among different studies. Association was found to be strong in studies of high-risk groups sexually transmitted infection clinic attendees, alcohol users, long-haul truck drivers (Lawoyin & Kehinde, 2006) but weak in studies from the general population (Winkel, 2006). Studies by Lewis, (2006) and Ogunle, (2008) argued that without an AIDS vaccine or curative treatment, and given the difficulty in getting persons at risk to adopt healthy sexual behaviours, alternative approaches to curb the spread of HIV infection are urgently needed especially in countries with high prevalence like Swaziland.

1.3 STATEMENT OF THE PROBLEM

As number of new HIV infection continues to increase in Sub-Saharan African, interventions to reduce the spread of HIV/AIDS are needed especially in countries such as Swaziland with high prevalence of HIV/AIDS. Researchers from various disciplines like Epidemiology, Bio-medical and Social sciences have conducted numerous studies that focused on interventions to help reduce the spread of HIV infection. Amongst others, health and sex education, consistent condom use, one sexual partner and male circumcision have been recommended as effective measures of reducing the spread of HIV infection.

A study by Addanki, et al, (2008) found that the general population of Swaziland hardly practices safe sex, and polygamy is widely accepted. Furthermore, the CSO, (2006) showed that male circumcision is not culturally and or traditionally practiced in Swaziland compared to West African countries such as Ghana, Nigeria and Sierra

Leone (UNAIDS, 2010). Male circumcision was estimated at 8.2% while HIV prevalence was estimated at 20% among men aged 15-49 (Central Statistics Office, 2008). Low circumcision rate and high HIV prevalence is a public health issue in Swaziland, as scientific evidence from randomised control trials by (Auvert, 2005; Bailey, 2007; Gray et al, 2007) have shown that circumcision reduces HIV infection by 50% to 60% among heterosexuals. There is no doubt for researchers to argue that lack or limited number of male circumcision can be regarded as one of the factors that account for high number of new HIV infection in Swaziland and this should be an area of concern in the country.

1.4 RESEARCH QUESTION

Is there an association between male circumcision and HIV infection in Swaziland?

1.5 OBJECTIVES

1.5.1 GENERAL OBJECTIVE

To examine the relationship between male circumcision and HIV infection in Swaziland, and to identify socio-economic and demographic factors associated with HIV infection.

1.5.2 SPECIFIC OBJECTIVES

- To estimate the prevalence of male circumcision and HIV.
- To examine the association between male circumcision and HIV infection.
- To examine the association between HIV infection and other socio-economic and demographic factors.

1.6 JUSTIFICATION

Numerous studies have been conducted in Sub-Saharan African countries to identify risk factors accounting for high HIV infection but very few studies have focused on the association between male circumcision and HIV infection in Swaziland. Those that have been conducted were small sample size, randomized controlled trials. Furthermore, none have been done utilizing the 2006/7 Swaziland Demographic and Health Survey. This therefore creates a gap that will be filled by this study. In addition, amongst the few studies that has been carried out are RCTs and ecological study designs. The issue with RCTs is that they have very low external validity and it becomes very hard to generalize findings into the general population. This study focuses on the general population and hopes to contribute to the body of literature on the protective effect of male circumcision against HIV infection in Swaziland. The study also has the potential to help Swaziland government to strengthen and expand its initiative launched in 2008 to voluntary circumcise HIV negative males aged 15 to 49 years (UNAIDS, 2012). More circumcision rates may reduce hundreds of new infection and thousands of deaths related to HIV/AIDS in Swaziland since the vaccine or cure seems unlikely to be discovered for now.

CHAPTER 2: LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 LITERATURE REVIEW

2.1.1 MALE CIRCUMCISION

Male circumcision is the surgical removal of the foreskin from the male sexual organ (Addanki et al, 2008). It is also one of the oldest and most controversial surgical procedures. Historically, male circumcision was practised among ancient Semitic people including Egyptians and those of Jewish faith with the earliest records depicting circumcision on Egyptian temple and wall paintings dating from around 2300 BC (Lissouba et al, 2011). With advances in surgery in the 19th century and increased mobility in the 20th century, the procedure was introduced into some previously non-circumcising cultures for health-related, religious and social reasons.

Medical reasons of male circumcision include reduced risk of HIV infection, a lowered risk of acquiring some sexually transmitted infections, especially ulcerative diseases (that are also known to enhance HIV transmission) like chancroid and syphilis, reduced risk for developing penile cancer and an equally reduced risk of developing cancer of cervix among their female partners both of which are associated with infections by cancer inducing types of human papiloma virus (Addanki et al, 2008). Male circumcision is also protective against other medical conditions that include reduced risk of acquiring urinary tract infections, prevention of inflammation of glans (balanitis) and the foreskin (posthitis), absence of health problems associated with presence of foreskin such as phimosis (inability to retract foreskin) or paraphimosis (swelling of the retracted foreskin that leads to inability to return it to normal position), and circumcised men maintain penile hygiene with ease (Freeman, et al, 2004).

Islam is the largest religious group to practice male circumcision. As an Abrahamic faith, Islamic people practice circumcision as a confirmation of their relationship with God and the practice is also known as ‘tahera’, meaning purification (Addanki et al, 2008). With the global spread of Islam from the 7th century AD, male circumcision

was widely adopted among previously non-circumcising peoples. There is no clearly prescribed age for circumcision in Islam, although the prophet Muhammad recommended it be carried out at an early age and reportedly circumcised his sons on the seventh day after birth (Freeman, et al, 2004). Many Muslims perform the rite on this day, although a Muslim may be circumcised at any age between birth and puberty.

In the Jewish religion, male infants are traditionally circumcised on their eighth day of life, provided there is no medical contraindication (Freeman, et al, 2004). The justification in the Jewish holy book the Torah is that a covenant was made between Abraham and God, the outward sign of which is circumcision for all Jewish males (Addanki et al, 2008). The Torah states: "This is my covenant, which ye shall keep, between me and you and thy seed after thee: every male among you shall be circumcised (Genesis 17:10). Male circumcision continues to be almost universally practiced among Jewish people.

Male circumcision is not prescribed in other forms of Christianity. Focus group discussions on male circumcision in sub-Saharan Africa found no clear consensus on compatibility of male circumcision with Christian beliefs. Some Christian churches in South Africa oppose the practice, viewing it as a pagan ritual while others including the Nomiya church in Kenya require circumcision for membership and participants in focus group discussions in Zambia and Malawi mentioned similar beliefs that Christians should practice circumcision since Jesus was circumcised and the Bible teaches the practice (Addanki et al, 2008).

In Africa, male circumcisions came into view as a general practise for most communities. Although, there are similarities and differences that have been observed among these communities. In communities (like Eastern Cape, South Africa, among Xhosa tribe and among the Dogon and Dowago ethnic groups of Western Africa) where it is practised traditionally, male circumcision is regarded as an important rite of passage and is generally done during puberty (Connolly et al, 2008). Communities such as the Xhosa and Pedi in South Africa still regard traditional circumcision safer

than medical circumcision and as a rite in order to fulfil the cultural requirements of becoming men (Connolly et al: 2008). Swaziland has one of the lowest male circumcision rates in the world. Circumcision in Swaziland is not culturally or traditionally practiced like in other West African countries, the majority of circumcision were performed for medical reasons. Though, the acceptability or willingness to circumcise among Swazi men started to expand after three randomized controlled trials conducted in South Africa, Uganda and Kenya which showed that male circumcision reduces HIV infection up to 60% (Auvert, 2005; Bailey, 2007; Gray et al 2008).

According to current estimates by UNAIDS, (2012) approximately 30% of all males across the world representing a total of approximately 670 million men are circumcised. Of this number, about 68% are of Islamic faith, less than 1% of Jewish faith and 13% are non-Muslim, non-Jewish Americans. In 2006, the estimated prevalence of circumcised men in Swaziland was 8%. Between 2007 and 2011, approximately 35,000 men underwent voluntary medical male circumcision, including 11,000 men circumcised in 2011 during a national HIV prevention campaign (UNAIDS, 2012).

2.1.2 HIV INFECTION AND MALE CIRCUMCISION

Male circumcision may have ancient roots. Today the impassioned debate centres on among other things, the potential value of male circumcision in making a significant dent in the incidence of HIV infection. The "abstinence, being faithful, using condoms" (ABC) prevention strategy, although promising in theory, has not proved to be effective in practice and the HIV epidemic in some areas has grown to epic proportions. New effective forms of prevention are desperately needed. Recent evidence suggests that male circumcision is effective and should have a clear place in the array of evidence-based interventions for the prevention of HIV (McCoombe, 2006).

The HIV epidemic in Sub-Saharan Africa has continued to grow despite prevention efforts and there is an urgent need for preventive interventions to reduce

transmission (McCoombe, 2006). An estimated number of people living with HIV worldwide in 2007 were 33.2 million. With more than 2.5 million new infections per year and 2.1 million deaths per year, global HIV is a pandemic of staggering proportions (Sean, 2010). In recent times, the scourge of HIV/AID in Swaziland has a major public concern. The overall median prevalence of HIV infection for Swaziland increased from 21·3% (IQR 11·5%–28·2%) in 1997/98 to 23·8% in 2002 (15·6%–29·2%) (McCoombe, 2006).

An impressive body of ecological and observational studies mainly in Sub-Saharan Africa have investigated the protective effect of male circumcision against HIV infection (Weiss, 2000; Gray, 2000; Reynolds, 2004). Most of studies found the prevalence of HIV to be significantly higher among uncircumcised men than in those who are circumcised. The study by Weiss, (2000) reported an adjusted relative risk of 0·42 (95% CI 0·34–0·54) among circumcised men, with a stronger adjusted relative risk of 0·29 (0·20–0·41) compared to uncircumcised men. In a study by Sean, (2010), male circumcision provided a 53% (95% CI 22–72) protective effect against HIV acquisition compared with the control group and a 60% (32–77) protective effect after adjustments for non-adherence and for those individuals who were found to be HIV positive at baseline. According to studies by Anderson and Cockcroft, (2011); Djamba et al (2007), uncircumcised men had higher risk of being HIV-positive compared to circumcised men.

In Cotonou, circumcision status was found to be significantly associated with risk of HIV infection (Patterson, 2002). A cohort study by Gray et al (2000) of sero-discordant couples in Rakai, Uganda found male circumcision to reduce HIV infection and transmission among couples. In Kenya, Johansson (2006) study also observed that uncircumcised men had higher risk of being HIV-positive compared to circumcised men. These findings collaborates to Auvert, et al (2005) study conducted in Orange Farm in South Africa which found that male circumcision was 60% protected against HIV infection per act of sex among heterosexual partners. However, the wide majority

of the research on the protective effect of male circumcision against HIV infection has been conducted in other African societies (Weiss, 2000; Gray, 2000; Reynolds, 2004) leaving a deficit of knowledge about the protective effect of male circumcision against HIV infection in Swaziland.

2.1.3 SOCIO-ECONOMIC AND DEMOGRAPHIC FACTORS ASSOCIATED WITH HIV INFECTION

Apart from male circumcision, there are many factors that are associated with HIV/AIDS. These include demographic, socio-economic, behavioral factors and biological. Depending on different countries and between different populations within a country, some factors were found in some studies to be risk factors for HIV infection and others were not associated with HIV infection. The strength of association among each demographic, socio-economic and behavioral factors varied from study to study. Studies that focused much on high HIV risk population such as sex workers, long distance truck drivers and sexual transmitted infection clinic attendees found high association compared to studies that focused on the general population.

AGE AND SEX

The risk of HIV transmission per sexual contact is thought to be highest among younger women between the ages of 18 and 30 (Andersson, and Cockcroft, 2011). While for males usually peaks between the ages of 30 and 40 (Edlyne, 2009). This partly explains the high HIV prevalence levels observed in young females in purely heterosexual epidemics and the tendency for older men to seek partnerships with younger women. A study conducted in Kisumu Kenya and Ndola Zambia found that HIV prevalence in women was six times that in men among sexually active 15-19 year olds, three times that in men among 20-24 year olds, and equal to that in men among 25-49 year olds (Gillum and Holt, 2010). This can be explained by the tendency for women to have older partners who are more likely to be at risk of HIV whereas young men are at least as likely to encounter an HIV-infected partner compared to young women.

Below the age of 15, HIV infections are relatively rare and usually are the result of children being infected by their HIV positive mothers either at birth or through breastfeeding. In addition to sexual transmission and mother-to-child transmission, the sharing of unsterilized needles by intravenous drug users is also a significant vector for HIV transmission.

MARITAL STATUS

In Kampala, Uganda, a cross-sectional study of males receiving voluntary HIV counseling and testing was carried out. The findings of the study were that men living together with their sexual partner and those who were uncircumcised were more likely to be in HIV positive. (Malamba, et al, 2005). A cross-sectional study was conducted in four cities of sub-Saharan Africa to determine risk factors for HIV transmission among married couples in the four urban populations. It was found out that the only significant risk factor for HIV-positive concordance was marital status (Freeman, et al, 2004). Married couples in Africa are generally affected by HIV epidemic due to labour migration of their partners. It is believed that labour migrants are more likely to have extra-marital sexual relationship in their place of work. A study conducted in South African gold mines of North West and Gauteng found that married mine migrant workers were four times more likely to have sexual relationship with other partners except their wife's compared to local mine workers. The study also found that migrant mine workers were 3.7 times more likely to be HIV infected compared to local migrant workers (Doyle, 2010)

PLACE OF RESIDENCE (URBAN/RURAL) AND REGION

Urban or rural place of residence plays a significant role in describing and understanding disease prevalence in a particular country. A number of researches that has been conducted showed different trends of disease between rural and urban areas. A population-based cohort study conducted in the rural district of Uganda called Rakai showed that there was an association between a sero-positive partner and area of residence. Men in trading centres were found to be most at risk followed

by those residing at the intermediate villages (Serwadda D, et al, 1995). Men in the agricultural community were least at risk. In Tanzania, a study conducted also showed that the area of residence was associated with HIV infection. In the study findings, those living in urban areas were more at risk of being infected than those in the rural areas (Soderberg S, et al, 1994). Most studies of HIV documented that HIV infection is much higher in rural compared to urban areas. However, analysis of findings from Moyo, et al. (1993) concluded that HIV infection rate was higher in Harare which is a city or urban area compared to rural areas countryside of Zimbabwe. This can be accelerated by the city urbanization which often leads to city poverty whereby young women engage in sexual activities in exchange for money.

EDUCATION AND WEALTH STATUS

Education can be regarded as the key to personal and community economic empowerment and national development. According to Hosegood, et al, (2007) education output is the human capital which constitutes the nation's primary wealth and potential for growth. In industrialized countries, it is usually members of ethnic minorities and poorer communities that are at greatest risk of HIV infection (UNAIDS, 2012), while in developing countries it is usually those with education and income who are at a higher risk of infection (Edlyne, 2009). In developing countries, economic migration plays an important role in the spread of the epidemic and accounts for the higher HIV prevalence among individuals of higher socio-economic status. Vandemoortele and Delamonica (2002) also found that some educated people have a higher risk of HIV infection because they are more likely to have several sexual partners. Nonetheless, this effect can be partially counterbalanced by a higher probability of condom use relative to less educated people (Edlyne, 2009). However, those who have high level of education especially university degrees and diplomas tend to be the first to receive and to employ information on HIV protection.

RELIGION

There is not much of literature on the link between religion and HIV/AIDS. There has however, been some work on how religious affiliation affects sexual attitudes and possibly behaviour. Garner (2000) refers to the literature on the impact of the upsurge in Pentecostalism and other dynamic types of church on attitudes and behaviour. A Zimbabwean study by Gregson et al, (2001) focused more specifically on how affiliation to different Christian denominations might influence vulnerability to HIV infection. Garner (2000) study conducted in Edenvale township of Pietermaritzburg in Kwazulu- Natal found significantly lower levels of extra- and pre-marital sex among members of the Pentecostal churches than among those affiliated to mainline churches. The latter refers to the established or mission churches such as Anglican, Methodist, Presbyterian and Roman Catholic. The lower levels extra and pre-marital sex among Pentecostal members is in turn hypothesised to result in lower levels of HIV infection. The study also highlighted the fact that condom usage is particularly frowned upon by the Pentecostal churches and low levels of sex outside marriage are thus particularly important among its members in the lowering vulnerability to HIV infection.

2.2 CONCEPTUAL FRAMEWORK

The conceptual framework used for this study is derived from Boerma and Weier, (2005) framework for proximate determinants of HIV infection. According to this framework HIV infection is influenced by underlying factors (both context and intervention programs) which operates through proximate determinants. Among the Context factors identified in the framework are socio-economic, sociocultural and demographic. Some of the intervention programs are counselling and testing, condom promotion, education for knowledge and changing attitudes. The framework identified circumcision, new sex partner, condom use as some of the proximate factors. Although all these factors (proximate and underlying) mentioned by Boerma and Weier, (2005), the main focus on this study will be on underlying factors (socio-

economic and demographic which are age of respondent, wealth status, education, place of residence, region, marital status and religion).

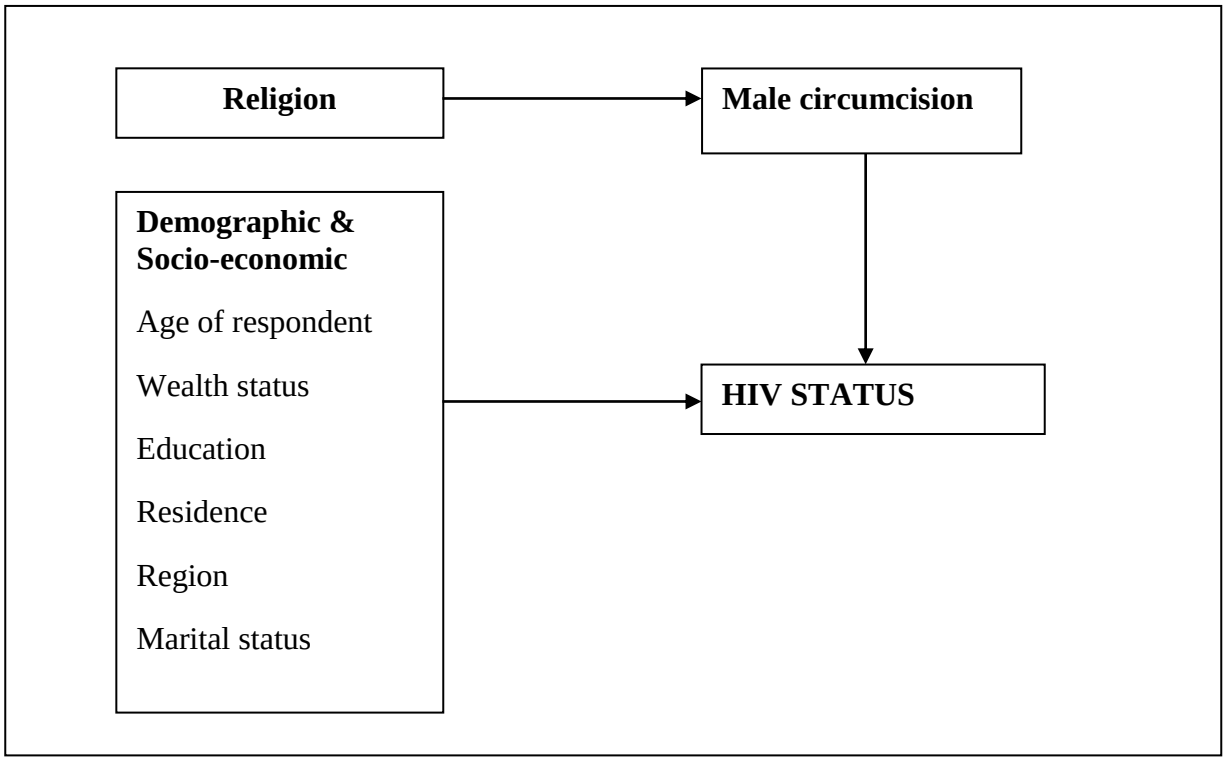


Figure 2: Direct and indirect socio-economic and demographic factors influencing HIV infection Source: adapted from Boerma and Weier, (2005)

Figure 2 above, shows the conceptual model used in the study which is adopted from Boerma and Weier, (2005). In specifying factors influencing HIV infection, the framework proposes that HIV infection is a function of socio-economic and demographic factors. Predisposing factors include age of respondent, wealth status, education, place of residence, religion and marital status. According to this adopted model, these factors can work as independent variables or can interact with each other to influence HIV infection.

2.3 RESEARCH HYPOTHESIS

Null hypothesis: The risk of HIV infection is the same between circumcised and uncircumcised men.

Alternative hypothesis: The risk of HIV infection differs between circumcised and uncircumcised men

CHAPTER 3: METHODOLOGY

This chapter contains data source, sample size and study population, study design and data processing, data management and measurement of variables and data analysis

3.1 DATA SOURCE

The study design was a cross-sectional analysis of the 2006 Swaziland Demographic and Health Survey (SDHS) for men and HIV datasets. The SDHS has been chosen as it is a nationally representative sample of the country.

3.2 SAMPLE SIZE AND STUDY POPULATION

The study population consisted of 2479 Swaziland men aged 15-49 years who ever had sex and voluntarily tested for HIV/AIDS as part of the 2006/7 Swaziland Demographic and Health Survey.

3.3 STUDY DESIGN AND DATA PROCESSING

The 2006-07 SDHS was designed to provide health and demographic indicators at the national level for the four regions of Swaziland (Manzini, Hhohho, Lubombo, and Shiselweni). A total of 275 clusters were drawn from the census sample frame. Women and men aged 15-49 were interviewed and were eligible for HIV testing. Over 4000 men voluntarily tested for HIV and pre and post-test counseling was provided to all respondents. All questionnaires for the SDHS were returned to Central Statistics Office for data processing. The processing operation consisted of office editing, coding of open-ended questions, data entry, double-entry verification, and resolving inconsistencies found by computer programmes developed for the SDHS.

3.4 DATA MANGEMENT AND MEASUREMENT OF VARIABLES

To achieve the objectives of the study, the study made use of two datasets. The 2006/7 SDHS male and HIV recode were merged into a single dataset using three unique identifiers (cluster, household and respondent numbers) for each dataset. The

statistical software stata IC version 12 was used for all data management and analyses. Data cleaning was done in cases where there were inconsistent information and coding was performed to create binary or dummy variables. The renaming of variables was done to clearly defining the variables and converting from DHS naming system. All the reported p-values were two-sided and significant at 0.05.

3.4.1 DEPENDENT VARIABLE

The dependent variable of the study was HIV STATUS of respondents. The variable has a binary outcome, HIV positive which was coded as (1) and HIV negative coded as (0). It was derived from variable "blood test results" in the HIV dataset.

3.4.2 INDEPENDENT VARIABLES

Table: 1 below shows all independent variables that were used in the study. The variables are segregated into key independent, socioeconomic and demographic variables. All independent variables were derived from the men's questionnaire of the 2006/7 Swaziland Demographic and Health Survey. Male circumcision is the key independent variable which was renamed from the variable "are you circumcised". This variable had a binary response of yes and or no which was then categorized as uncircumcised and or circumcised and coded 0 and 1, respectively.

The variable region consisted of Hhohho, Manzini, Shiselweni and Lubombo which were coded as 1, 2 3 and or 4 respectively. Variable wealth status was manipulated from wealth index which consists of five levels "poorer, poor, middle, rich and richest". For the purpose of the study 3 levels were derived poor, middle and rich. Poor and poorer were combined to be poor, while rich and richest were combined to be rich.

Variable type of place of residence refers to rural and or urban, only renaming of the variable was done. Age of respondents had seven levels but for the purpose of this study it was further categorised into three levels (15-24, 25-34 and 35 plus) and coded

1, 2 and 3 respectively. Education consisted of four levels (none, primary, secondary and higher). Marital status had three levels and religion had three levels as well. Variable religion was categorized into Christians, Zionist and Other because there were more respondents in these categories and less in various categorises which were combined to be other.

Variables	**Definition**
Key independent variable	
Male circumcision	Uncircumcised (0) Circumcised (1)
Socio-economic and demographic variables	
Region	Hhohho (1) Manzini (2) Shiselweni (3) Lubombo (4)
Wealth Status	Poor(1) Middle(2) Rich(3)
Type of place of residence	Rural(1) Urban(2)
Age of respondent	15-24 (1) 25-34(2) 35+(3)
Education	None(0) Primary(1) Secondary(2) Higher(3)
Marital status	Never married(0) Married(1) Formerly married(2)
Religion	Christian (0) Zionist (1) Other(2)

Table 1: Independent variables of the study

3.6 DATA ANALYSIS

Bivariate descriptive, bivariate analytical and multivariate analysis were carried out in order to meet the objectives of the study. Bivariate descriptive analysis was used to estimate the prevalence of male circumcision and HIV. Bivariate analytical statistics were used to determine the association between HIV infection and male circumcision and to measure the association between HIV infection and other socio-economic and demographic factors. The multivariate logistic regression model was fitted to identify factors associated with HIV infection. The logistic regression model was used because the outcome variable is dichotomous (HIV negative and HIV positive). The model enables entering several variables and controlling for many confounders at the same time. It also gives the magnitude as well as the direction of

association between the explanatory and the outcome variables. The underlying distribution of the logistic model is binomial. The fitted values lie between 0 and 1 and the relationship between the outcome and the independent variables is non-linear (s-shaped). The logistic regression model gives the probability that the outcome, occurs as an exponential function of the independent variables. It involves fitting to the data an equation of the form:

$$\ln (p_i/ (1-p_i) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_7 x_{7+} \beta_8 x_8$$

Where:

p_i= the proportion of respondents who are HIV positive

B_0= constant

X_1Circumcision

X_2 Age of the respondent

X_3 Marital status

X_4 Educational status

X_5 Place of residence

X_6 Region

X_7 Religion

X_8 Wealth status (Knocke et al, 2002)

3.7 LIMITATIONS OF THE STUDY

3.7.1 Temporality

A major limitation of this research is that temporality between outcome and predictor variables is difficult to establish due to cross-sectional nature of the study, for example HIV infection of men is not known when it occurred. It is possible that some men who are HIV-positive might have been infected by the HIV/AIDS virus before circumcision, while others might have been infected by the HIV/AIDS virus after circumcision.

Secondly, sexual behavioural variables such as condom use, number of sexual partners and recent sexual activity are not used in the study because they are greatly influenced by temporality. For example, men who have multiple sexual partners can be using condom consistently which will reduce chances of getting infected with HIV. In this instance, results are more likely to say that men with multiple sexual partners are less likely to be HIV infected compared to those who have one sexual partner.

3.7.2 Heterosexual as the sole mode of HIV/AIDS transmission

The study also makes an assumption that, all HIV/AIDS infection is transmitted through heterosexual intercourse. Heterosexual intercourse accounts for the bulk of HIV/AIDS infections in Swaziland as is the case elsewhere within SSA, but not all cases. The increasing number of men who have sex with men in Swaziland might be a possible explanation of the mode of transmission (Addanki et al, 2008).

3.7.3 Type of male circumcision is not defined

The SDHS 2006/7 did not measure if male circumcision was either medical or tradition. As scientific evidence have shown that the medical male circumcision is protective against HIV infection, however, there is no scientific evidence suggesting that traditional male circumcision reduces the risk of HIV. The study could not establish if circumcised respondents were medical or traditional.

3.8 ETHICAL CONSIDERATION

Permission to use the dataset was sourced and obtained from Measure Demographic and Health Survey, ICF International, 11785 Beltsville Drive, Suite 300 Calverton, MD 20705 USA. This study is a secondary analysis. No personal information or names of respondents has been disclosed in the dataset, thus anonymity is guaranteed.

CHAPTER 4: RESULTS

4.1 BIVARIATE DESCRIPTIVE ANALYSIS

The first objective of the study was to estimate the prevalence of male circumcision and HIV infection among men in Swaziland. The results showed that 33.36% were uncircumcised and HIV positive. 25.85% were circumcised and HIV positive. Results also showed an estimated HIV prevalence of 32.56%.

Characteristics	**HIV Positive%**	**HIV negative%**
Circumcision Status		
Uncircumcised	413(33.36%)	825(66.64%)
Circumcised	38(25.85%)	109(74.15%)
Total	451(32.56%)	934(67.44%)
Age-group		
15-24	45(16.67%)	225(83.33%)
25-34	200(35.34%)	366(64.66%)
35+	206(37.52%)	343(62.48%)
Total	451(32.56%)	934(67.44%)
Marital Status		
Never married	109(24.55%)	335(75.45%)
Married	220(31.47%)	479(68.53%)
Formerly married	122(50.41%)	120(49.59%)
Total	451(32.56%)	934(67.44%)
Education		
None	54(37.24%)	91(62.76%)
Primary	143(34.13%)	276(65.87%)
Secondary	207(33.23%)	416(66.77%)
Higher	47(23.74%)	151(76.26%)
Total	451(32.56%)	934(67.44%)
Place of residence		

Rural	210(35.12%)	388(64.88%)
Urban	241(30.62%)	546(69.38%)
Total	451(32.56%)	934(67.44%)
Region		
Hhohho	121(32.28%)	232(65.72%)
Manzini	110(29.02%)	269(70.98%)
Shiselweni	82(33.06%)	166(66.94%)
Lubombo	138(34.07%)	267(65.93%)
Total	451(32.56%)	934(67.44%)
Religion		
Christian	155(28.70%)	385(71.30%)
Zionist	190(36.12%)	336(63.88%)
Other	106(33.33%)	212(66.67%)
Total	451(32.56%)	934(67.44%)
Wealth		
Poor	119(33.62%)	235(66.38%)
Middle	77(34.53%)	146(65.47%)
Rich	255(31.56%)	553(68.44%)
Total	451(32.56%)	934(67.44%)

Table 2: characteristics of respondents by HIV status

From the table above, the distribution of HIV status varies by socio-economic and demographic characteristics of the respondents. Age-groups show that the older the respondents are, the higher the proportion of those who are HIV positive (15-24=16.67%, 25-34=35.43%, 35+=37.52%). Formerly married respondents had the highest proportion of those who are HIV positive (50.51%), while those who were never married had the lowest proportion of those who are HIV positive. Results also showed that, the lower the education status among respondents, the higher the proportion of those who are HIV positive (no education= 37.24%, primary= 34.13%, secondary= 33.23% and higher= 23.74%). The proportion of those who are HIV was higher among respondents from rural areas (35.12%) compared to (30.62%) among

respondents from urban areas. The distribution of the proportion of those who are HIV positive respondents among the regions differs slightly (Hhohho= 32.28%, Manzini= 29.02%, Shiselweni= 33.06% and Lubombo= 34.07%). Christians had the lowest HIV positive proportion (28.70%), 36.12% for Zionist and 33.33% for other religions. Rich respondents had the lowest proportion of those who are HIV positive (36.56%).

4.2 BIVARIATE ANALYTICAL ANALYSIS

The second and third objectives were to measure the association between male circumcision and HIV infection, to measure the association between HIV infection and other socio-economic and demographic factors. Logistic regression was done for each independent variable (circumcision status, age-group, marital status, education, place of residence, region, religion and wealth status) against dependent variable (HIV status).

Table 3: Summary of significant and insignificant factors associated with HIV infection among men aged 15-49 in Swaziland

Characteristics	**Unadjusted Odds ratio**	**95 % Confidence Interval**
Circumcision Status		
Uncircumcised	1.00	
Circumcised	0.69	0.47-1.03
Age-group*		
15-24	1.00	
25-34	2.73*	1.89-3.93
35+	3.00*	2.09-4.32
Marital Status*		
Never married	1.00	
Married	1.41*	1.07-1.85
Formerly married	3.12*	2.24-4.35

Education*		
None	1.00	
Primary	0.87	0.58-1.29
Secondary	0.84	0.58-1.22
Higher	0.52	0.33-0.84
Place of residence		
Rural	1.00	
Urban	0.81	0.65-1.02
Region		
Hhohho	1.00	
Manzini	0.78	0.57-1.07
Shiselweni	0.94	0.67-1.33
Lubombo	0.99	0.73-1.34
Religion*		
Christian	1.00	
Zionist	1.40*	1.08-1.82
Other	1.24	0.92-1.67
Wealth		
Poor	1.00	
Middle	1.04	0.73-1.48
Rich	0 .91	0.69-1.18

***=overall significance of the variable *=category significance

The results show that, although there was no statistical significance, circumcised men were protected from HIV infection compared to uncircumcised (UOR=0.69, 95% CI=0.47-1.03). There was a statistical significant association between Age group and HIV infection. Age-groups showed that the older the respondents are, the higher the odds of HIV infection. Respondents aged 25-34 were more likely to be HIV infected compared to those aged 15-24 years (UOR=2.73, 95% CI=1.89-3.93). Those aged 35+ were more likely to be HIV infected to those aged 15-24 years (UOR=3.00, 95%CI=2.09-4.32).

There was a significant statistical association between marital status and HIV infection. Married respondents were more likely to be HIV infected compared to never married (UOR= 1.41, 95% CI=1.07-1.85). Formerly married respondents were more likely to be HIV infected compared to never married (UOR=3.12, 95% CI=2.24-4.35). Zionist respondents were more likely to be HIV infected compared to Christians (UOR=1.40, 95% CI=1.08-1.82). Educational status, place of residence, region and wealth status showed no statistical significance.

4.3 MULTIVARIATE ANALYSIS

Table 4: Adjusted odds ratios and 95% confidence interval of predictors of HIV infection in Swaziland

Characteristics	Adjusted Odds ratio	95 %Confidence Interval
Circumcision Status		
Uncircumcised	1.00	
Circumcised*	0.58	0.36-0.88
Age-group		
15-24	1.00	
25-34*	2.85	1.91-4.24
35+*	3.69	2.36-5.78
Marital Status		
Never married	1.00	
Married	0.81	0.58-1.23
Formerly married*	2.01	1.39-2.92
Education		
None	1.00	
Primary	1.01	0.66-1.52
Secondary	1.05	0.69-1.59
Higher	0.65	0.38-1.12

Place of residence		
Rural	1.00	
Urban	0.74*	0.55-0.99
Region		
Hhohho	1.00	
Manzini	0.81	0.58-1.12
Shiselweni	0.92	0.67-1.37
Lubombo	0.89	0.64-1.23
Religion		
Christian	1.00	
Zionist	0.37*	1.01-1.85
Other	1.06	0.76-1.46
Wealth		
Poor	1.00	
Middle	0.95	0.65-1.38
Rich	0.87	0.61-1.23

The adjusted odds ratio reported in Table 4 implies that the result given of the effect of particular variable on HIV status have taken into consideration the other variables that are together with it in the model that could also have effect on the outcome. Circumcised respondents were protected against HIV infection (AOR=0.65, 95% CI=0.47-0.91) compared to uncircumcised respondents and the association was statistically significant at 0.05. The older the respondents were the higher the likelihood of HIV infection. Respondents aged 25-34 were 2.85 times more likely to be HIV infected (AOR=2.85, 95% CI=1.91-4.24), those aged 35 years or older were 3.69 times more likely to be HIV infected (AOR=3.69, 95% CI=2.36-5.78) compared to those who were aged 15-24.

Respondents who were formerly married were more 2.01 times more likely to be HIV infected (AOR=2.01, 95% CI=1.39-2.92) compared to never married respondents.

Respondents who were residing in urban areas were 0.74 less likely to be infected (AOR=0.74, 95% CI=0.55-0.99) compared to respondents who were residing in rural areas. With regards to religious affiliation, respondents who were Zionist were 0.37 less likely to be infected (AOR=0.37, 95% CI=1.01-1.85) compared to Christians. Variable education, region and wealth status were statistically insignificant.

CHAPTER 5: DISCUSSION OF RESULTS

In an effort to improve our understanding of the ways to reduce the incidence of HIV/AIDS epidemic in Swaziland, this study examined the association between male circumcision and HIV infection and provides socio-economic and demographic analysis of the association between circumcision and HIV infection on a national probability sample in Swaziland. Given the nature of the study design of the study, temporality is an issue, therefore the study results should be interpreted in light of this limitation. This study showed a low male circumcision prevalence and high HIV prevalence in Swaziland. About 33.36% were uncircumcised and HIV positive, while 25.85% were circumcised and HIV positive. This results shows a similar trend to a study conducted by Auvert et al (2005) in Orange farm South Africa.

Although before adjusting for socio-economic and demographic factors results showed no statistical significance between male circumcision and HIV infection (UOR=0.69, 95% CI=0.47-1.03). However, after adjusting for socio-economic and demographic factors, results clearly show that male circumcision has a protective effect in HIV infection in Swaziland (AOR=0.65, 95% CI=0.47-0.91). The findings in this study resemble the findings of Weiss, (2000) which concluded that male circumcision has a protective effect against HIV infection. The net effects of all other socio-economic and demographic factors examined in this study showed that male circumcision has a protective effect against HIV infection and HIV positive men were less likely to be circumcised. These findings are also similar to three famous randomized controlled trials that focused on male circumcision and HIV infection (Auvert et al. 2005; Bailey, 2006; Gray et al, 2007) that were conducted in orange farm, South Africa, Kisumu Kenya and Ragai Uganda. Three cross-sectional studies of (Djamba and Davis, 2007; Addanki, et al, 2008; Connolly, et al, 2004, conducted in Kenya, various countries of Southern Africa and South Africa respectively concluded that male circumcision reduces the risk of contracting HIV infection by up to 60%. These findings add to the

large body of research literature indicating that male circumcision has a protective effect against HIV infection among men when adjusting for socio-economic and demographic factors. The extent that male circumcision is protective, could also be explained by the high prevalence of HIV in Swaziland like in South Africa especially in KwaZulu-Natal which dominated by Zulu where male circumcision is not traditionally practiced relative to the Eastern Cape and Limpopo where circumcision is traditionally practiced and HIV prevalence has been observed to be lower.

Nonetheless, not all studies that have been done looking on the association between male circumcision and HIV infection have detected the protective effects. For example a study conducted in Cape Town, South Africa by Connolly, et al, (2008) found an insignificant statistical association between male circumcision and HIV infection. This is a concern, and has implications for the possible adoption of the mass male circumcision strategy both as a public health policy and an HIV prevention strategy. However, most studied have shown an inverse of what Connolly et al (2008) have found because the study was based on a cross-sectional study design which cannot show a temporal relationship, and information on circumcision was self-reported and might have been influenced by imperfect recall and influences of social desirability as to when and where circumcision had taken place (Connolly et al, 2008)

It is also interesting to note that the results showed that age was a predicting factor for HIV infection. Bivariate descriptive results showed that the older the respondents are, the higher the proportion of those with HIV infection (15-24=16.67%, 25-34=35.43%, 35+=37.52%). However, in the multivariate model, the results show that, the older the respondents were the higher the likelihood of HIV infection. Respondents aged 25-34 were 3.71 times more likely to be HIV infected (AOR=3.71, CI=2.79-4.95), those aged 35 years or older were 4.38 times more likely to be HIV infected (AOR=4.38, CI=3.13-6.12) compared to those who were aged 15-24 when other socio-economic and demographic factors are controlled for. The results therefore concur with other studies that have been carried out in other African countries. The most complete picture of the effect of age is provided by the study of

(Andersson and Cockcroft 2011), which estimated that in individuals aged 15 to 24 years for sero-conversion, the risks of HIV infection increased on average by 33% per decade. Similarly to the Study of Ibia, (2008) which concluded that age group 15-24 years are more vulnerable to HIV infection compared to other groups because they engage in risky behaviours such as alcohol or drug abuse.

It is always expected that individuals who are married are less at risk of HIV infection because they are less likely to engage in risky sexual behaviors. However, results from this study found that at bivariate descriptive analysis, Formerly married respondents had the highest HIV positive proportion (50.51%), while those who were never married had the lowest HIV proportion.The study also revealed that married and formerly married couples had an increasing risk of HIV infection before adjusting for socio-economic and demographic factors. Even though married men did not attain statistical significance after adjusting for socio-economic and demographic factors. This suggests that more efforts combined with male circumcision are still required to fight HIV virus not only among single men but married men also need to be involved. Although some few studies (Garanne, 2011) found that there is no statistical significance between marriage and HIV infection, based on the results of the study there is enough evidence to suggest that marriage is no longer protective against HIV infection since partners often become infected before they marry and marriage is also not protective in couples that experience long separations due to migrant employment.

Generally, rural communities maybe regarded as being more at risk than urban communities. According to UNAIDS, (2012) levels of STI tend to be higher in rural areas because of poorer access to STI treatment and levels of HIV knowledge tend to be lower in rural areas compared to urban areas. Numerous studies that investigated the association between male circumcision and HIV infection found place of residence and to be associated with HIV infection. Bivariate descriptive results shown found that there was high proportion of HIV among rural residents compared to urban residents.

This study found that respondents who were residing in urban areas were protected from HIV infection after adjusting for socio-economic and demographic factors compared to respondents who were residing in rural areas (AOR=0.74, CI=0.55-0.99). Though this findings contradicts with findings by (Moyo, et al, 1993; Mugwanya, et al, 2011; Reither, al, 2004) which concluded that men from rural were protected from HIV infection compared to urban men who resided in urban areas, but agrees with studies by Connolly, et al, (2008).

With regards to religious affiliation, respondents Zionist religious group were more likely to be HIV infected compared to Christians before adjusting for socio-economic and demographic factors (UOR=1.40, 95% CI= 1.08-1.82). However, after adjusting for socio-economic and demographic factors Zionist were protected against HIV infection compared to Christians. AOR=0.37, 95% CI=1.01-1.05). In summary, it is not clear whether church members in general are less likely to be HIV positive than non-members. There is evidence from this study, however to suggest that members of Zionists churches are less likely to be infected with HIV compared to other Christian churches.

Vandemoortele and Delamonica (2002) find that HIV is significantly decreasing from individuals with higher educational attainment. On the other hand Vandemoortele and Delamonica (2002) also find that some educated people have a higher risk of HIV infection because they are more likely to have several sexual partners. Although education have been found in some studies to be a risk factor for HIV infection and not found to be a risk factor in some studies. Results of this study showed that education is not a significant predictor for HIV infection both before and after adjusting for socio-economic and demographic factors. This creates confusion because educated people are considered well informed with severe risk of HIV infection. Furthermore, educated people also adopt safe sexual behaviours as compared to uneducated one.

The region and wealth status had showed no statistical significance; therefore they had no effect on HIV infection. This again is contrary to what is perceived in the current literature that poor people particularly young girls trade for sex with rich people. This therefore put them at very high risk of contracting the virus.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study showed low male circumcision prevalence and high HIV prevalence. The study also showed that male circumcision is protective against HIV infection among circumcised men compared to uncircumcised men in Swaziland as found by some other studies elsewhere. Age and place of residence are critical risk factors for HIV infection.

6.2 Recommendation

The findings from this study are intended to inform policy makers, health educators, planners and other health professionals about low male circumcision and high HIV prevalence. This way, they can initiate policies and programs that can expand male circumcision among men, which will in turn reduce number of new infection. The study therefore makes the following recommendations aimed at reducing number of new infections.

It is recommended that the Swaziland government expand its initiative launched in 2008 to voluntary circumcise HIV negative males aged 15 to 49 years (UNAIDS, 2012) especially those who are formerly married and those who are married aged 35 years and more who reside in rural areas. More circumcision rates will help reduce hundreds of new infection and thousands of deaths related to HIV/AIDS in Swaziland since the vaccine or cure seems impossible to be discovered for now.

Although male circumcision alone cannot be regarded as a unique approach to HIV prevention because it does not fully protect against HIV infection in heterosexual relations. However, this is equally true of any other method, including condoms and

microbicides. It is therefore recommended that other protective method such as abstinence, faithfulness and condom use be expanded and used at all times

While the study recommend that scaling up of male circumcision as a protective method be used to combat the spread of HIV in Swaziland, the study also recognize sex and HIV/AIDS education as a priority as it will help people to understand risk factors of HIV infection and how to reduce them.

REFERENCES

Addanki, K. C, et al. (2008). A practice for all seasons: male circumcision and the prevention of HIV transmission.

Andersson, N. and Cockcroft, A (2011). "Male circumcision, attitudes to HIV prevention and HIV status: a cross-sectional study in Botswana, Namibia and Swaziland." AIDS Care**24**(3): 301-309.

Auvert B. et al (2005), 'Randomized, Controlled Intervention Trial of Male Circumcision for Reduction of HIV Infection Risk: The ANRS 1265 Trial', PloS Medicine 2(11)

Bailey, RC, et al., (2007) "Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial." The Lancet**369**(9562): 643-656.

Boerma and Weier, (2005) "Integrating demographic and epidemiological approaches to research on HIV/AIDS": The proximate determinants framework, Journal of infectious disease,191 (suppl 1).

Central Statistical Office (CSO) [Swaziland] and Macro International Inc. 2008. *Swaziland Demographic andHealth Survey 2006-07.* Mbabane, Swaziland: Central Statistical Office and Macro International Inc.

Connolly C, et al., (2004) "Epidemiology of HIV in South Africa – results of a national, community-based survey". South African Medical Journal; 94: 776 – 781.

Connolly C, et al., (2008) Male circumcision and its relationship to HIV infection in South Africa: South African Medical Journal, **98**(10)

De Bruyn, G, et al., (2009). "Male circumcision for HIV prevention: developments from sub-Saharan Africa." Expert Review of Anti-infective Therapy**8**(1): 23-31.

Djamba, Y. K. and Davis L. S, (2007). "The protective effect of male circumcision on HIV infection in a sample of Kenyan men."African Journal of AIDS Research**6**(3): 199-204.

Dorrington RE et al., (2002). "HIV/AIDS profile of the Provinces of South Africa: Indicators for 2002". Cape Town: Centre for Actuarial Research, Medical Research Council and the Actuarial Society of South Africa.

Doyle, S. M., et al. (2010). "The Impact of Male Circumcision on HIV Transmission."The Journal of Urology**183**(1): 21-26.

Drain, P.D, et al., (2006). "Male circumcision, religion, and infectious diseases: an ecologic analysis of 118 developing countries." BMC Infectious Diseases**6**(1): 172.

Edlyne E. A, (2009) "Women, education and work in Nigeria",Educational Research and Review**4** (4): 127-134.

Freeman E, et al., (2004). Factor's affecting HIV concordance in married couples in four African cities. AIDS; **18** (12): 7-21.

Gillespie, S.et al. (2007). "Is poverty or wealth driving HIV transmission?" AIDS**21**: S5-S16.

Gillum, R and Holt, C. (2010). "Associations Between Religious Involvement and Behavioral Risk Factors for HIV/AIDS in American Women and Men in a National Health Survey." Annals of Behavioral Medicine**40**(3): 284-293.

Gray RH, , et al., (2000). “Male circumcision and HIV acquisition and transmission: cohort studies in Rakai, Uganda”. AIDS **34**(2): 354-359

Gregson, S. T. et al., (2001). School education and HIV control in sub-Saharan Africa: from discord to harmony?, John Wiley & Sons, Ltd. New York

Gruskin, S. (2007)."Male Circumcision, in so Many Words."Reproductive Health Matters**15**(29): 49-52.

Herman-Roloff, A., E. Llewellyn, et al. (2011)."Implementing Voluntary Medical Male Circumcision for HIV Prevention in Nyanza Province, Kenya: Lessons Learned during the First Year."PLoS ONE**6**(4).

Hosegood, V, et al. (2007). "Revealing the full extent of households' experiences of HIV and AIDS in rural South Africa." Social Science & Medicine **65**(6): 1249-1259.

Johnson, K, (2006). "Risk Factors for HIV Infection in a National Adult Population: Evidence From the 2003 Kenya Demographic and Health Survey." JAIDS Journal of Acquired Immune Deficiency Syndromes**42**(5): 627-636.

Jones, L, (2006). “Sexual discourse and decision-making by urban youth in AIDS-afflicted Swaziland”, African Journal of AIDS Research, 5(2): 145–157.

Kahn J G, et al., (2006). “Cost-Effectiveness of Male Circumcision for HIV Prevention in a South African Setting” Plos medicine **3(12)**: 2349-2358.

Knocke, D, et al., (2002) Statistics for Social Data Analysis, F:E Peacock Publishers: Itasca.

Kumwenda, N, (2006). “HIV Incidence among Women of Reproductive Age in Malawi and Zimbabwe”, sexually transmitted diseases, **33**(11): 646-651.

Lau, J. T., et al., (2003). "The relationship between condom use, sexually transmitted diseases, and location of commercial sex transaction among male Hong Kong clients."AIDS**17**(1): 105-112.

Lissouba, P., et al., (2011). "Adult male circumcision as an intervention against HIV: An operational study of uptake in a South African community (ANRS 12126)." BMC Infectious Diseases**11**(1): 253.

Lopman, B, et al., (2008). "HIV incidence in 3 years of follow-up of a Zimbabwe cohort—1998–2000 to 2001–03: contributions of proximate and underlying determinants to transmission." International Journal of Epidemiology **37**(1): 88-105

Malamba SS, et al., (2005). Couples at risk:HIV-1 concordance and discordance among sexual partners receiving voluntary, counselling and testing in Uganda. Journal of Acquired Immune Deficiency Syndromes; 39 (5): 576-80.

Mishra, V, et al., (2007). "HIV infection does not disproportionately affect the poorer in sub-Saharan Africa." AIDS**21**(17).

Moyo, I.M., et al., (1993)., "Behaviour patterns that may predispose to HIV infection or further transmission and possible intervention strategy in the city of Harare. Part II. Central AfricanJournal of Medicine**39**(11): 217-2291.

Mugwanya, K. K, et al., (2011). "Circumcision of Male Children for Reduction of Future Risk for HIV: Acceptability among HIV Serodiscordant Couples in Kampala, Uganda." PLoS ONE**6**(7): 222-254.

Reither, E.N et al., (2004). "Educational Status and HIV Discrepancies in Cameroon: Are uneducated women at reduced Risk of HIV Infection?"African Population Studies Supplement, 23: 127-140.

Serwadda D, et al., (1995). The social dynamics of HIV transmission as reflected through discordant couples in rural Uganda. AIDS; **7** (2) 12-34.

Shisana O, et al., (2004). “Marital status and risk of HIV infection in South Africa.”, South African Medical Journal :**7**(94)

Soderberg S, et al., (1994). “Prevalence of HIV-1 infection in rural, semi-urban and urban villages in southwest Tanzania: estimates from a blood-donor study”. AIDS; **8** (7): 971-6.

UNAIDS (2010) HIV country report: World Health Organization, New York.

UNAIDS. (2010). Report on Global AIDS epidemic. http://www.unaids.org/en/HIV data/ Global Report/default.asp, Downloaded 15 September 2011.

Vandemoortele, J and Delamonica, E (2002)The "Education Vaccine" Against HIV: www.tc.columbia.edu/cice/Issues/03.01/31vandemoortele_delamonica.pdf, Downloaded 23 May 2011.

Weiss, H. A., et al., (2008). "Male circumcision for HIV prevention: from evidence to action?"AIDS**22**(5): 567-574

WHO, (2012) Swaziland Country report on monitoring the political declaration on HIV/AIDS, Mbabane: The kingdom of Swaziland

APPENDIX I: Do file

```
***Research Report***


***Merging data "Male recorde and HIV sample"


use "C:\Research Report\Research Project\Data\Swaziland\Male\szmr51fl.dta", clear

duplicates r  mv001 mv002 mv003

rename  mv001 cluster_number

rename mv002 household_number

rename mv003 respondent_number

sort cluster_number household_number respondent_number

save SwaziMale1

clear

use "C:\Research Report\Research Project\Data\Swaziland\HIV\SZar51fl.dta", clear

rename hivclust cluster_number

rename hivnumb household_number

rename hivline respondent_number

sort cluster_number household_number respondent_number

save C:\SwaziHIV1


merge m:1 cluster_number household_number respondent_number using "C:\Documents and
Settings\MREE\Desktop\Research Report\Data\Swaziland\HIV\Swaziland1HIV.dta"

t

tab _merge

clear

use"use "C:\Documents and Settings\MREE\Desktop\Research Report\Data\Swaziland\RR final
merged.dta"
```

Cleaning Data for analysis

Variables to keep for analysis

keep mcaseid mv000 cluster_number household_number respondent_number hiv01 hiv02 hiv03 hiv05 _merge mcaseid mv013 mv025 mv035 mv106 mv130 mv190 mv483 mv501 mv505 mv525 mv536 mv714 mv716 mv761 mv101 sm802 sm804

Renaming Variables

rename hiv03 HIV_status

rename mv013 Age_groups

rename mv025 Place_of_residence

rename mv035 Sexual_partners

rename mv106 Education

rename mv130 Religion

rename mv190 Wealth

rename mv483 Circumcision_status

rename mv501 Marital_status

rename mv505 Sexual_partners2

rename mv525 Age_at_1stintercourse

rename mv536 Recent_sexual_activity

rename mv716 Employment

rename mv761 Condom_use

rename mv101 Region

rename sm802 age_at_circumcision

rename sm804 Reason_4_circumcision

Recording and labelling variables for analaysis

Outcome Variable

tab HIV_status

```
label define HIV_status 1"HIV_Positive" 0"HIV_Negative
label value HIV_status HIV_status
label var HIV_status "HIV_status"
tab HIV_status

***predictors***
tab Circumcision_status
label define Circumcision_status 0"Uncircumcised" 1"Circumcised"
label value Circumcision_status Circumcision_status
label var Circumcision_status "Circumcision_status"
tab Circumcision_status

*Agegroups*
tab Age_groups
replace Age_groups =1 if Age_groups==2
replace Age_groups =2 if Age_groups==3
replace Age_groups =2 if Age_groups==4
replace Age_groups =3 if Age_groups==5
replace Age_groups =3 if Age_groups==6
replace Age_groups =3 if Age_groups==7
label define Age_groups 1"15-24" 2"25-34" 3">34"
label value Age_groups Age_groups
label var Age_groups  "Age_groups"
tab Age_groups

*Place of residence*
tab Place_of_residence
label define Place_of_residence 1"Rural" 2"Urban"
```

```
label value Place_of_residence Place_of_residence

labe var Place_of_residence "Place_of_residence"

tab Place_of_residence


*Education*

tab Education

label define Education 0"No Education" 1"Primary" 2"Secondary" 3"Higher"

label value Education Education

label var Education "Education"

tab Education


*Region*

tab Region

label define Region 1"Hhohho" 2"Manzini" 3"Shiselweni" 4"Lubombo"

label value Region Region

label var Region "Region"

tab Region


*Wealth status*

tab Wealth

replace Wealth =1 if Wealth==1

replace Wealth =1 if Wealth==2

replace Wealth =2 if Wealth==3

replace Wealth =3 if Wealth==4

replace Wealth =3 if Wealth==5

label define Wealth 1"Poor" 2"Middle" 3"Rich"

label value Wealth Wealth

label var Wealth "Wealth"
```

```
tab Wealth


*Marital status*
tab Marital_status
replace Marital_status =2 if Marital_status==2
replace Marital_status =2 if Marital_status==3
replace Marital_status =2 if Marital_status==4
replace Marital_status =2 if Marital_status==5
label define Marital_status 0"Never married" 1"Married" 2"Formerly married"
label value Marital_status Marital_status
label var Marital_status "Marital_status"
tab Marital_status

tab age_at_circumcision

br Age_at_1stintercourse
recode Age_at_1stintercourse 1/17=1 18/50=2
replace Age_at_1stintercourse=. if Age_at_1stintercourse==96
label define Age_at_1stintercourse 0"Not had intercourse" 1"Less than 17 yrs" 2"17 yrs or more"
label value Age_at_1stintercourse Age_at_1stintercourse
label var Age_at_1stintercourse "Age_at_1stintercourse"
tab Age_at_1stintercourse



*Religion*
*g1
replace Religion=0 if Religion==2
```

```
replace Religion=0 if Religion==3

replace Religion=0 if Religion==4

replace Religion=0 if Religion==5

replace Religion=0 if Religion==7


*g2

replace Religion=12 if Religion==6


*g3

replace Religion=2 if Religion==1

replace Religion=2 if Religion==8

replace Religion=2 if Religion==9

replace Religion=2 if Religion==10

replace Religion=2 if Religion==96

recode Religion 12=1

label define Religion 0"Grp1" 1"Grp2" 2"Grp2"

label value Religion Religion

tab Religion


*recent sexual activity*


tab Recent_sexual_activity

replace Recent_sexual_activity =1 if Recent_sexual_activity==3

tab Recent_sexual_activity


***Age_at_1stintercourse***

recode Age_at_1stintercourse 0=.
```

Bivariate descriptive

tab HIV_status Circumcision_status if Recent_sexual_activity==1, col

tab HIV_status Age_groups if Recent_sexual_activity==1, col

tab HIV_status Marital_status if Recent_sexual_activity==1, col

tab HIV_status Education if Recent_sexual_activity==1, col

tab HIV_status Place_of_residence if Recent_sexual_activity==1, col

tab HIV_status Region if Recent_sexual_activity==1, col

tab HIV_status Religion if Recent_sexual_activity==1, col

tab HIV_status Wealth if Recent_sexual_activity==1, col

Bivariate analytical

xi: logistic HIV_status i.Circumcision_status if Recent_sexual_activity==1

xi: logistic HIV_status i.Age_groups if Recent_sexual_activity==1

xi: logistic HIV_status i.Marital_status if Recent_sexual_activity==1

xi: logistic HIV_status i.Education if Recent_sexual_activity==1

xi: logistic HIV_status i.Place_of_residence if Recent_sexual_activity==1

xi: logistic HIV_status i.Region if Recent_sexual_activity==1

xi: logistic HIV_status i.Religion if Recent_sexual_activity==1

xi: logistic HIV_status i.Wealth if Recent_sexual_activity==1

Multivariate analysis

xi: logistic HIV_status i.Circumcision_status i.Age_groups i.Marital_status i.Education i.Place_of_residence i.Region i.Religion i.Wealth if Recent_sexual_activity==1

APPENDIX II: Bivariate descriptive analysis

HIV_status	Circumcision_status Uncircumc	Circumcis	Total
HIV_Negative	825 66.64	109 74.15	934 67.44
HIV_Positive	413 33.36	38 25.85	451 32.56
Total	1,238 100.00	147 100.00	1,385 100.00

HIV_status	Age_groups 15-24	25-34	>34	Total
HIV_Negative	225 83.33	366 64.66	343 62.48	934 67.44
HIV_Positive	45 16.67	200 35.34	206 37.52	451 32.56
Total	270 100.00	566 100.00	549 100.00	1,385 100.00

HIV_status	Marital_status Never mar	Married	Formerly	Total
HIV_Negative	335 75.45	479 68.53	120 49.59	934 67.44
HIV_Positive	109 24.55	220 31.47	122 50.41	451 32.56
Total	444 100.00	699 100.00	242 100.00	1,385 100.00

HIV_status	Education				
	No Educat	Primary	Secondary	Higher	Total
HIV_Negative	91	276	416	151	934
	62.76	65.87	66.77	76.26	67.44
HIV_Positive	54	143	207	47	451
	37.24	34.13	33.23	23.74	32.56
Total	145	419	623	198	1,385
	100.00	100.00	100.00	100.00	100.00

HIV_status	Place_of_residence		
	Rural	Urban	Total
HIV_Negative	388	546	934
	64.88	69.38	67.44
HIV_Positive	210	241	451
	35.12	30.62	32.56
Total	598	787	1,385
	100.00	100.00	100.00

HIV_status	Region				
	Hhohho	Manzini	Shiselwen	Lubombo	Total
HIV_Negative	232	269	166	267	934
	65.72	70.98	66.94	65.93	67.44
HIV_Positive	121	110	82	138	451
	34.28	29.02	33.06	34.07	32.56
Total	353	379	248	405	1,385
	100.00	100.00	100.00	100.00	100.00

HIV_status	religion Grp1	Grp2	Grp2	Total
HIV_Negative	385 71.30	336 63.88	212 66.67	933 67.41
HIV_Positive	155 28.70	190 36.12	106 33.33	451 32.59
Total	540 100.00	526 100.00	318 100.00	1,384 100.00

APPENDIX III: Bivariate analytical

Logistic regression — Number of obs = 1385; LR chi2(1) = 3.50; Prob > chi2 = 0.0614; Log likelihood = -872.24378; Pseudo R2 = 0.0020

HIV_status	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ICircumci~1	.6964036	.1377463	-1.83	0.067	.4726026	1.026185

Logistic regression — Number of obs = 1385; LR chi2(2) = 42.92; Prob > chi2 = 0.0000; Log likelihood = -852.53051; Pseudo R2 = 0.0246

HIV_status	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_IAge_grou~2	2.732239	.5067466	5.42	0.000	1.899533	3.929981
_IAge_grou~3	3.002913	.5572527	5.93	0.000	2.087299	4.32017

Logistic regression — Number of obs = 1385; LR chi2(2) = 46.88; Prob > chi2 = 0.0000; Log likelihood = -850.55203; Pseudo R2 = 0.0268

HIV_status	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
IMarital~1	1.41158	.1935076	2.51	0.012	1.078991	1.846686
IMarital~2	3.124618	.5292464	6.73	0.000	2.241923	4.354848

Logistic regression — Number of obs = 1385; LR chi2(3) = 9.43; Prob > chi2 = 0.0241; Log likelihood = -869.27884; Pseudo R2 = 0.0054

HIV_status	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_IEducatio~1	.8731213	.1748941	-0.68	0.498	.5896186	1.292939
_IEducatio~2	.8385417	.160734	-0.92	0.358	.5759224	1.220915
_IEducatio~3	.5245279	.1256752	-2.69	0.007	.3279619	.8389069

Logistic regression

Number of obs	1385
LR chi2(1)	3.12
Prob > chi2	0.0775
Log likelihood = -872.43423	Pseudo R2 = 0.0018

HIV_status	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_IPlace_of~2	.8155242	.0941219	-1.77	0.077	.6504251	1.022531

Logistic regression

Number of obs	1385
LR chi2(3)	3.12
Prob > chi2	0.3734
Log likelihood = -872.43276	Pseudo R2 = 0.0018

HIV_status	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_IRegion_2	.7840487	.1249154	-1.53	0.127	.573758	1.071414
_IRegion_3	.9471274	.1662041	-0.31	0.757	.671487	1.335916
_IRegion_4	.9909927	.1521311	-0.06	0.953	.7334985	1.33888

Logistic regression

Number of obs	1384
LR chi2(2)	6.81
Prob > chi2	0.0332
Log likelihood = -870.19378	Pseudo R2 = 0.0039

HIV_status	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_IReligion_1	1.40457	.1846802	2.58	0.010	1.085483	1.817455
_IReligion_2	1.241935	.1891658	1.42	0.155	.9213995	1.673979

Logistic regression

Number of obs	1385
LR chi2(2)	0.94
Prob > chi2	0.6253
Log likelihood = -873.5235	Pseudo R2 = 0.0005

HIV_status	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_IWealth_2	1.041499	.1877445	0.23	0.822	.7315064	1.482858
_IWealth_3	.9106174	.1234838	-0.69	0.490	.6980865	1.187853

APPENDIX IV: Multivariate analysis

Logistic regression

Number of obs	= 1384
LR chi2(16)	= 105.73
Prob > chi2	= 0.0000
Pseudo R2	= 0.0605

Log likelihood = -820.73332

HIV_status	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_ICircumci~1	.5816202	.1218072	-2.59	0.010	.385811	.8768078
_IAge_grou~2	2.846153	.5802189	5.13	0.000	1.908673	4.244092
_IAge_grou~3	3.695431	.8446957	5.72	0.000	2.361015	5.784041
IMarital~1	.8057094	.1385714	-1.26	0.209	.5751524	1.128688
IMarital~2	2.012357	.3814149	3.69	0.000	1.387942	2.917687
_IEducatio~1	1.005274	.2110537	0.03	0.980	.6661587	1.51702
_IEducatio~2	1.049189	.2214382	0.23	0.820	.693749	1.586739
_IEducatio~3	.6548478	.1783527	-1.55	0.120	.3839805	1.11679
_IPlace_of~2	.7393271	.1110084	-2.01	0.044	.5508464	.9922993
_IRegion_2	.8107157	.1354271	-1.26	0.209	.5843573	1.124757
_IRegion_3	.9520259	.1775082	-0.26	0.792	.6606015	1.372012
_IRegion_4	.8892584	.1462756	-0.71	0.476	.6441877	1.227562
_IReligion_1	1.368332	.2109862	2.03	0.042	1.011446	1.851144
_IReligion_2	1.055468	.175619	0.32	0.746	.7617528	1.462434
_IWealth_2	.9482145	.1838545	-0.27	0.784	.6484291	1.386598
_IWealth_3	.8736758	.1607733	-0.73	0.463	.6091338	1.253106

Examiner's comments on research report in Demography and Population Studies submitted by Richard Owen Machava titled *Male circumcision and HIV infection in Swaziland: Is there an association?*

This report explores the association between HIV infection, male circumcision and other socio-economic and demographic variables in Swaziland. The research question is a timely one, reflecting the current debate on the scale-up of bio-behavioral interventions (like MMC) for addressing HIV infection in high prevalence countries. The candidate has demonstrated use of research methods to answer empirical questions, but revision to the report is needed. My more specific comments follow below:

Chapter 1: Introduction

- Correct for inconsistent reporting of HIV estimates. For example, page 2, first paragraph reports 2008 statistics (25.9% prevalence among 15-49) and the second paragraph reports 2011 statistics (12.67% for adults and 1.59% for children). Or perhaps just clarify that the former is the 2008 estimates for the population of reproductive age, the latter for the general population.
- Page 4, last sentence: temper the statement "since the vaccine or cure seems impossible to be discovered for now." I'd say "unlikely" not "impossible". We seem to be getting closer.
- In general, much of this chapter is quite repetitious – for example, sections 1.1, 1.2 and 1.3 provide the same information. I suggest that it be revised and streamlined.

Chapter 2: Literature Review and Conceptual Framework

- 2.1.1 – Very nice review of the religious background of MC.
- P 8 – Clarify what the studies say about how MMC reduces HIV infection up to 60%. For example, is that a 60% reduction per act of sex to heterosexual male partners? To the woman? At the population level?
- 2.1.3 – The review of the literature on socio-economic and demographic factors associated with HIV infection needs to be expanded. The only demographic factor that is addressed is area of residence. I suggest that this section be more thoroughly developed – among other things, it should include a discussion of age/sex-prevalence, marital status, religion, wealth, etc. – i.e., what is known about the *other variables* that are included in the analysis (as outlined on p 11, last sentence is section 2.2). Also, the second paragraph talks about HSV-2, but that is a medical vulnerability to HIV infection, not a socio-economic/demographic one.
- 2.2 – Conceptual framework. P 12 says, "The model also suggests that religion influences HIV infection through male circumcision directly". But according to the figure, religion has both a direct and indirect influence. Please clarify.
- P 13 – States that a huge body of literature has found a positive, protective effect of MMC on HIV infection and that this study expects to find the same. While originality is not a prerequisite for this thesis, I do think that a few sentences should be devoted to how and why this study is different as well as a contribution to the advancement of knowledge on the subject.

Chapter 3: Methodology

- Independent variable – "are you circumcised?" It is not clear from this question if there is a difference between medical male circumcision and traditional circumcision. The former has been shown to be protective against HIV, not the latter. I recommend that the candidate address this issue. If it is unknown, than that should be stated as a limitation (although if traditional circumcision is not practiced widely in Swaziland, or in any of the four primary regions, this can be mentioned).
- P 15, paragraph 2 and 3 – variables are not relabeled into "levels" but rather "categories". Revise for word choice.
- 3.7.2 - P 18 – it is not "homosexuals" (as a social category) but same sex sexual behavior that increases risk for HIV infection. I suggest replacing "homosexual" with "men who have sex with men". The latter is the more appropriate, recognized term.

Chapter 4: Results

- 4.1 - P 21 – revise language. It should say "the proportion of those who are HIV positive" not "HIV proportion". This comments holds for various places in the interpretation of the results.
- P 25 – "Respondents who were residing in urban areas were protected from HIV infection compared to respondents who were residing in rural areas." This is oddly worded. I suggest interpreting the statistic as an odds ratio, i.e., that those living in urban areas were .74 less likely than those living in rural areas to be infected with HIV. Same applies for the interpretation of the religion variable.

Chapter 5: Discussion of Results

- P 26, first paragraph, last sentence – should the statement not be the reverse? That UNAIDS found *lower MC* and *higher HIV prevalence* in Southern African countries than in Western African countries?
- P 27 – Connolly et al Cape Town study (2008) – more should be said about what they found, especially since it is counter to the results in this study and those of others cited in the report.
- P 27, second paragraph – more should be said about the age effect. The last sentence compares the study results with that of studies carried out elsewhere in the "developed World and Asia". But what are those results?
- Paragraph 3 – a greater discussion is needed about the marriage results. Notably, the interpretation of the results should include a discussion about what is known about multiple concurrent partnerships in SSA, condom use (or lack thereof) in marriage, and other marital strategies for averting HIV infection, such as divorce. As is, the discussion is decontextualized.
- P 28 – discussion of education, wealth and region. Again, needs to engage more substantially with the literature, in this case on poverty and HIV. Mention is made to studies that "young girls trade sex for money", but no citations are provided.

- Overall, much of this section just repeats the previous chapter (Chapter 4). The Discussion section should go further than mere reporting and tell us what the results mean and what contributions the study makes to the topic at hand. This will also be strengthened by addressing my previous comment about further developing the literature review (Chapter 4) to include studies that have used some of the same variables as this report.
- Return to the limitations of the study – that in light of the results, temporality is an issue as the data are cross-sectional. This should perhaps be mentioned in the opening paragraph of this discussion so that the results are interpreted in light of the limitations.

Chapter 6: Conclusion and Recommendations

- This section needs revision for recommendations more closely tailored to the study results. As is it is a bit generic. For example, if "age and place of residence" are "critical risk factors for HIV infection" (p 29, section 6.1), than shouldn't they also be considered when discussing policy recommendations? For example, maybe MCC campaigns need to target certain age groups or certain regions of the country? Relatedly, it is not clear why the study is advocating for the continued use of condoms, monogamy, etc., when these sexual behavior variables were not featured in the analysis (p 17, section 3.7.1 Limitations). In sum, the conclusion/recommendations should be more firmly grounded in the study results.
- P 30 – the pronoun "we" should be replaced either with "I" or the third person singular (i.e., "it", referring to the study).

Other

- Definition of terms: The second definition of prevalence: "This is the number of HIV status that has ever occurred to the study population at the time they are being studied" is poorly worded and unclear.
- The report needs a thorough editing to correct for improper use of grammar, use of terms, etc.

Thank you for the opportunity to examine the thesis of the above named candidate. I have read through the report and filled the examiner's report attached. However, I am of the opinion that the following details will help improve the quality of the thesis:

1. The topic is a good one and very relevant in the context of Swaziland with a very high prevalence of HIV and male circumcision. An understanding of the connection between the two issues constitute a major public health concern in the country.
2. There is the need to improve on the statement of problem section. It is not very convincing and need to show the gap in research. If the connection is well established as presented, then what is gap the current effort is aimed at filling?
3. The claim in page 4 on justification needs to be referenced and expatiated...*Ecological studies are subject to incorrect sampling and ecological fallacy*
4. Objective 4 needs to be deleted, it is outside the scope of the current research.
5. The conceptual framework on page 12 is dis-jointed and not sure it captures the work well.

List of corrections effected on MA Demography and Population Studies research report titled "Male circumcision and HIV infection in Swaziland: Is there an association?"

I have gone through the comments of the two examiners and believe that they are fair assessment of the study. I have effected changes where due and necessary and I have noted the useful suggestions passed on to me for future use. They will certainly be of immense benefit.

Examiner 1

Chapter 1: Introduction

Consistent HIV estimates have now been used in the introduction.

The sentence "since vaccine or cure seems impossible to be discovered for now" has been changed to "since the vaccine or cure seems unlikely to be discovered for now"

Section 1.1, 1.2 and 1.3 have now been revised and are no longer repetitious as the Examiner stated. They all provide different information per section.

Chapter 2: Literature review and conceptual framework

Clarity on what studies say about how MC reduces HIV infection up to 60% has been incorporated. Studies showed that MC reduces HIV infection up to 60% per act of sex to heterosexual male.

The review of the literature on socio-economic and demographic factors associated with HIV infection has been expanded. Discussions of age/sex, marital status, religion, wealth status, region and place of residence have been incorporated.

In conceptual framework, variable religion only affects HIV infection through circumcision. Corrections have been made as it was stated that it affects HIV infection both directly and indirectly.

Chapter 3: Methodology

The SDHS 2006/7 did not measure if male circumcision was either medical or tradition. As scientific evidence have shown that the medical male circumcision is protective against HIV infection, however, there is no scientific evidence suggesting that traditional male circumcision reduces the risk of HIV. The study could not establish if circumcised respondents were medical or traditional.

Wording has been changed from levels to "categories": homosexuals to "men who have sex with men"

Chapter 4: Results

Wording have been changed from HIV proportion to "the proportion of those who are HIV positive"

Some of the Interpretation of results were incorrectly interpreted; they have been changed to interpreting the statistic as an odds ratio.

Discussion of results

The statement that "UNAIDS found lower MC and Higher HIV prevalence in Southern African countries than in Western countries" has been changed and its now in reverse.

More results have been included about Connelly et al (2008) study hence it counter the findings of the this study.

a detailed discussion of the effect of age and results from other studies conducted in other regions of the world have been incorporated.

A greater discussion of marriage has been incorporated and the interpretation of results includes more discussion about what is known concurrent partnerships in SSA, condom use in marriage and divorce.

In the discussion of education, wealth status and region, a more detailed discussion have been incorporated

Temporality is the main limitation of the study has been stated in the opening paragraph of the discussion of the study so that results are interpreted in light of the limitation.

Conclusion and recommendation

Recommendation have been revised and more closely tailored to the study results.
The conclusion is also more firmly grounded in the study results.

The use of pronouns has been corrected.

Other: Definition of terms

Prevalence is now correctly defined

Examiner 2

The problem statement of the study has been revised and it now clearly shows the gap in research in Swaziland.

The claim that “Ecological studies are subject to incorrect sampling and ecological fallacy” has been removed

Objective 4 of the study has been removed hence it is outside of the scope the study

The conceptual framework has been revised and captures what the study is addressing.

I hope I have addressed adequately all the issues raised by the examiners.

Thank you.

Regards
Richard Machava