MALE CIRCUMCISION AND CONSISTENT CONDOM USE IN SOUTH AFRICA

BY

TETELO MAAKAMEDI

STUDENT NUMBER: 603667

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SUPERVISOR: PROFESSOR CLIFFORD ODIMEGWU

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DECLARATION

I, Tetelo Maakamedi, declare that this research report is my own original work. It is submitted for the degree of Master of Arts in Demography and Population Studies at the University of the Witwatersrand, Johannesburg. I declare that to the best of my knowledge, it has not been submitted before for any other degree or examination in this or any other university.

15 March 2017

DEDICATION

To Patrick and Maureen Maakamedi.

Ke a leboga.

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Glory and honour to the Lord God Almighty who knew it all.

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ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
CI	Confidence Intervals
HIV	Human Immunodeficiency Virus
HBM	Health Belief Model
NCS	National HIV Communication Survey
NSP	National Strategic Plan on HIV/AIDS and STIs 2012-2016
OR	Odds Ratios
PrEP	Pre-exposure Prophylaxis
RCT	Randomised Clinical Trials
SANAC	South African National AIDS Council
STIs	Sexually Transmitted Infections
TB	Tuberculosis
UNAIDS	The Joint United Nations Programme on HIV/AIDS
VMMC	Voluntary Medical Male Circumcision
WHO	World Health Organisation

ABSTRACT

Background: Evidence shows that circumcised men are less likely to be infected with HIV compared to their uncircumcised counterparts. However, critics have argued that adopting male VMMC as part of the comprehensive HIV prevention strategy might lead circumcised men to believe that they are completely protected against HIV. Consequently, this could cause them to neglect other HIV protective measures, such as consistent condom use. This study investigated the association between male circumcision and consistent condom use among sexually active men in South Africa.

Methodology: The analyses were done using nationally representative cross-sectional secondary data drawn from the 2012 Third National HIV Communication Survey. The study sampled a total of 1899 single black men who were sexually active and were aged between 16-55 years. The management and analysis of the data were carried out using STATA version 14. Descriptive statistics were computed to describe the levels of male circumcision and consistent condom use in South Africa, and cross-tabulations and a Pearson Chi-square test were used to assess associations between patterns of male circumcision and consistent condom use by selected variables. Bivariate and multivariate binomial logistic regressions were used to examine the socio-demographic determinants of male circumcision, as well as the association between male circumcision and consistent condom use.

Results: The main findings showed that circumcised men were more likely (OR=1.18; C.I, 1.171 - 1.182) to consistently use condoms, compared to uncircumcised men. Furthermore, place of residence, education, occupation status and socioeconomic status were positively associated with consistent condom use. On the other hand, men who believed that they would get HIV, and those who were older than 24 years were less likely to consistently use condoms. While circumcision rates were lower in all the provinces compared to the Eastern Cape; Kwa-Zulu Natal and North West had the lowest odds of circumcision of all the provinces. However, both these provinces had the highest odds of consistent condom use compared to all the other provinces.

Conclusion: This study found a positive association between male circumcision and consistent condom use. The findings revealed that, contrary to concerns that circumcised men may have a false sense of protection and therefore use condoms less consistently, circumcised men were more likely to consistently use condoms compared to uncircumcised men. There is, therefore, no evidence of risk compensation associated with circumcision. As a result, male circumcision should continue to be rolled-out nationally, as part of an effective and comprehensive HIV prevention strategy. On the other hand, it is also evident that HIV prevention education targeting men is crucial, as men who believe that they will get infected with HIV and those older than 24 years need to be encouraged to practice safe sexual and HIV protective behaviours such as consistent condom use.

CHAPTER 1: INTRODUCTION

1.1 Background

HIV/AIDS continues to be a major public health concern globally, and sub-Saharan Africa accounts for more than 70% of all new HIV infections (Kharsany et al., 2016). In Southern Africa, where over two-thirds of the world's HIV-positive population live, the principal mode of transmission is through heterosexual intercourse (Maharaj, 2005; Carey et al., 2011; Delva et al., 2014). Currently, South Africa has the largest number of people living with HIV (7.03 million) in the world, and adults aged 15–49 years are the population group with the highest burden of the disease (Petros et al., 2006; StatsSA, 2016).

Certain behavioural, social and economic factors have been identified as major contributors to the rapid spread of the HI virus in Africa, as well as in South Africa specifically. Such factors include high levels of multiple concurrent partnerships and partner change, age-disparate sexual relationships, inconsistent and incorrect use of condoms, early sexual debut, low levels of male circumcision, high levels of poverty, migrant labour, income and gender inequalities, gender-based violence, illiteracy, and stigma and discrimination (Petros et al., 2006; Delva et al., 2014; Zuma et al., 2016).

In response to the epidemic, various prevention programmes based on the ABC (Abstinence, Be faithful and Condomise) campaign have been implemented to raise awareness and improve people's HIV/AIDS prevention knowledge, and promote positive behaviour change (Kekana et al., 2011; Beksinska et al., 2012; Johnson at el, 2013). Despite these efforts devoted to eliminating the spread of HIV through behaviour change, HIV infection rates have continued to rise (Godlonton et al., 2011). More recently, however, the focus has shifted slightly, from behavioural to biomedical interventions. A biomedical intervention that has received global attention, and is currently in the spot light for its documented efficaciousness in reducing the risk of acquiring HIV, is male circumcision.

Male circumcision is the surgical removal of the foreskin of the human penis (Kibira et al., 2013). It is one of the oldest known surgical procedures, and it has been practiced throughout the world for religious, cultural, social and medical reasons (WHO/UNAIDS, 2007; Connolly et al., 2008; Peltzer et al., 2009; Kibira et al., 2013). In South Africa, male circumcision is primarily practiced for cultural reasons, predominantly among the Xhosa, Pedi and the Venda people as a rite of passage into manhood (Govender, 2013). When practiced for religious, cultural, and social reasons male circumcision usually takes place in a non-clinical setting and is performed by a non-medical practitioner (Peltzer et al., 2009). In 2006, the former president Thabo Mbeki signed a bill outlawing the circumcision of young males aged 16 years and younger, except for religious and medical reasons (Katz et al., 2008). The ban came

after many alarming cases of fatal complications and injuries among young initiates because of traditional circumcision (Vincent, 2008). Furthermore, concerns that HIV infection would increase as a result of using the same surgical instrument to simultaneously circumcise multiple young men without sterilising it also played a role in the regulation of traditional male circumcision in the country (Vincent, 2008).

In 2007, the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organization (WHO) recommended that Voluntary Medical Male Circumcision (VMMC) be recognised as an additional HIV prevention strategy in countries with high heterosexually-acquired HIV prevalence and low levels of male circumcision (Riess et al., 2010; Westercamp et al., 2014). This recommendation came after three Randomised Control Trials (RCTs) conducted in South Africa, Kenya and Uganda found that VMMC reduced the risk of acquiring HIV in males by 60% (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007). Alongside that, circumcision was also found to provide protection against other Sexually Transmitted Infections (STIs), reduce the risk of developing penile cancer, and reduce the risk of cervical cancer in female partners of circumcised men (Tchuenche et al., 2016).

In 2010, South Africa adopted the recommendations by WHO and UNAIDS, as part of their comprehensive HIV prevention strategy. A target to circumcise 4.3 million men, in hopes to avert more than 1 million new HIV infections by 2015, was set by the national government (Govender, 2013; Tchuenche et al., 2016). Thus far, the country has performed more than 2.5 million procedures on HIV negative men, making it one of the very few countries in Eastern and Southern Africa to have achieved such a substantial number of circumcisions (WHO, 2013; Tchuenche et al., 2016). However, although a high number of HIV negative males have been circumcised, South Africa still failed to reach its target by 2015. Some of the factors attributed to the country not meeting the target were due to a lack of human resources, amongst others. According to the WHO, funding shortages and limited numbers of VMMC-trained health care providers and facilities in most of the implementing countries, including South Africa, limited countries' abilities to reach their targets (WHO, 2016).

A further challenge that has been identified is that a large percentage of South African men still prefer or feel it necessary to undergo traditional circumcision. A study conducted in the Eastern Cape revealed that 70% of the initiates in the study feared being stigmatised if they chose medical, rather than traditional circumcision (Peltzer et al., 2009). In Botswana, another Southern African country which has practices traditional circumcision, found that men feared that if they underwent VMMC they would not be viewed as 'real men' when compared to those whom had undergone circumcision traditionally. The author noted that this may have contributed to Botswana failing to meet their target (Farham, 2013). Furthermore, other studies have revealed that the fear of pain and Adverse Events (AEs), as well as the fear of the perceived reduction in sexual pleasure and HIV testing are also bottlenecks to the VMMC

programme meeting the nationally set target (Farham, 2013; George et al., 2014; Moyo, et al., 2015; Chiringa et al., 2016). Some authors found that some men have questioned the value of VMMC if consistent condom use is still necessary to avert HIV infection. This has led to large proportions of men deciding not to undergo VMMC (Farham, 2013; Maibvise et al., 2014).

Indeed VMMC, as an HIV prevention strategy, is only effective with the concurrent use of condoms at every sexual act. This is because, VMMC does not fully protect one against HIV infection and any risky sexual behaviour, including incorrect or inconsistent condom use, has the potential to increase the risk of HIV infections (Atashili, 2006; Newell et al., 2007). Whereas, VMMC as an HIV prevention strategy is a relatively new method, condoms have long been considered one of the most effective prevention strategies for reducing the risk of acquiring STIs, including HIV (Moreno et al., 2014). When used correctly and consistently, condoms have been proven to provide more than 80% protection against STIs and HIV (Beksinska et al., 2012; Pallin et al., 2013). Despite their efficacy in preventing HIV, condoms are still not widely used by many sexually active people in high endemic settings, such as South Africa. A study conducted in rural South Africa showed that only 15.4% of men reported to using condoms consistently in the past year (Shai et al., 2012). Another nationally representative study, conducted in 2012, revealed that consistent condom use was only reported by 27.4% of sexually active respondents (Shisana et al., 2014). This is disappointingly the lowest prevalence of consistent condom use in Southern Africa. For instance, a study conducted in four southern African countries revealed that consistent condom use was reported by 40.5% of men in Zambia, 49.5% in Tanzania, 54.9% in Swaziland, and 69.9% in Namibia (Reynolds et al., 2013). In Zimbabwe, 45% of men compared to women (33%) reported consistent condom use (Smith et al., 2014).

With the current low prevalence of consistent condom use in South Africa it has further been argued that introducing VMMC in the country might lead to further declines in condom use, as men may develop the belief that they are not at risk of HIV. This, in turn, could increase the current HIV prevalence. Hence, this study investigated whether circumcised men used condoms more consistently than uncircumcised men.

1.2 Problem Statement

Unprotected heterosexual intercourse is the main contributor to the spread of HIV in sub-Saharan Africa, including in South Africa (Osuafor et al., 2016). Although there has been a significant improvement in HIV prevention knowledge, many people still engage in unprotected sexual intercourse. A nationally representative survey revealed that in 2012 the majority (52.9%) of sexually active respondents reported having never used a condom (Shisana et al., 2014).

In South Africa, condoms are recognised as a primary contraceptive method meant for dual protection against STIs/HIV and pregnancy. While they have traditionally been used as one of the main HIV prevention strategies, evidence revealed that in 2012 condom use at last sex was sadly reported by only 36.2% of the population. This was a significant decline from 45.1% reported in 2008 (Pallin et al., 2013; Shisana et al., 2014; Beksinska et al., 2012). This decline in condom use at last sex occurred despite the increase in the number of condoms distributed in public sectors during the same period (Ashmore et al., 2015).

There are many probable explanations for this decline in condom use, including the fact that people no longer give prevention efforts targeting condom use attention, and that there has been a significant decrease in perceived risk of acquiring HIV (Shisana et al., 2014; Zuma et al., 2016). Low perceived risk of acquiring HIV is a significant predictors of risky sexual behaviours, especially among men (Chimbindi et al., 2010; Beksinska et al., 2012; Lammers et al., 2013; Moreno et al., 2014). In 2012, South African males were more likely (38.6%) to use condoms compared to females (33.6%), although the variation could possibly be explained by the fact that males were five times more likely than females to report having multiple sexual partners. Those who reported having more than one sexual partner were also significantly more likely to use a condom (Shisana et al., 2014).

Furthermore, consistent condom use was only reported by 27.4% of sexually active respondents, and this was even lower (23.6%) among respondents who reported to be living with their sexual partners (Shisana et al., 2014). Living with a sexual partner has in fact been found to be a significant predictor of lack of condom use, and evidence from a study conducted in South Africa found that young adults (aged 15-24 years) were less likely to consistently use a condom if they were with a regular rather than a casual partner (Chimbindi et al., 2010). Other common causes of lack of condom identified in the literature include the fact that condoms are believed to reduce sexual pleasure, they are stigmatised due to the fact that they are seen to be linked with STIs and HIV, and they also suggest mistrust and infidelity in relationships (Osuafor et al., 2016). Notions of masculinity have also played a major role in the rejection of condom use in some heterosexual relationships. A study conducted in South Africa showed that in couples where the male partner moderately or highly supported hegemonic masculine norms, the odds of using condoms consistently declined (OR=0.46, 95% CI: 0.22-0.95), compared to couples where the male partner did not support these norms (Leddy et al., 2016). Moreover, condoms are more acceptable as a method of preventing pregnancies than STIs/HIV, meaning that when other methods of contraception are used, such as the injection or pill, condoms are less likely to be used (Beksinska et al., 2012).

Consequently, lack of consistent condom use exposes men and their sexual partners to STIs, including HIV infections, making it a major public health concern in South Africa. What's more is that while

literature focuses more on HIV due to a lack of condom use, other STIs, have a profound impact on the sexual and reproductive health of individuals. This is because, if not treated, some STIs can lead to cancer, adverse pregnancy outcomes and infertility (WHO, 2016). Furthermore, STIs are also known to increase the risk of transmitting or acquiring HIV threefold, and they account for 14% of all new HIV infections (Setswe et al., 2016; WHO, 2016). The extent of the problem is evident in the fact that about four million people receive treatment for STIs and more than two million HIV-positive people are on Anti-Retroviral Therapy (ART) (StatsSA, 2015; Risher et al., 2016; Setswe et al., 2016). While this might imply that people who are diagnosed with an STI or HIV receive the necessary treatment, it also suggests that too many people are engaging in risky sexual behaviours, much of which is due to a lack of consistent condom use.

Although both VMMC and consistent condom use have been found to be effective in reducing the risk of acquiring HIV, in South Africa, the uptake of both these prevention methods is significantly low (Shisana et al., 2014). Furthermore, since the introduction of VMMC as an HIV prevention strategy, various debates have emerged that argue that VMMC might increase the HIV prevalence instead of reducing it. This could be since circumcised males may have the perception that they are completely protected from HIV infections, and thus engage in riskier sexual behaviours (Van Howe et al., 2011; Grund et al., 2012). Furthermore, some literature finds that VMMC results in the loss of penile sensitivity and that some men have even reported reduced sexual pleasure, therefore arguing that this procedure may be linked with rougher sexual activities and declines in condom use (Bronselaer et al., 2013). This, therefore, means that VMMC as a prevention method has the potential to reduce condom uptake and increase risky sexual behaviours, hence placing men and their sexual partners at an increased risk of acquiring HIV as well as other STIs (Van Howe et al., 2011; Grund et al., 2012). It is, therefore, the aim of this study to examine whether male circumcision is significantly associated with consistent condom use among sexually active males in South Africa.

1.3 Justification

One of the primary goals of the 2012-2016 South African HIV and AIDS and STI Strategic Plan (NSP) is to reduce new HIV infections by at least 50%, through prevention. One of the strategies to reach this target is to make available and distribute free condoms throughout the country. One such initiative included the introduction of purple-coloured, grape-scented government-subsidised male condoms (CHOICE) in higher learning institutions in 2015 (Ashmore et al., 2015; SANAC, 2015). Another strategy that has been included is to provide VMMC as part of the sexual and reproductive health services (SANAC, 2012). Despite such policy initiatives, condom distribution efforts and

encouragement of the uptake of VMMC, both condom use and VMMC remain low in South Africa. This is evident from the high HIV prevalence (18.9%) among people aged 15 years and older, with the highest rates being amongst the black population (StatsSA, 2016).

Evidence from a nationally representative study conducted in South Africa revealed the prevalence of HIV in 2004 was 19.9% among black people aged 15-49 years; compared to 0.5% among whites, 1% among Indians and, 3.2% among coloureds in the same age group (Kenyon et al., 2013). Although HIV prevalence rates were lower in 2012 compared to 2004, black people still had the highest prevalence (15%) of HIV compared to other racial groups (0.3 % whites, 0.8% Indians and 3.1% coloureds). This remained unchanged in 2016, making the black population one of the most at risk population groups for contracting HIV (Shisana et al., 2014; StatsSA, 2016). This study, therefore, focuses only on black South African men as this population group needs to be one of the main target groups in HIV prevention interventions, such as those for VMMC and consistent condom use. Furthermore, while women are a key at-risk-population of HIV infections, studies have found a gap in condom use behaviours among men. This is problematic since literature has shown that in settings such as South Africa men control the terms of sexual intercourse in relationships, including whether to use condoms, which further exposes women to HIV infections (Carey et al., 2011; StatsSA, 2015; Kharsany et al., 2016).

VMMC has been found to be effective in reducing HIV infections in men. However, given the notions and ideas of masculinity, high levels of inconsistent condom use amongst the general male population, and a possible lower perceived risk of HIV infection post-circumcision – the VMMC strategy could actually potentially reduce the biomedical benefits of the practice and increase HIV prevalence (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007; Mukama et al., 2015). That is, if men believe that circumcision is a 'natural condom', the probability of not using a condom consistently is high and places both themselves and their female partners at heightened risk of HIV (Kibira et al., 2013). Furthermore, VMMC does not benefit women directly. A parallel study of the Ugandan RCT found that circumcision of HIV positive men did not have the same protective effect of HIV transmission in HIV negative women. Women whose HIV positive partners were circumcised in the study, were still 21.7% more likely to acquire HIV compared to those women whose partners were not circumcised (Wawer et al., 2009). This further signifies the importance of using condoms consistently, in conjunction with being circumcised.

Therefore, the purpose of this study was to investigate whether male circumcision is a predictor of consistent condom use among men in South Africa. This is important because knowing this relationship will advise policy makers and programme developers on programmes and initiatives where awareness needs to be increased, where programmes aiming at increasing positive and safe sexual practices need to be developed and where further work regarding condom use still needs to be done. Furthermore, by

understanding levels and factors that influence lack of consistent condom use, this study will be able to identify which group of people should be targeted for awareness. This study will further fill the gap in knowledge identified in the literature review, specifically finding an association between male circumcision and consistent condom use since most studies have looked at condom use at last sex.

1.4 Research Question

What is the association between male circumcision and consistent condom use among sexually active men in South Africa?

1.4.1 Sub-Questions

1. What are the levels and patterns of male circumcision and consistent condom use among sexually active men in South Africa?
2. Which socio-demographic characteristics are significantly associated with male circumcision status?
3. What is the association between male circumcision and consistent condom use among sexually active men in South Africa?

1.5 Research Objective

To investigate the association between male circumcision and consistent condom use among sexually active men in South Africa.

1.5.1 Specific Objectives

1. To describe the levels and patterns of male circumcision and consistent condom use among sexually active men in South Africa.
2. To explore socio-demographic characteristics which are significantly associated with male circumcision status.
3. To examine the association between male circumcision and consistent condom use among sexually active men in South Africa, while controlling for socio-demographic factors.

1.6 Definition of Terms

Male Circumcision is the surgical removal of the foreskin from a human penis (Kibira et al., 2013). In this study, male circumcision refers to male circumcision status, whether one is circumcised or not.

Consistent condom use is the regular use of condoms to protect oneself against STIs, including HIV, whenever one engages in sexual intercourse. In this study, consistent condom use in the past 12 months was measured as "how often" one uses condoms with their current sexual partners.

CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Literature Review

Recently, VMMC has been widely accepted as an effective HIV prevention method following the results of three RCTs conducted in sub-Saharan Africa. These clinical trials showed that VMMC reduced the risk of heterosexually transmitted HIV infection in men by 60%, and reduced the incidence of other STIs (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007; Mattson et al., 2008; Kibira et al., 2013). Despite these results, VMMC as an HIV prevention strategy has raised major concerns that suggest that this procedure might lead to an increase in risky sexual behaviours, due to the fact that circumcised men might have the impression that they are completely protected from acquiring HIV (Mattson et al., 2008). This is known as risk compensation.

Evidence of changes in sexual behaviours post-VMMC has been widely inconsistent. Starting with the three RCT studies that demonstrated the protective effect of VMMC. The South African study found that after the procedure circumcised men had more sexual contacts compared to uncircumcised men. However, condom use did not decline nor did the number of sexual partners increase (Auvert et al., 2005). On the other hand, the Kenyan study reported a decrease in risky sexual behaviours among both circumcised and uncircumcised men. However, circumcised men reported slightly riskier sexual behaviours compared to uncircumcised men at the 24 month follow up. This was significant for consistent condom use and unprotected sexual intercourse with any sexual partner in the past 6 months. This study did not find any evidence of risk compensation, rather the authors attributed the slight difference in sexual practices among the two groups as resulting from safer sexual practices adopted by uncircumcised men (Bailey et al., 2007). The Ugandan study found no changes in sexual behaviour among participants post-VMMC (Gray et al., 2007). This was also true for males in the Ugandan post-trial follow-up study, which reported insignificant differences in the characteristics and sexual behaviours of men whom had been circumcised and those whom had not (Gray et al., 2012).

On the other hand, a three-year post-trial follow-up in the Ugandan RCT found that while there was no evidence of risk compensation associated with VMMC, the distribution of the number of sexual partnerships among both the circumcised and uncircumcised changed significantly. Those whom had remained uncircumcised during the post-trial period had increased their number of sexual partners (Kong et al., 2012). Furthermore, the study found that circumcised men reduced engagements in non-marital sexual relations, but that condom use with all their sexual partners had decreased. The decrease in condom use, however, was shown to be significant amongst both the circumcised and uncircumcised men (Kong et al., 2012).

Likewise, findings from another Ugandan study revealed that circumcised men were more likely to have had four or more lifetime partners, had sexual debut before the age of 18 years, engaged in higher-risk sexual intercourse, and engaged in higher-risk sexual intercourse without using a condom compared to uncircumcised men (Kibira et al., 2013). The authors found that circumcision and risky sexual behaviour were strongly associated, although circumcised men were still less likely to contract HIV even though they engaged in riskier sexual behaviours (Kibira et al., 2013). On the other hand, a case control study conducted in Uganda found that while HIV infections were lower in men who had undergone circumcision for religious reasons, HIV infections were higher in men who had sexual intercourse soon after the surgical procedure, before the wound healed completely which has been shown to increase HIV transmission dramatically (Ediau et al., 2015). Furthermore, literature looking at the acceptability of VMMC discovered that wanting to be circumcised was strongly associated with risky sexual behaviours, with a study conducted in Uganda showing that males who did not use a condom at last sex and those who engaged in non-marital sexual intercourse were more likely to be willing to undergo circumcision (Kibira et al., 2015).

In general, circumcised men had a higher prevalence of sexual risk behaviours compared to their counterparts (Kibira et al., 2016). This study showed that prior to and after the implementation of a safe VMMC programme in Uganda, circumcised men were significantly more likely to have multiple sexual partners and also have nonmarital sexual intercourse, even after controlling for socio-demographic factors (Kibira et al., 2016). Interestingly, this study revealed that before the implementation of the VMMC programme in 2004, condom use at last non-marital sexual intercourse did not differ between circumcised and uncircumcised men. However, in 2011, circumcised men were less likely to report using condoms at last sex with a non-marital partner. This revealed that while VMMC campaigns were encouraging males to be circumcised by informing them about the protective effect of circumcision, they neglected to inform males about the importance of safe sex even after the procedure (Kibira et al., 2016).

On the other hand, a study in Kenya found no evidence that circumcised men engaged in riskier behaviours after the procedure. Rather, what the findings revealed was that both circumcised and uncircumcised men reduced their HIV risk behaviours during the follow-up visits (Mattson et al., 2008). Also, a prospective cohort study conducted in Kenya found that while uncircumcised men engaged in higher risky sexual intercourse during the first month, HIV-risky sexual behaviours of circumcised men were not significantly different to those of uncircumcised men during the first-year post-enrolment (Agot et al., 2007). Despite declines in HIV risk perception among circumcised men and increased sexual activities among young men aged 18-24 years, a study in Kenya revealed that there was no evidence suggesting that circumcised men engaged in riskier behaviours compared to uncircumcised men. Instead, the study found that risky behaviours decreased over time in both groups, and the number

of men reporting condom use at last sex increased - with a greater increase observed among circumcised men (Westercamp et al., 2014).

Similar results were also documented in a qualitative study conducted in Kenya. This study reported that VMMC did not necessarily lead to increased risky behaviours; however, changes in behaviour were noted. The findings of this study revealed that while most men reported either adopting a protective sexual behaviour or not changing their sexual behaviours at all, after circumcision or learning of the protective effects of circumcision, a small group of men reported having engaged in higher risk behaviours, such as not using condoms or increasing the number of sexual partners. (Riess et al., 2010). In a similar qualitative study also conducted in Kenya, results showed that while participants in the study had a good understanding of the partial protection of VMMC, there were still those who reported that they had more frequent sexual intercourse or had more sexual partners after circumcision since they no longer experienced pain while engaging in sexual activities. Nonetheless, this was a small number of the men who partook in the study. On the other hand, most men in this study reported that they would continue using other protective measures such as condoms, and some even reported increased condom use, since using condoms was now easier. The authors concluded that with most participants showing a good understanding of the protective effects of VMMC, there was little evidence that suggested risk compensation following VMMC (L'Engle et al., 2014).

Furthermore, a cross-sectional study conducted in Botswana found no relationship between lack of condom use and circumcision, showing that undergoing VMMC did not encourage lack of condom use. Instead, this study found that other factors such as religious beliefs, lack of or low education, drunkenness, misconceptions about ART and type of sexual partner were significantly associated with not using a condom at last sex (Ayiga et al., 2011). On the other hand, a similar study conducted in Botswana, using the same dataset, found that circumcised men were more likely to report currently having multiple sexual partners and having had more sexual partners in the year preceding the survey compared to uncircumcised men (Keetile et al., 2014). This was also the case among men who reported to be willing to undergo the circumcision procedure. These findings suggested the presence of risk compensation following VMMC, as well as amongst those willing to be circumcised (Keetile et al., 2014).

A comparison study conducted in Botswana, looking at risky sexual behaviours of circumcised and uncircumcised men found that uncircumcised men aged between 30-34 years and 35-39 years were significantly more likely to use condoms inconsistently compared to those aged 40-44 years. Inconsistent condom use was also found amongst those who were never married (Balekang et al., 2016). On the other hand, men who had been circumcised were significantly less likely to use condoms inconsistently if they had secondary education. The study revealed that while circumcised men who

lived in a city or town were significantly more likely to use condoms inconsistently, uncircumcised men from urban villages had lower odds of using condoms inconsistently (Balekang et al., 2016).

In Zambia, a cross-sectional study that examined circumcised men's sexual behaviours post-surgical healing period, found that almost a quarter of circumcised men reported resuming sexual intercourse prior to the six-week post-procedure healing period (Hewett et al., 2012). Of these men, the prevalence of risky sexual behaviour before the recommended time of resuming sexual acts was high, with 46% reporting to have engaged in sexual intercourse within the first 3 weeks, 82% having had at least one unprotected sexual act, and 37% reporting to having sexual intercourse with two or more sexual partners (Hewett et al., 2012). This is the opposite of what was found in Zimbabwe, which showed that VMMC and risky sexual behaviours were not associated. However, men who said they wanted to be circumcised were more likely to have engaged in risky sexual behaviours (Chikutsa et al., 2014). The association between wanting to be circumcised and engaging in risky sexual behaviours were apparent in a similar study, which found that males who reported wanting to be circumcised were more likely to have had multiple sexual partners and having previously paid for sex. Furthermore, those who reported wanting to be circumcised were also less likely to have used a condom at last sex (Chikutsa et al., 2015).

The information about the protective effects of VMMC was found not to encourage risky behaviours in a study conducted in Malawi. This study found that uncircumcised men who were informed about the protective effects of VMMC still practiced safer sex by reducing the number of sexual contacts per month and increasing their condom use by 58%. Among circumcised men, this study also reported that there was no evidence of risk compensation, concluding that receiving information about VMMC did not lead to increased risky behaviours (Godlonton et al., 2011).

A qualitative study conducted in Swaziland showed that after VMMC men changed both their sexual attitudes and behaviour, which were protective on the one hand and risky for HIV transmission on the other. For example, most men described protective changes in their behaviours such as developing a more responsible attitude towards safe sex, reducing sexual temptation and partners, and easier condom use. However, a minority engaged in increased sexual risk-taking, however, this was during a brief period of sexual experimentation shortly after the circumcision (Grund et al., 2012).

A recent South African study, comparing medically and traditionally circumcised men's HIV risk perception and behaviour found that medically circumcised men were more likely to have more than two sexual partners compared to uncircumcised men. However, the results for traditionally circumcised men were not significant. The study also found that condom use among medically circumcised and traditionally circumcised men was not significantly different to that of uncircumcised men, therefore concluding that there was no evidence of risk compensation (Zungu et al., 2016). Furthermore, in a post-intervention evaluation conducted in the Eastern Cape, South Africa, medically circumcised males

who were attending the initiation schools in the surrounding areas reported that they would prefer to abstain from sexual activities for between two weeks to about two months. Furthermore, the participants also indicated that they would increase their condom use when resuming sexual activity. While the authors concluded that their study was predisposed to social desirability bias, they found no evidence of risk compensation because of the findings from their focus group discussions (Peltzer et al., 2009).

Similarly, a study conducted in Cape Town (South Africa) found no evidence of risk compensation among circumcised men. This came after the study found that men who were informed about the partial protective effects of circumcision still perceived themselves as being at a higher risk of HIV and were, therefore, more likely to use condoms at last sex. In contrast, informed women perceived themselves as being at a lower risk of HIV infection and were, therefore, less likely to use condoms at last sex (Maughan-Brown et al., 2012). Likewise, while participants in Johannesburg (South Africa) agreed about the beneficial effects of circumcision, the authors found that among black and coloured participants the view that being circumcised lead to condom avoidance was rejected. However, this view was not held by white participants as they saw circumcision as a way of condom avoidance (Bridges et al., 2011).

On the other hand, a study exploring South African women's perceptions of VMMC revealed that while women understood the partial protection of circumcision, they felt this procedure did not benefit them. Therefore, they viewed VMMC as increasing women's risk of contracting HIV as they believed that circumcised men would most likely engage in increased risky behaviours and increase their sexual partners after the procedure (Mantell et al., 2013). Furthermore, most participants believed that condom use would decrease after the procedure and men would have sexual intercourse during the healing period (6-week post-surgery), further compromising women's sexual and reproductive health (Mantell et al., 2013). Similarly, a qualitative study conducted in Kwa-Zulu Natal (South Africa) found that apart from concerns that being circumcised could lead to sexual dysfunctions, most men viewed circumcision as appealing to the opposite sex and also as a sexual enhancer (Humphries et al., 2015). Furthermore, respondents were quoted as believing that after circumcision "you become free" and because circumcision is protective against HIV infections condoms were only necessary for preventing pregnancies. This suggested that circumcision was a way of avoiding condom use and also for attracting multiple sexual partners, which further suggested the presence of risk compensation post-circumcision (Humphries et al., 2015).

The above literature illustrates how inconsistent the results of the association between VMMC and risky sexual behaviours have been. Most of the studies have paid more attention to males who only had the procedure done in medical settings (VMMC), which is not a reflection of the circumcision procedure in reality. This is a significant limitation since literature has found that almost half of the global

circumcisions were for religious and cultural reasons, insinuating that they were non-medical (Morris et al., 2016). This current study will thus focus on both medically and non-medically circumcised males since most men in South Africa prefer non-medical circumcision (i.e. traditional circumcision) to VMMC (Shisana et al., 2014).

Moreover, most studies have been conducted either in Uganda or Kenya. However, South Africa still experiences a lack of knowledge in this area of research. Thus, this study looks at South Africa specifically, a country with the highest HIV prevalence in the world, but also the country in sub-Saharan Africa that has reached the highest number of VMMC to date. Furthermore, most of these studies are conducted on a small scale. The current study uses a nationally representative survey, meaning that the results are generalisable to the entire black South African male population. Finally, the above studies have looked at condom use at last sex which does not tell us about the consistency of condom use. Hence, this study will focus on consistent condom use rather than condom use at last sex.

2.2 Theoretical Framework

The first theory used to inform this study is the Risk Compensation Theory. However, due to the fact that this theory does not account for the effect of sociodemographic factors on behaviour change, components of the Health Belief Model (HBM) were adapted to provide an explicit connection of the relationship between male circumcision and consistent condom use among sexually active South African men.

The Risk Compensation Theory was first formulated by Peltzman in 1975 to explain the observed increased risks that emerged as a result of the introduction of compulsory motor vehicle safety regulation laws in the United States (Pinkerton, 2001). After almost a decade after the introduction of the Federal motor vehicle safety standards, Pelzman set to evaluate whether these safety standards had indeed improved road safety as predicted (Hedlund, 2000). Taking an economic perspective, Peltzman postulated that individuals are rational economic consumers who have their own best interest at heart. He believed that if one has an abundance of something they will exchange the excess for something else they desire (Hedlund, 2000). In the context of road safety, Peltzman suggested that if cars were made to be safer than needed, individuals would be more likely to drive faster than they usually would if cars were not as safe, trading safety for time (Hedlund, 2000).

To test his theory, Pelzman conducted an econometric analysis of the effects of the Federal motor vehicle safety standards on road safety. Upon his findings, he concluded that the safety measures which were put in place were not as effective as had hoped. Rather, what he found was that while these safety

standards protected motor vehicle occupants, pedestrians were placed at an increased risk of death, deeming the laws to be counterproductive, as deaths on the roads did not necessarily decrease (Hedlund, 2000). Based on these observations, the Risk Compensation Theory can be described as a theory that put forward that individuals are more likely to engage in an increased risky behaviour in response to a perceived risk reduction, following an intervention (Westercamp et al., 2014).

Most of the earliest research on risk compensation focused on road safety. In this area of research, it has been argued that adding safety features to cars, such as air bags, anti-lock brakes, seatbelts and warning systems encourages people to be less cautious of road safety measures. Thus, people will act in a riskier manner which places both the driver and other road users at risk (Thompson et al., 2001). This reckless driving on the roads is caused by the fact that drivers feel adequately protected by the vehicle's safety features. While drivers may indeed be protected, it has however been argued that this lower perception of risk that increases reckless driving nullifies the protection which the motor vehicle safety features are designed to provide, by increasing accidents on the roads (Thompson et al., 2001).

In recent years, the Risk Compensation Theory has also gained its popularity in HIV prevention and health behaviour research. In this area of inquiry, researchers use this theory to understand how individuals imagine their own risk, particularly in the context of increasingly available biomedical interventions that are used to reduce their risk of acquiring HIV infections (Eaton et al., 2007). Some researchers have argued that the introduction of HIV prevention interventions, such as vaccines, microbicides, antiretroviral (ARV) medications, and VMMC have the potential to lower individuals' perceptions of risk. This in turn may alter their risk-related behaviours and threaten the potential benefits that HIV prevention interventions sought to provide (Eaton et al., 2007).

As such, evidence from studies that looked at HIV vaccines indicated that if people were to receive a HIV vaccine their risky behaviours associated with HIV infections would increase. Findings from a cross-sectional study conducted among adults revealed that nearly 25% of the study participants indicated a greater likelihood of engaging in HIV-risky behaviour if they were to be vaccinated against HIV (Crosby et al., 2006). Similarly, a longitudinal study by Chesney and colleagues (1997) noted an increase in risky behaviour in participants who hoped that the vaccine would protect them from HIV infections. In this study, higher-risk behaviours were seen among participants who were younger and had multiple sexual partners (Chesney et al., 1997).

As well as HIV vaccines, the Risk Compensation Theory has also been applied in other areas such as contraceptives, pre-exposure prophylaxis (PrEP) and VMMC. For instance, a study that was looking at whether providing women with cost-free contraception was associated with an increase in the number of sexual partners and frequency of intercourse over time, found little evidence to support concerns of increased sexual risk-taking behaviours following access to cost-free contraception (Secura et al.,

2014). Similarly, a longitudinal analysis of the sexual behaviour of heterosexual participants receiving PrEP for HIV prevention concluded that receiving the treatment did not result in significant changes in risky sexual behaviour for heterosexual couples (Mugwanya et al., 2013).

Although various studies have used this theory to explain the potential behaviour change after an intervention, a question that is still of concern for all partially protective HIV prevention strategies is whether individuals will engage in an increased risky behaviour due to a false sense of protection. Like the above literature on risk compensation, this current study aimed at investigating whether being circumcised encouraged unsafe sexual practices – specifically, a lack of consistent condom use.

While acknowledging that the Risk Compensation Theory adequately explains why individuals might modify their behaviour as a result of a lower perceived risk due to an intervention, this theory does not, take into account the effects of demographic and socioeconomic factors on behaviour change. To this effect, this study consolidated the HBM with the Risk Compensation Theory to improve the theory's ability to explain the association between circumcision status and consistent condom use.

The HBM is a widely used conceptual framework which was first developed in the 1950s by social psychologists, Hochbaum, Rosenstock, and Kegels. These psychologists worked in the U.S. Public Health Services and attempted to explain and predict health related behaviours (Glanz et al., 2008). Specifically, the psychologists were baffled by the lack of interest people were showing towards free health screening programmes for tuberculosis (TB) (Glanz et al., 2008). In trying to understand why people failed to participate in these programmes, these social psychologists developed six fundamental constructs which were deeply rooted in two learning theories, the Stimulus Response Theory and Cognitive Theory (Glanz et al., 2008). These constructs included perceived susceptibility, perceived severity, perceived benefits and perceived barriers to a behaviour, cues to action, and self-efficacy. The last two constructs were initially not part of the constructs developed in the 1950s but were later included in the model to give a more comprehensive understanding of behaviour change (Glanz et al., 2008). By using these constructs, the model hypothesises that health behaviours can be predicted, and accurate interventions can be developed, to help promote healthy behavioural changes. The idea is that if individuals regard themselves as being susceptible to a condition, belief that the condition could lead to a serious consequence if not dealt with. Furthermore, belief that taking an action will yield positive outcomes by reducing either their susceptibility to or severity of the condition, and belief that the expected benefits of taking an action outweigh the barriers to the action then individuals are more likely to take a positive health action which they believe will reduce their risk (Glanz et al., 2008). The model's main assumption is that individuals' characteristics, their environment, and previous experiences shape their perception to risks and this has an influence on the health action which they take (Keetile et al., 2014).

Apart from the initial TB screening programme, which the HBM was developed for, the HBM has since been applied to a wide range of behavioural change research and intervention programmes. This has specifically been applied to sexual and reproductive health research to predict the likelihood that individuals will use health services, and in HIV/AIDS research (Zhao et al., 2012). For instance, a study that investigated factors which affected condom use among South African university students found perceived barriers to be significantly associated with increasing age and reduced condom use intentions, while perceived susceptibility found to be associated with past condom use. Also, higher self-efficacy was positively associated with using condoms in the past and intending to use condoms in the future (Peltzer, 2000). In another study, trying to assess whether perceived susceptibility of pregnancy encouraged adolescents and young adult women to use oral contraceptives or condoms, the authors found that after adjusting for other factors the risk of pregnancy was positively associated with using both oral contraceptives and condom use. However, this association was not significant (Rahman et al., 2013). The study concluded that perceived susceptibility to pregnancy did not influence the use of any birth control methods (Rahman et al., 2013).

While this model appropriately explains health behaviour change, it does not capture the effects of interventions on health-related behaviours. This is because rather than explain behaviour that results from the introduction of an intervention, the HBM is often used as a guide to developing health interventions (Glanz et al., 2008). This, therefore, means that the current study cannot solely rely on the model to inform this study due to this limitation, hence the need to consolidate both theories mentioned above.

This study has only used three constructs from the HBM - the modifying factors, perceived susceptibility, and behaviour action. This study also merges them to the constructs from the Risk Compensation Theory - the intervention, perceived risk, and behaviour outcome. By doing this, this study can give a more comprehensive link between male circumcision and consistent condom use while also taking into account socio-demographic factors and perceived risk of HIV, which are believed to have an effect on the relationship which this study attempts to investigate.

2.3 Conceptual Framework

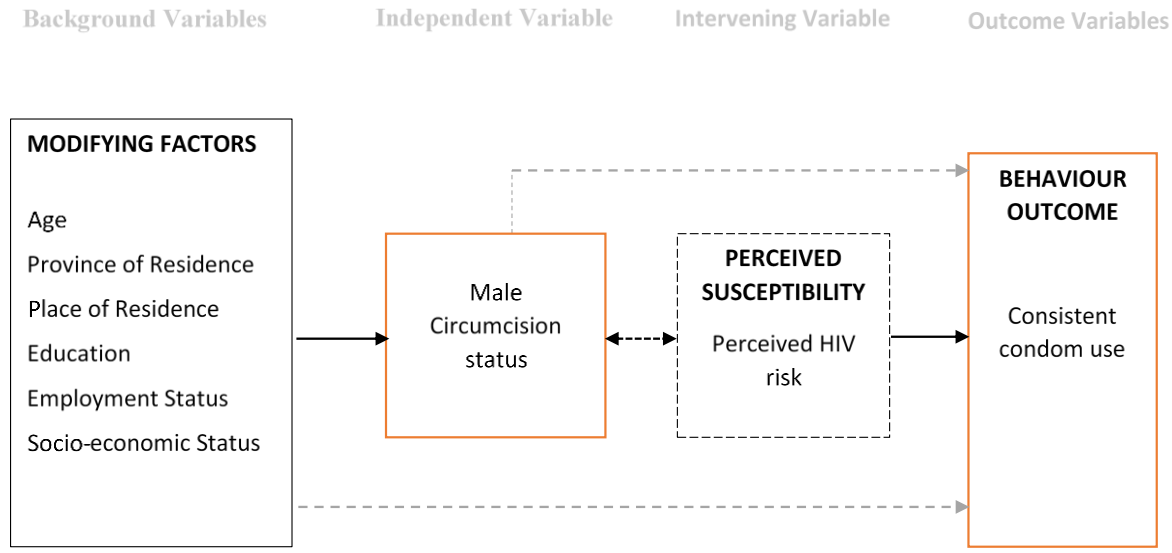
This study adapts and modifies the Risk Compensation Theory together with the HBM to investigate whether circumcision is a significant predictor of consistent condom use among sexually active men in South Africa. By drawing from both the Risk Compensation Theory and the HBM this study recognises the effect of socio-demographic factors on circumcision status, which further indirectly influences and is influenced by the perceived risk of HIV. Perceived HIV risk is shown by the dotted lines in Figure 1

to indicate that it is not the main focus of the study (not the main independent variable). However, it is on the causal pathway and it has a direct effect on consistent condom use. Furthermore, both socio-demographic factors and male circumcision status indirectly influence consistent condom use, which is the outcome of this study.

From the conceptual framework below, the graphical depiction in Figure 1 shows the link between background factors, which have a direct influence on circumcision status and an indirect influence on consistent condom use. This is because evidence from previous literature conducted in sub-Saharan Africa shows that older men (20 years and older), men from urban dwellings, men with secondary or higher education, those with professional occupations and men from the richest wealth quintile are more likely to be circumcised (Tram et al., 2014; Keetile et al.; 2014; Lau et al., 2015). Furthermore, literature based in South Africa found circumcision prevalence to be higher in two provinces, namely Limpopo and Eastern Cape, than in any of the other South African provinces (Peltzer et al., 2014). Also, among South African occupants, circumcision was found to be strongly associated with being older than 50 (Connolly et al., 2008). This might be since most men in South Africa are circumcised after their 17th birthday, with the median age at circumcision being 18 years amongst black males. Furthermore, speaking Sepedi and IsiXhosa were strongly associated with circumcision and this is because most Sepedi speakers originate from Limpopo, while Xhosa speakers originate from the Eastern Cape. Both these provinces are known to practise traditional male circumcision (Connolly et al., 2008). Additionally, being from rural South Africa was associated with being circumcised compared to those from urban areas (Connolly et al., 2008).

Not only do individual socio-demographic factors influence the decision to be circumcised or not, but literature has also found an indirect association between background factors and condom use behaviours. Studies in South Africa and Botswana show that being young, single, a male, and African, leaving in an urban area, being a student and having grade 12 or higher education were all positively associated with using condoms (Chandran et al., 2012; Ngome, 2016). However, perceived risk of HIV infection was negatively associated with consistent condom use among adolescents in Botswana (Ngome, 2016).

Figure 1: Conceptual Framework of Consistent Condom Use among South Africa Males



Source: Adapted from Peltzman, 1975; Glanz et al., 2008: pp 49

2.4 Hypotheses

The following hypotheses will be tested at the 0.05 significance level:

H0: Circumcised men are less likely to consistently use condoms.

H1: Circumcised men are more likely to consistently use condoms.

CHAPTER 3: METHODOLOGY

3.1 Study Design

This study has employed a quantitative approach, using a cross-sectional study design. The analysis was done using nationally representative cross-sectional secondary data drawn from the Third National HIV Communication Survey (NCS), conducted in 2012. This study design was selected due to its cost and time efficiency, and because the NCS dataset included all variables required to test the research hypotheses and answer the research questions.

3.2 Data Source

The 2012 NCS was conducted in collaboration with the Johns Hopkins Health and Education in South Africa (JHHESA), LoveLife and Soul City. The survey was funded by the Department of Health, USAID through the President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund. Health and Development Africa (HDA) managed the survey, while the Johns Hopkins Bloomberg School of Public Health Centre for Communication Programmes (JHU-CCP) provided technical support and oversight at all stages of the study. Data were gathered by the Freshly Grounds Insights (FGI) who used the FGI's unique mobile electronic data collection platform (Johnson et al., 2013).

Using a multistage cluster sampling approach, the survey was conducted in all nine provinces of South Africa. Data was representative of people aged between 16-55 years across all population groups. The multi-stage cluster sampling approach involved three stages from which a sample of 400 primary sampling units (PSUs) were drawn (Johnson et al., 2013). The first stage involved making Statistics South Africa's sub-places the PSUs. The country was stratified into nine provinces, with the sample size matching the population size in each province. Within each province, the probability of a PSU being selected was proportional to the number of individuals in each sub-place. An initial sub-place was randomly selected from each province, and within each selected province additional sub-places were selected. This led to the 400 PSUs being selected (Johnson et al., 2013).

Using a systematic sampling approach, the second stage involved sampling the number of households within each PSU. The sampled households were calculated proportional to the size of the population of each PSU. Within each PSU, sampling intervals were calculated and random selection was used to select the starting point (Johnson et al., 2013).

The third and final stage involved sampling eligible respondents who were household residents aged between 16 and 55 years who spent at least 4 nights a week at the household. One eligible respondent per household was randomly selected to be interviewed in their home by a trained interviewer of the same sex, using structured questionnaires. In total, approximately 10 000 respondents in all provinces of South Africa were interviewed between February and May 2012 and the survey produced a response rate of 83%. To ensure that the survey sample was representative of the South African population, survey weights were verified using the Statistics South Africa 2007 Community Survey (Johnson et al., 2013).

3.3 Study Population

The population of interest for this study was South African males aged 16-55 years who were interviewed in the survey. Specifically, the study population was limited to single black men who reported to ever being sexually active. For this study, sexually active men were defined as those men who have ever had sexual intercourse in their lifetime. Single men were defined as those who were either never married and were not cohabiting with their sexual partners at the time of the survey, and those who were widowed or divorced. This inclusion criterion of the study participants results from the fact that in South Africa sexual contact is the main mode of HIV transmission. This has led to the adoption of HIV prevention interventions, such as condoms and VMMC. Furthermore, literature has shown that HIV prevalence is primarily high among black people compared to any other racial groups in the country (Shisana et al., 2014). While condom use in marriage or cohabiting partnerships is rare and shunned upon, literature has revealed that people who have never been married are more likely to engage in risky sexual behaviours, such as having multiple sexual partners, compared to married people (Maharaj et al., 2005; Balekang et al., 2016). The above makes the current study population the most at risk of HIV infections.

3.4 Sample Size

The survey sample included 4 065 men aged 16-55 years old. However, this study was limited to a sample population of 1 899 who met the inclusion criteria (being single, black, sexually active men). The current study population is representative of 5 975 831 single, black, and sexually active men in South Africa between the ages of 16 to 55 years.

3.5 Questionnaire Design

The questionnaire for the 2012 NCS was developed in consultation with CMT, HDA, JHHESA, JHU-CCP, LoveLife and Soul City. This questionnaire was structured and it included a series of 24 questions which covered socio-demographic characteristics, exposure to various HIV communication programmes, and indicators of HIV and AIDS knowledge, attitudes and behaviour. The questionnaire was first piloted in Gauteng, KwaZulu-Natal and Eastern Cape. Thereafter, is was adjusted to be easily understood by both researchers and respondents alike. The final questionnaire was translated from English into the 10 other official languages in South Africa. Interviews lasted 1.5 hours on average and were conducted in the respondent's preferred language. With a Cronbach alpha of 0.853, the survey was deemed reliable and validity was ensured by conducting a 10% validity check (Johnson et al., 2013).

3.6 Study Variables

The variables which have been selected for this study were chosen with the guidance from the theoretical frameworks underpinning this study, as well as from previous literature which has been reviewed. According to previous literature, the selected socio-demographic factors have been found to have a direct influence on male circumcision status and perceived risk of HIV. For both frameworks, the Risk Compensation Model and the HBM, perceived risk or susceptibility to an illness determines whether one takes an action to prevent the illness. In this case, the study tried to determine whether one would use condoms consistently to avoid HIV infection when they are circumcised.

3.6.1 Dependent Variable

The dependent variable for this study is self-reported consistent condom use with the most recent sexual partner. In the survey, the question that was used to measure consistent condom is "when you have sex with this person (most recent sexual partner), how often do you use a condom?" The possible answers to this question were "never", "hardly never", "some of the time", "most of the time" and "always". For the purpose of this study, consistent condom use was categorised into two categories, and these included "0" = Inconsistent (combining use a condom never, hardly never, some of the time and most of the time) and "1"= consistent (always use a condom). This was done because previous literature that used this variable with more than two categories did not find a significant difference in the results (Moyo et al., 2008).

3.6.2 Main Independent Variable

The main independent variable is circumcision status, which has a binary outcome of 'No" or 'Yes' to the question "Are you circumcised?". This variable was categorised as uncircumcised (0) and circumcised (1).

3.6.3 Intervening Variable

Perceived HIV risk is categorised into three categories which include; (0) will not get infected, (1) will get infected and, (2) already HIV positive. This variable was included in this study as previous literature has established its effect on health seeking behaviours and HIV preventative measures such as condom use (Prata et al., 2006). Furthermore, in both the Risk Compensation Theory and the HBM, perceived risk is one of the most important predictor of behaviour change. In the current study, this is consistent condom use. Additionally, perceived risk to HIV has also been linked to circumcision, with literature showing that men who perceive themselves to be at risk of getting infected with HIV and other sexually transmitted infections wanting to be circumcised (WHO/UNAIDS, 2007).

3.6.4 Control Variables

Evidence shows that the knowledge and skills one attains through education may increase their health literacy and make them more receptive to health education messages, such as the importance of using condoms to prevent HIV infections (Kipping et al., 2014). Having an education, being employed and having a higher socioeconomic status are also linked to better health and the utilisation of health services (Harris et al., 2011). In South Africa, literature shows that people who reported better health and know their health status have higher education, are employed and lived in urban areas (Peltzer et al., 2009; Van der Hoeven et al., 2012). Likewise, educational attainment has been found to be related to lower sexual risk taking. A study conducted in rural South Africa revealed that young people currently attending school were less likely to have a higher number of sexual partners, a larger age gap between their partners and were more likely to use condoms compared to those were not attending school (Hargreaves et al., 2008). A study conducted in four sub-Saharan African countries also found a strong relationship between wealth status and condom use, with young people from wealthy households reporting condom use more than those from poorer households (Madise et al., 2007). The younger age group is also significantly associated with using condoms since young people are more likely to be exposed to information and interventions relating to HIV prevention, as they are more likely to still be in school (Maticka-Tyndale, 2012).

On the other hand, literature shows that people who live in rural areas are mostly burdened by social ills such as high unemployment rates, lower educational attainment, and poverty, explaining their poor

health and health seeking behaviours compared to those from urban areas (Peltzer et al., 2009). The South African National HIV Prevalence, Incidence and Behaviour Survey found that residents from rural areas had higher HIV prevalence compared to urban residents (Shisana et al., 2014). Also, variations of HIV prevalence between provinces were shown. Kwa-Zulu Natal, Mpumalanga, Free State, and the North West have the highest HIV prevalence in the country (Shisana et al., 2014).

The above indicates the importance of controlling for socio-demographic characteristics of individual participants. Therefore, for this study, age, province of residence and type of place of residence, education, occupation status and socioeconomic status were controlled for.

This study acknowledges that while youth in South Africa are broadly classified as those between 14-35 years, due to the lack of differences between the age groups reported in five-year age groups, age was categorised into two categories, those between (0) 16-24 years and those between (1) 25-55 years (StatsSA, 2013). Province of residence included all nine South African provinces. These are Kwa-Zulu Natal, Eastern Cape, Free State, Gauteng, Limpopo, Mpumalanga, North West, Northern Cape and Western Cape. Type of place of residence was categorised as (0) rural and (1) urban. This study also controlled for, education. This variable was categorised into (0) primary/no education (combining no schooling and primary education due to small sample size among those with no schooling), (1) secondary (combining up to grade 11 and matric) and (2) tertiary education. Occupation status was categorised as (0) unemployed, (1) employed and (2) student. In the survey, socio-economic status was derived from the respondent's household items using it as a measure of living standards (Johnson et al., 2013). In this study, socio-economic status was categorised as low (0), middle (1) and high (2).

Table 1: Variables used in the Study

Variable	Definitions	Variable codes and Categories
Dependent Variables		
Consistent Condom Use	*How often do you use a condom when you have sex?*	0 = Inconsistent 1 = Consistent
Main Independent Variable		
Circumcision Status	*Are you circumcised?*	0 = Uncircumcised 1 = Circumcised
Intervening Variable		
Perceived HIV Risk	*Perceived risk of getting infected with HIV.*	0 = Will not get infected 1 = Will get infected 2 = Already HIV positive
Background / Control Variables		
Age	*Respondent's current age category*	0 = 16-24 1 = 25-55
Province	*Current province of residence*	0 = Eastern Cape 1 = Free State 2 = Gauteng 3 = Kwa-Zulu Natal 4 = Limpopo 5 = Mpumalanga 6 = North West 7 = Northern Cape 8 = Western Cape.
Place of Residence	*Local or settlement type*	0 = Rural 1 = Urban
Education	*Highest level of education completed*	0 = Primary/No education 1 = Secondary education 2 = Tertiary education
Occupation Status	*Current occupation status*	0 = Unemployed 1 = Employed 2 = Student
Socio-economic Status	*Socio-economic status scale*	0 = Low 1 = Middle 2 = High

3.7 Ethical Issues

This study used secondary analysis of available data. Prior to conducting the survey, ethical approval was obtained from the University of the Witwatersrand's Human Research Ethics Committee (Non-medical) and from the Institutional Review Board of the Johns Hopkins University Bloomberg School of Public Health. Informed consent forms were provided to each participant in their home language, and for those respondents who were younger than 18 years, informed consent was sought from the

respondent and from a parent or guardian. Furthermore, confidentiality of respondent's information and anonymity of respondents was maintained using unique identifying numbers (Johnson et al., 2013). Permission to use the 2012 NCS dataset was granted by the NCS Steering Committee.

3.8 Data Management

The management of the data was carried out using STATA version 14. Variables used in this study were recoded and new variables were computed to match those in Table 1 above. Furthermore, weights were applied to control for the effect of non-response, over- and under-sampling. In addition, model fitting was carried out and multicollinearity tested. The variables used in this study were independent of each other. STATA output is presented in appendix A.

3.9 Data Analysis

This study was analysed in three stages, according to the study objectives, while excluding missing cases.

Objective 1: To describe the levels and patterns of male circumcision and consistent condom use among sexually active men in South Africa.

Univariate and bivariate analysis were computed to address objective one of the study. For the univariate analysis, descriptive statistics were computed. Percentage and frequency distributions to describe the levels of male circumcision and consistent condom use in South Africa were used. Other selected variables were also described. The bivariate analysis was computed using cross-tabulations to analyse the patterns of male circumcision and consistent condom use by selected socio-demographic characteristics. Association between categorical variables was examined using a Pearson's Chi-square test. The estimates were considered statistically significant at $p<0.05$.

The Chi-square equation is:

$$\chi^2 = \sum ((O - E)^2 / E)$$

(Lancaster et al., 2005)

Where;

χ^2 = Chi-square

$\sum$ = Summation

O = Observed values

E = Expected values

Objective 2: To examine the socio-demographic factors that influence male circumcision in South Africa.

To examine which factors influence male circumcision in South Africa, a multivariate analysis was conducted using a binomial logistic regression model. The outcome variable, male circumcision status, is a nominal binary variable. The outcome variable only has two categories, which is one of the assumptions of using a binomial logistic regression model. The two categories for this variable were coded as (0) uncircumcised (reference category) and (1) circumcised. A binomial logistic regression estimates the probability that an event will occur. This, therefore, means that the results are presented as odds ratios.

The analysis of objective 2 was computed in two stages. The first stage was the unadjusted or crude odds ratio model, and the second was an adjusted odds ratio model. Unadjusted odds ratios mean that the results have not been adjusted for the effect of other confounding factors (Sedgwick; 2013). Confounding factors are those factors that have the potential to affect the association between the dependent and the independent variables if not controlled for, yielding a false association (Szumilas, 2010). On the other hand, adjusted odds ratios have been adjusted for potential confounders. This means that the association between the dependent and independent variables were examined simultaneously with other variable or confounders (Sedgwick; 2013).

Therefore, the binomial logistic regression equation is:

$$\text{Ln}\,(Y^{*}_{j}) = \ln\,[(P_i) / (1\text{-}P_j)] = a_j + (\beta_1 X_1 + \beta_2 X_2 + \ldots\ \beta_p X_p)$$

(Hosmer et al., 2004)

Where;

$\ln\,[(P_i) / (1\text{-}P_j)]$ = outcome variable

a = intercept

β = regression coefficient

X = independent variable.

The results of the binomial logistic regression were expressed as odds ratios (OR) with a 95% confidence interval (CI). Estimates were considered statistically significant at $p<0.05$.

Objective 3: To examine the association between male circumcision and consistent condom use among sexually active men in South Africa, while controlling for socio-demographic factors.

To examine whether male circumcision is a significant predictor of consistent condom use a multivariate analysis was conducted using a binomial logistic regression model, while controlling for the effect of socio-demographic factors. This is because the outcome of the study (consistent condom use) is a nominal binary variable. The categories for this variable were coded as (0) inconsistent (reference category) and (1) consistent. The results were also presented as unadjusted and adjusted odds ratios.

The results of this binomial logistic regression were also expressed as odds ratio (OR) with a 95% confidence interval (CI). The estimates were considered statistically significant at $p<0.05$.

3.10 Limitations

Since this study used self-reported cross-sectional data recall bias and social desirability bias among respondents for some of the sexual behaviour questions may affect the study results. However, it is the hope of this study that this will not influence the results too much since the survey questionnaire controlled for this. Nevertheless, the results of this study should be interpreted with caution. Furthermore, because cross-sectional data is collected at one point in time, the sequence of events cannot be determined meaning that causal relationship cannot be inferred. Therefore, the interpretation of the findings are limited to associations between the variables - rather than cause and effect relationships. Finally, while only VMMC has been found to reduce the risk of acquiring HIV in men, this study used male circumcision as a general term and did not differentiate between medical or traditional circumcision. This may, therefore, affect how the results are interpreted. Caution needs to be applied when interpreting the results.

CHAPTER 4: RESULTS

In this chapter, the results of this study are presented.

4.1 Descriptive Characteristics of the Study Population

Only 40.8% of the men reported to being consistent users of condoms, while the rest remained inconsistent condom users (Table 2). Furthermore, just under two thirds of the men were circumcised (61.5%), while 38.5% were not circumcised. Among those who were circumcised, the average age at circumcision was 16 years and majority (90.3%) reported to being fully circumcised and for most (56.1%) this procedure was performed by a traditional circumciser. When asked about their perceived risk of getting infected with HIV the majority (73%) of the participants reported that they would not get infected, while 4% were already HIV positive. Additionally, most men (60.8%) were aged between 25-55 years compared to those in their youth (16-24). Most men were either from Gauteng (28.9%) or Kwa-Zulu Natal (23.6%), and 1.2% were from the Northern Cape. Over two thirds (68.1%) of the sample were from urban areas, with only 31.9% from rural areas. The majority (76.4%) had at least a secondary education and 14.0% had a tertiary education. More than half of the men (50.9%) were currently unemployed, while the remainder were either employed (35.5%) or students (13.6%). Also, 30.9% of the men were from a household with a low socioeconomic status, while 29.7% reported to belonging to a household with a high socio-economic status.

Table 2: Frequency and Percentage Distributions of Sample Characteristics

VARIABLES	FREQUENCY (n)	PERCENTAGE (%)
Consistent Condom Use		
inconsistent	823	59.2
consistent	568	40.8
Total	1 391	100
Male Circumcision		
uncircumcised	694	38.5
circumcised	1 110	61.5
Total	1 804	100
Perceived HIV Risk		
will not get infected	1 292	73.0
will get infected	402	22.7
already HIV positive	76	4.3
Total	1 770	100
Age		
16-24	744	39.2
25-55	1 155	60.8
Total	1 899	100
Province		
Eastern Cape	211	11.1
Free State	112	5.9
Gauteng	549	28.9
Kwa-Zulu Natal	448	23.6
Limpopo	160	8.4
Mpumalanga	116	6.1
North West	140	7.4
Northern Cape	22	1.2
Western Cape	141	7.4
Total	1 899	100
Place of Residence		
rural	605	31.9
urban	1 294	68.1
Total	1 899	100
Education		
primary/no education	183	9.7
secondary education	1 446	76.4
tertiary education	264	14.0
Total	1 893	100
Occupation Status		
unemployed	944	50.9
employed	658	35.5
student	252	13.6
Total	1 854	100
Socio-economic Status		
low	587	30.9
medium	749	39.4
high	563	29.7
Total	1 899	100

Note: Inconsistencies in the total number for all the above variables is due to missing cases

4.2 Bivariate Analysis

All of the socio-demographic factors, including perceived HIV risk, were significantly associated with male circumcision status; except for occupation status (p = 0.418) (Table 3). With regards to perceived risk to HIV, a significant percentage (75.8%) of men who reported that they would not get infected with HIV were circumcised. Of those participants aged 16-24 years 37.5% were circumcised; whilst amongst those aged 25-55 years 62.5% were circumcised. A considerable percentage of circumcised men were from Gauteng (28.7%); followed by those from the Eastern Cape (16.5%). Men from urban areas (69.5%) compared to those from rural areas (30.5%) were more likely to be circumcised. Furthermore, circumcision was higher among men with secondary education (75.5%) compared to those of other educational statuses. The majority of unemployed men (51.3%) were circumcised, while a higher percentage of men from a middle socioeconomic household (40.8%) were circumcised.

Table 3: Percentage Distribution of Perceived HIV Risk and Socio-Demographic Characteristics of Male Circumcision Status

VARIABLES	Chi2 p-value	MALE CIRCUMCISION STATUS			
		Uncircumcised		Circumcised	
		n	(%)	n	(%)
Perceived HIV Risk*	**0.002**				
will not get infected		447	(68.2)	792	(75.8)
will get infected		178	(27.2)	209	(20.0)
already HIV positive		30	(4.6)	44	(4.2)
Age*	**0.033**				
16-24		295	(42.5)	416	(37.5)
25-55		399	(57.5)	694	(62.5)
Province*	**0.000**				
Eastern Cape		22	(3.2)	183	(16.5)
Free State		44	(6.3)	65	(5.9)
Gauteng		185	(26.7)	318	(28.7)
Kwa-Zulu Natal		277	(39.9)	163	(14.7)
Limpopo		28	(4.0)	130	(11.7)
Mpumalanga		39	(5.6)	71	(6.4)
North West		73	(10.5)	53	(4.8)
Northern Cape		6	(0.9)	15	(1.4)
Western Cape		20	(2.9)	112	(10.1)
Place of Residence*	**0.035**				
rural		245	(35.3)	339	(30.5)
urban		449	(64.7)	771	(69.5)
Education*	**0.000**				
primary/no education		83	(12.0)	85	(7.7)
secondary education		541	(78.4)	837	(75.5)
tertiary education		66	(9.6)	186	(16.8)
Occupation Status	**0.418**				
unemployed		341	(50.6)	559	(51.3)
employed		229	(34.0)	386	(35.5)
student		104	(15.4)	144	(13.2)
Socio-economic Status*	**0.008**				
low		241	(34.7)	312	(28.1)
middle		270	(38.9)	453	(40.8)
high		183	(26.4)	345	(31.1)

CHI_2 statistically significant at $p<0.05$*

As can be seen from Table 4 below, most variables were significantly associated with consistent condom use - except for circumcision status and province. The table shows that just under two thirds of circumcised men (62.6%) were consistent condom users, while 37.4% did not use condoms consistently. Furthermore, most (77.3%) of those who believed that they would not get infected with HIV reported being consistent condom users, while 3.5% of those who were already living with HIV were consistent condom users.

Among those who reported using condoms consistently, 46.5% were aged between 16-24 years and 53.5% were between 25-55 years. Just under a third (29.2%) of men from the Gauteng Province reported consistent condom use, followed by those from Kwa-Zulu Natal (26.2%). The province that had the lowest percentage of consistent condom users (1.1%) were from the Northern Cape. Furthermore, the clear majority of men (73.4%) from urban areas reported consistent condom use, while only 26.6% of men from the rural areas were consistent condom users.

Among those with primary or no education 3.9% were consistent condom users. For those with secondary education the majority (81.3%) were consistent condom users, while only 14.8% of those with tertiary education reported using condoms consistently. Just below half of unemployed men (47.3%) reported using condoms consistently, followed by those who were currently employed (34.9%). Less than half (44.4%) of men from the middle socioeconomic household were consistent condom users, followed by those from a household with a high socioeconomic status (30.3%).

Table 4: Percentage Distribution of Circumcision Status, Perceived HIV Risk and Socio-Demographic Characteristics by Consistent Condom Use

VARIABLES	Chi2 p-value	Consistent condom use	
		n	(%)
Circumcision Status	**0.140**		
uncircumcised		207	(37.4)
circumcised		347	(62.6)
Perceived HIV Risk*	**0.000**		
will not get infected		422	(77.3)
will get infected		105	(19.2)
already HIV positive		19	(3.5)
Age*	**0.036**		
16-24		264	(46.5)
25-55		304	(53.5)
Province	**0.173**		
Eastern Cape		72	(12.7)
Free State		30	(5.3)
Gauteng		166	(29.2)
Kwa-Zulu Natal		149	(26.2)
Limpopo		29	(5.1)
Mpumalanga		37	(6.5)
North West		36	(6.3)
Northern Cape		6	(1.1)
Western Cape		43	(7.6)
Place of Residence*	**0.000**		
rural		151	(26.6)
urban		417	(73.4)
Education*	**0.002**		
primary/no education		22	(3.9)
secondary education		461	(81.3)
tertiary education		84	(14.8)
Occupation Status*	**0.016**		
unemployed		266	(47.3)
employed		196	(34.9)
student		100	(17.8)
Socio-economic Status*	**0.000**		
low		144	(25.4)
middle		252	(44.4)
high		172	(30.3)

CHI_2 statistically significant at $p<0.05$*

Table 5 below presents the patterns of consistent condom use by selected characteristics, while controlling for the province of residence. Among the circumcised men, consistent condom use was higher for men who lived in the Eastern Cape (91.7%), Limpopo (89.7%), and the Western Cape (84.6%). Of the men who reported that they would get infected with HIV, most who reported consistent condom use were from the Eastern Cape (22.9%), followed by those from Kwa-Zulu Natal (25.0%) and Gauteng (21.4%).

Over two thirds of the men who reported consistent condom use in the Northern Cape (66.7%), and over half in Limpopo (58.6%), North West (58.3%) and the Free State (56.7%) were aged 16-24 years. On the other hand, 62.8% of men in the Western Cape, 59.5% of men in Mpumalanga, and 59.1% in Kwa-Zulu natal who reported consistent condom use, were men aged 25-55 years. Rural Gauteng had the least number of men (1.8%) who reported consistent condom use compared to men from rural areas in other provinces. On the other hand, the majority of men from urban areas in Gauteng reported consistent condom use (98.2%), followed by those in the Free State (83.3%) and the Eastern Cape (73.6%).

Consistent condom use was higher among men with secondary education in all the provinces. Overall, unemployed men had a higher probability of using condoms consistently compared to those who were either employed or still students. When looking at individual provinces, by unemployed men, a higher percentage (60.0%) of those from North West reported to using condoms consistently compared to the other provinces. When looking at socioeeconomic status, men from a household with a middle socio-economic status reported consistent condom use more compared to those belonging to a household with a low or high socio-economic status. A higher percentage (73.3%) of men from the middle-income homes in the Free State were consistent condom users, compared to men from other provinces.

Table 5: Frequency and Percentage Distribution of Consistent Condom Use by Province

VARIABLES	Eastern Cape		Free State		Gauteng		Kwa-Zulu Natal		Limpopo		Mpumalanga		North West		Northern Cape		Western Cape	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Male Circumcision																		
uncircumcised	6	(8.3)	12	(40)	47	(29.6)	93	(62.8)	3	(10.3)	15	(41.7)	24	(68.6)	1	(16.7)	6	(15.4)
circumcised	66	(91.7)	18	(60)	112	(70.4)	55	(37.2)	26	(89.7)	21	(58.3)	11	(31.4)	5	(83.3)	33	(84.6)
Perceived HIV Risk																		
will not get infected	52	(74.3)	25	(83.3)	112	(72.7)	109	(73.7)	25	(89.3)	29	(85.3)	27	(79.4)	6	(100)	37	(88.1)
will get infected	16	(22.9)	4	(13.3)	33	(21.4)	37	(25.0)	1	(3.6)	5	(14.7)	6	(17.7)	0	(0.0)	3	(7.1)
already HIV positive	2	(2.9)	1	(3.3)	9	(5.8)	2	(1.4)	2	(7.1)	0	(0.0)	1	(2.9)	0	(0.0)	2	(4.8)
Age																		
16-24	35	(48.6)	17	(56.7)	78	(47.0)	61	(40.9)	17	(58.6)	15	(40.5)	21	(58.3)	4	(66.7)	16	(37.2)
25-55	37	(51.4)	13	(43.3)	88	(53.0)	88	(59.1)	12	(41.4)	22	(59.5)	15	(41.7)	2	(33.3)	27	(62.8)
Place of Residence																		
rural	19	(26.4)	5	(16.7)	3	(1.8)	46	(30.9)	29	(100)	20	(54.1)	23	(63.9)	6	(100)	0	(0.0)
urban	53	(73.6)	25	(83.3)	163	(98.2)	103	(69.1)	0	(0.0)	17	(46.0)	13	(36.1)	0	(0.0)	43	(100)
Education																		
primary/no education	3	(4.2)	1	(3.3)	6	(3.6)	5	(3.4)	1	(3.5)	1	(2.7)	3	(8.6)	0	(0.0)	2	(4.7)
secondary education	61	(84.2)	27	(90.0)	126	(75.9)	122	(81.9)	23	(79.3)	33	(89.2)	28	(80.0)	5	(83.3)	36	(83.7)
tertiary education	8	(11.1)	2	(6.7)	34	(20.5)	22	(14.8)	5	(17.2)	3	(8.1)	4	(11.4)	1	(16.7)	5	(11.6)
Occupation Status																		
unemployed	42	(59.2)	15	(50.0)	63	(38.2)	74	(50.3)	11	(37.9)	18	(48.7)	21	(60.0)	1	(16.7)	21	(50.0)
employed	14	(19.7)	8	(26.7)	74	(44.9)	48	(32.7)	9	(31.0)	16	(43.2)	6	(17.1)	4	(66.7)	17	(40.5)
student	15	(21.1)	7	(23.3)	28	(17.0)	25	(17.0)	9	(31.0)	3	(8.1)	8	(22.9)	1	(16.7)	4	(9.5)
Socio-economic Status																		
low	18	(25.0)	3	(10.0)	23	(18.9)	47	(31.5)	14	(48.3)	8	(21.6)	18	(50.0)	1	(16.7)	12	(27.9)
middle	41	(56.9)	22	(73.3)	60	(36.1)	71	(47.7)	12	(41.4)	18	(48.7)	7	(19.4)	1	(16.7)	20	(46.5)
high	13	(18.1)	5	(16.7)	83	(50.0)	71	(20.8)	3	(10.3)	11	(29.7)	11	(30.6)	4	(66.7)	11	(25.6)

Note: This table shows the results for the category, consistent condom use, as it is the interest of this study. The results for inconsistent condom use have been omitted

From the results in Table 6, a higher percentage of circumcised men who obtained a tertiary (79.3%) and secondary education (60.8%) were consistent condom users. When looking at their perceived risk of getting infected with HIV, a higher percentage (78.0% and 78.8%) of men with secondary and tertiary education, respectively, whom reported that they would not get infected with HIV were consistent condom users.

Among those men aged 16-24 years, consistent condom use was reported by just under half of those with secondary education (49.7%), followed by those with tertiary education (33.3%). When controlling for tertiary education, a high percentage of men from Gauteng (40.5%) and Kwa-Zulu Natal (26.2%) reported being consistent condom users. When looking at place of residence, overall, a higher percentage of men from urban areas were consistent condom users. Of these men, a higher proportion of those with primary or no education (77.3%) reported using condoms consistently, compared to those with secondary and tertiary education.

In general, those who were currently employed were better consistent condom users than their unemployed or student counterparts. More than half of those with a tertiary education (53.6%) reported being consistent condom users, compared to those with secondary or primary/no education. When controlling for tertiary education, most men belonging to a household with a high socio-economic status (59.5%) reported to using condoms consistently.

Table 6: Frequency and Percentage Distribution of Consistent Condom Use, controlling for Education

VARIABLES	Primary/No education		Secondary Education		Tertiary Education	
	n	(%)	n	(%)	n	(%)
Male Circumcision						
uncircumcised	13	(59.1)	176	(39.2)	17	(20.7)
circumcised	9	(40.9)	273	(60.8)	65	(79.3)
Perceived HIV Risk						
will not get infected	10	(52.6)	348	(78.0)	63	(78.8)
will get infected	8	(42.1)	84	(18.8)	13	(16.3)
already HIV positive	1	(5.3)	14	(3.1)	4	(5.0)
Age						
16-24	6	(27.3)	229	(49.7)	28	(33.3)
25-55	16	(72.7)	232	(50.3)	56	(66.7)
Province						
Eastern Cape	3	(13.6)	61	(13.2)	8	(9.5)
Free State	1	(4.6)	27	(5.9)	2	(2.4)
Gauteng	6	(27.3)	126	(27.3)	34	(40.5)
Kwa-Zulu Natal	5	(22.7)	122	(26.5)	22	(26.2)
Limpopo	1	(4.6)	23	(5.0)	5	(6.0)
Mpumalanga	1	(4.6)	33	(7.2)	3	(5.6)
North West	3	(13.6)	28	(6.1)	4	(4.8)
Northern Cape	0	(0.0)	5	(1.1)	1	(1.2)
Western Cape	2	(9.1)	36	(7.8)	5	(6.0)
Place of Residence						
rural	5	(22.7)	125	(27.1)	20	(23.8)
urban	17	(77.3)	336	(72.9)	64	(76.2)
Occupation Status						
unemployed	11	(50.0)	226	(49.6)	29	(34.5)
employed	11	(50.0)	140	(30.7)	45	(53.6)
student	0	(0.0)	90	(19.7)	10	(11.9)
Socio-economic Status						
low	11	(50.0)	126	(27.3)	6	(7.1)
middle	9	(40.9)	215	(46.6)	28	(33.3)
high	2	(9.1)	120	(26.0)	50	(59.5)

Note: This table shows the results for the category, consistent condom use, as it is the interest of this study. The results for inconsistent condom use have been omitted

4.3 Multivariate Analysis

4.3.1 Unadjusted Regression Results

Table 7 below shows the unadjusted and adjusted logistic regression results of the perceived HIV risk and socio-demographic determinants of male circumcision. From both the models presented below, all the selected socio-demographic variables, including perceived risk of HIV, were significantly associated with male circumcision. Furthermore, before adjusting for other factors, men who believed that they would get infected with HIV, and those who were already HIV positive, were less likely (0.63 and 0.73 OR, respectively) to be circumcised than men who believed that they would not get infected with HIV.

The odds of being circumcised were 1.29 times greater for men aged 25-55 years compared to those age 16-24 years. Also, when compared to men from the Eastern Cape, men from all the other South African provinces were less likely to be circumcised. On the other hand, men from urban areas were 1.54 times more likely to be circumcised compared to those from rural areas.

When looking at education, men with secondary and tertiary education were 1.48 and 2.88 times more likely to be circumcised compared to men with primary or no education, respectively. Additionally, employed men were 1.01 times more likely to be circumcised while students were 20% less likely to be circumcised, compared to men who were unemployed. Similarly, men from middle and high socio-economic status had greater odds of being circumcised (1.33 and 1.54 OR, respectively) than men from low socio-economic status households.

4.3.2 Adjusted Regression Results

While holding other factors in the model constant, the adjusted model (Model 2) showed that similar to the unadjusted model, men who believed that they would get infected with HIV were significantly less likely to be circumcised (OR= 0.82). Furthermore, men aged 25-55 years had higher odds (OR=1.49) of being circumcised compared to those aged 16-24 years. When looking at province of residence, men from all other provinces had lower odds of being circumcised compared to men from the Eastern Cape. Furthermore, men from urban areas had greater odds (OR=1.21) of being circumcised compared to men from rural areas.

The odds of being circumcised were 1.71 and 3.15 times higher for men with secondary and tertiary education than men with primary or no education, respectively. With respect to occupation status, employed men and students were 4% and 2% less likely to be circumcised than unemployed men, respectively. The results for household socioeconomic status show that while men from middle socio-

economic status households had 3% lower odds of being circumcised, men from a high socio-economic household were 10% more likely to be circumcised, compared to men from a low socio-economic status household.

Table 7: Weighted Unadjusted and Adjusted Perceived HIV Risk and Socio-Demographic Determinants of Male Circumcision

	MODEL 1	MODEL 2
CHARACTERISTICS	UNADJUSTED OR [95% CI]	ADJUSTED OR [95% CI]
Perceived HIV Risk		
will not get infected	1	1
will get infected	0.63 [0.629 - 0.634]*	0.82 [0.817 - 0.824]*
already HIV positive	0.73 [0.723 - 0.735]*	0.60 [0.594 - 0.606]*
Age		
16-24	1	1
25-55	1.29 [1.286 - 1.296]*	1.49 [1.480 - 1.493]*
Province		
Eastern Cape	1	1
Free State	0.20 [0.197 - 0.202]*	0.16 [0.155 - 0.159]*
Gauteng	0.21 [0.213 - 0.217]*	0.15 [0.147 - 0.151]*
Kwa-Zulu Natal	0.06 [0.059 - 0.060]*	0.05 [0.054 - 0.055]*
Limpopo	0.60 [0.596 - 0.610]*	0.55 [0.546 - 0.560]*
Mpumalanga	0.25 [0.248 - 0.254]*	0.22 [0.217 - 0.223]*
North West	0.09 [0.093 - 0.096]*	0.09 [0.085 - 0.087]*
Northern Cape	0.18 [0.181 - 0.189]*	0.15 [0.148 - 0.155]*
Western Cape	0.92 [0.912 - 0.936]*	0.74 [0.726 - 0.747]*
Place of Residence		
rural	1	1
urban	1.54 [1.531 - 1.542]*	1.21 [1.202 - 1.216]*
Education		
primary/no education	1	1
secondary education	1.48 [1.473 - 1.489]*	1.71 [1.698 - 1.722]*
tertiary education	2.88 [2.864 - 2.905]*	3.15 [3.124 - 3.180]*
Occupation Status		
unemployed	1	1
employed	1.01 [1.009 - 1.017]*	0.96 [0.958 - 0.967]*
student	0.80 [0.795 - 0.803]*	0.98 [0.970 - 0.982]*
Socio-economic Status		
low	1	1
middle	1.33 [1.323 - 1.334]*	0.97 [0.968 - 0.978]*
high	1.54 [1.533 - 1.546]*	1.10 [1.093 - 1.105]*

p<0.05*; OR = Odds Ratio; 95% CI = 95% Confidence Interval; 1 = Reference Category

4.3.3 Unadjusted Regression Results

Table 8 below shows the unadjusted and adjusted logistic regression results of the effects of selected variables on consistent condom use behaviours. In both the models all the selected variables were significantly associated with consistent condom use. Furthermore, before adjusting for other factors, the odds of consistently using condoms were 1.17 times greater for circumcised men than uncircumcised men. Also, men who believed that they would get infected with HIV were 0.71 times less likely, while those who were already HIV positive were 1.04 times more likely, to consistently use condoms than men who believed that they would not get infected with HIV.

The results also show that older men are less likely to consistently use condoms, with the odds of using a condom consistently were 0.79 times lower for men aged 25-55 years than those aged 16-24 years. Furthermore, when compared to men from the Eastern Cape, men from all the other South African provinces were less likely to consistently use condoms. On the other hand, men from urban areas were 1.48 times more likely to use condoms consistently compared to those from rural areas.

When looking at education status, men with secondary and tertiary education were 2.76 and 2.80 times more likely to consistently use condoms compared to men with primary or no education, respectively. Additionally, employed men and students were 1.16 and 1.74 times more likely to use condoms consistently than unemployed men, respectively. Similarly, men from middle and high socio-economic status households had greater odds of consistently using condoms (1.92 and 1.53 OR, respectively) than men from low socio-economic status households.

4.3.4 Adjusted Regression Results

After adjusting for perceived HIV infection and selected socio-demographic variables in the regression model, the second model showed that like the first model, the odds of consistently using a condom were significantly higher for circumcised men (OR=1.18; C.I, 1.171 - 1.182) than uncircumcised men. Furthermore, men who believed that they would get infected with HIV were 0.72 times less likely, while those who are already HIV were 41% more likely, to use condoms consistently than those who believed that they would not get infected with HIV.

Additionally, compared to men aged 16-24 years, those aged 25-55 years had lower odds of consistently using condoms (OR=0.83; C.I, 0.830 - 0.838). On the other hand, compared to men from the Eastern Cape, men from Kwa-Zulu Natal and North West were 22% and 31% more likely to use condoms consistently. However, men from all the other provinces were less likely to consistently use condoms. Furthermore, urban men were 43% more likely to consistently use condoms than men from the rural areas.

The odds of using a condom consistently were 2.34 and 2.14 times greater for men with secondary and tertiary education than men with primary or no education, respectively. With regards to occupation status, employed men and students were 19% and 78% more likely to use condoms consistently than unemployed men, respectively. Similarly, men from middle and high socio-economic status households were 1.94 and 1.31 times more likely to use condoms consistently than men from low socio-economic status households, respectively.

Table 8: Weighted Unadjusted and Adjusted Effects of Circumcision Status, Perceived HIV Risk and Socio-Demographic Characteristics on Consistent Condom Use

	MODEL 1	MODEL 2
CHARACTERISTICS	UNADJUSTED OR [95% CI]	ADJUSTED OR [95% CI]
Circumcision Status		
uncircumcised	1	1
circumcised	1.17 [1.667 - 1.176]*	1.18 [1.171 - 1.182]*
Perceived HIV Risk		
will not get infected	1	1
will get infected	0.71 [0.702 - 0.709]*	0.72 [0.718 - 0.726]*
already HIV positive	1.04 [1.033 - 1.055]*	1.41 [1.393 - 1.424]*
Age		
16-24	1	1
25-55	0.79 [0.789 - 0.795]*	0.83 [0.830 - 0.838]*
Province		
Eastern Cape	1	1
Free State	0.72 [0.710 - 0.725]*	0.63 [0.628 - 0.642]*
Gauteng	0.95 [0.939 - 0.954]*	0.78 [0.771 - 0.786]*
Kwa-Zulu Natal	0.85 [0.844 - 0.857]*	1.22 [1.211 - 1.234]*
Limpopo	0.50 [0.499 - 0.509]*	0.62 [0.609 - 0.624]*
Mpumalanga	0.84 [0.836 - 0.852]*	0.91 [0.902 - 0.922]*
North West	0.83 [0.817 - 0.835]*	1.31 [1.291 - 1.323]*
Northern Cape	0.39 [0.380 - 0.400]*	0.41 [0.399 - 0.421]*
Western Cape	0.82 [0.089 - 0.825]*	0.74 [0.735 - 0.752]*
Place of Residence		
rural	1	1
urban	1.48 [1.476 - 1.488]*	1.43 [1.425 - 1.442]*
Education		
primary/no education	1	1
secondary education	2.76 [2.740 - 2.789]*	2.34 [2.318 - 2.365]*
tertiary education	2.80 [2.771 - 2.827]*	2.14 [2.120 - 2.169]*
Occupation Status		
unemployed	1	1
employed	1.16 [1.157 - 1.167]*	1.19 [1.182 - 1.194]*
student	1.74 [1.733 - 1.754]*	1.78 [1.766 - 1.789]*
Socio-economic Status		
low	1	1
middle	1.92 [1.908 - 1.926]*	1.94 [1.929 - 1.950]*
high	1.53 [1.524 - 1.539]*	1.31 [1.306 - 1.321]*

p<0.05*; OR = Odds Ratio; 95% CI = 95% Confidence Interval; 1 = Reference Category

4.4 Hypotheses Testing

This section presents the testing of the hypotheses stated in section 2.4. According to the main theoretical framework guiding this study, the Risk Compensation Theory, individuals are more likely to engage in an increased risky behaviour in response to a perceived risk reduction following an intervention (Westercamp et al., 2014). Therefore, the hypothesis for this study was:

H_0: Circumcised men are less likely to consistently use condoms.

H_1: Circumcised men are more likely to consistently use condoms.

Using a binomial logistic regression analysis, the results revealed that when controlling for other factors, circumcised men were 1.18 times more likely to consistently use a condom than uncircumcised men, and the p-value for these results was 0.00 which is less than the $a = 0.05$ used to test significance.

This study, therefore, rejects the null hypothesis (**H_0**).

CHAPTER 5: DISCUSSION

While VMMC has been proven to be effective in reducing the risk of HIV infections in heterosexual men, the belief that one is completely protected from acquiring HIV may be detrimental to the fight against the spread of this infectious disease. Due to its partial protection, VMMC, as an HIV prevention strategy can only be effective if other HIV prevention measures are used in conjunction with the intervention, such as condoms. If not, there is a high likelihood that the rates of HIV infections will increase, thus nullifying the protective effect that the intervention is meant to provide. Therefore, for VMMC to be effective as an HIV prevention strategy continuous monitoring of the association between male circumcision and other risky sexual behaviours is of the utmost importance. This is also crucial if South Africa is to reduce the number of HIV infections by 50% in 2016 and achieve Sustainable Development Goal 3, which aims to end the epidemic of AIDS and other communicable diseases by 2030. The primary objective of this study, therefore, was to investigate the association between male circumcision and consistent condom use in South Africa.

Overall, this study found a positive association between male circumcision and consistent condom use. Specifically, this study found that circumcised men were significantly more likely (OR=1.18; C.I, 1.171 - 1.182) to consistently use condoms than uncircumcised men. The findings on the protective sexual behaviours of circumcised men are consistent with findings from several studies which also found that, contrary to the concerns about male circumcision increasing men's risky sexual behaviours after the procedure, circumcised men decrease their risky sexual behaviours over time. These studies found no evidence of risk compensation (Bailey et al., 2007; Mattson et al., 2008; Westercamp et al., 2014; Balekang et al., 2016), similar to the current study.

For instance, the findings from a two-year prospective cohort study conducted in Kenya found that condom use increased over time for both circumcised and uncircumcised men, with a significant increase in those who were circumcised compared to those who were uncircumcised (Westercamp et al., 2014). Supporting these results are other studies also conducted in Kenya, which found that risky sexual behaviours decreased over time for both circumcised and uncircumcised men (Bailey et al., 2007; Mattson et al., 2008). Similar results were also reported by a study conducted in Botswana, which found that circumcised men with secondary education were more likely to use condoms consistently (Balekang & Dintwa, 2016).

While the decline in condom use among circumcised men has been of central concern for those against the roll-out of VMMC as a recognised HIV preventative strategy, a qualitative study conducted in South Africa revealed that circumcised men reported using condoms easier after circumcision as a result of the absent foreskin. Furthermore, the participants in that study stated that using a condom after

circumcision was safer as the condom did not slide off during sexual engagements (Humphries et al., 2015). Similar results were also documented in a qualitative study conducted in Kenya, where medically circumcised participants stated that before the circumcision wearing a condom was difficult and "it took long" causing frustration that led to them engaging in sexual intercourse without a condom (L'Engle et al., 2014). After circumcision, however, wearing a condom was reported to be easier and safer due to the fact that the condom would "stay on" and "not burst or slip off" (L'Engle et al., 2014). The above accounts are probable explanations of why circumcised men in this current study were more likely to consistently use condoms, compared to uncircumcised men. According to the above studies, having a circumcised penis makes wearing a condom an easier task which further encourages consistent use of condoms.

On the other hand, the positive association between male circumcision and consistent condom use could also be explained by the fact that, after circumcision, circumcised men engage in frequent sexual intercourse and some have also reported increasing the number of their sexual partners (Auvert et al., 2005; Kibira et al., 2013; L'Engle et al., 2014; Kibira et al., 2014). For instance, the first randomised control trial study conducted in South Africa found that circumcised men reported more sexual contacts compared to uncircumcised men (Auvert et al., 2005). Similarly, a Ugandan study found a strong association between circumcision and risky sexual behaviours, with circumcised men, reporting to having more than three-lifetime sexual partners and having had risky sexual intercourse without the use of a condom (Kibira et al., 2013). Similar results were also reported by a study conducted in Uganda which found that circumcised men had multiple lifetime partners and were likely to engage in non-marital sexual intercourse while also not using a condom (Kibira et al., 2014).

Moreover, findings from qualitative studies conducted in sub-Saharan Africa, revealed that circumcised men reported to increase their sexual contact and the number of their sexual partners. This was due to the belief that circumcision provided them with better sexual pleasure than before, which encouraged them to have more sexual encounters (L'Engle et al., 2014; Humphries et al., 2015). The increase in the number of sexual partners has also been found to be associated with condom use. Studies conducted in South Africa revealed that men who had more than one sexual partner were significantly more likely to report condom use (Shisana et al., 2014; Simbayi et al., 2014). Furthermore, while circumcised men in this current study may be more likely to use condoms consistently, this might also conceal their other risky sexual behaviours such as having multiple concurrent partners. According to a study conducted in South Africa, men who had undergone VMMC had a higher risk (RRR=1.67; CI, 1.14–2.46) of having more than two sexual partners, compared to uncircumcised men (Zungu et al., 2016).

The fact that circumcised men are more likely to use condoms might also indicate that they are using condoms with their casual partners, especially if they are more likely to increase the number of their

sexual partners after circumcision. Moreover, literature shows that consistent condom use is usually higher among casual sexual partners than among regular sexual partners (Maharaj, 2005). This is because in long term relationships people do not feel at risk, as they trust their partners and requesting a condom in a regular or stable relationship suggests mistrust or infidelity (Maharaj, 2005; Dokubo et al., 2014). This could be a probable explanation in this study as well, particularly because the survey did not specify the type of current relationship one is using a condom with. Furthermore, the current study only focused on consistent condom use and, therefore, the association between male circumcision and multiple sexual partners could not be investigated.

On the other hand, circumcised men in this current study might genuinely be using condoms consistently, not because they are engaging in other risky behaviours but because condom use after circumcision becomes easier and because of the increased HIV knowledge in the country. Amongst those who underwent VMMC, it is possible that they received this information during the voluntary HIV counselling and testing that forms part of the provision of VMMC services in South Africa. This could be associated with the greater protective behaviour resulting from HIV counselling as literature has shown a positive association between receiving counselling and testing for HIV and condom use (Prata et al., 2006). Unfortunately, this study was not able to assess whether voluntary HIV testing and counselling contributed to this protective behaviour. Furthermore, HIV awareness is widespread in the country and could be another possible explanation for the results observed in this study. For instance, a study among students and staff at South African technical and vocational education and training colleges reported that 87% of the participants had heard of AIDS; while 96% were aware that HIV could be transmitted through unprotected sexual intercourse (Mbelle et al., 2014).

On the other hand, knowledge and perception of risk does not always translate to behaviour change, such as condom use. In this study, men who perceived themselves as being at risk of contracting HIV reported lower odds of using condoms consistently. These results are in line with the findings from a study conducted in Uganda among adolescents, which found that perception of risk to HIV was not significantly associated with condom use even after controlling for other factors (Kayiki et al., 2011). Similar results were also reported in another Ugandan study, which found a higher risk perception of HIV infection among adolescent males to be associated with engagements in risky sexual behaviours 12 months prior to the study (Kibombo et al., 2007). On the other hand, a study conducted in Nigeria found that condom use was twice as prevalent among those who perceived themselves to be at risk of HIV compared to those who did not (Ibrahim et al., 2014). Similarly, a South African study also found that among married or cohabiting couples, women who perceived themselves to be at risk of getting infected by a partner were four times more likely to report condom use than women of other marital status' (Maharaj et al., 2005). Among adolescents, a study conducted in four sub-Saharan African

countries found that those who perceived themselves to be at high risk of HIV were 2.26 to 5.10 times more likely to report condom use (Cederbaum et al., 2014).

Significant are the findings that men who were already HIV positive reported greater odds of using condoms consistently. Condom use among people living with HIV has also been reported by a study conducted in rural South Africa. According to this study, condom use among those who were aware of their seropositive status was extremely high (75%), compared to those who were not aware that they were HIV positive and those who were HIV negative (Rosenberg et al., 2017). A similar study conducted in rural Kwa-Zulu Natal also found that condom use was significantly associated with being HIV positive (Chimbindi et al., 2010). On the other hand, a study conducted in Kenya found that while people living with HIV were more likely to use condoms with their primary sexual partners, the proportion of condom use decreased with the ranking of other casual partners among these participants (Emmanuel et al., 2015). Furthermore, condom use among people living with HIV remained low in those aged 18-24 years and those who relied on remittance from their kin as the main source of income (Emmanuel et al., 2015). In contrast, a study conducted in Mozambique reported that among people living with HIV, condom use at last sex was very low (83%). However, those who reported to be not using a condom at last sex were unaware of their seropositive status (Dokubo et al., 2014). The findings from the current study, and findings from previous studies, point to the importance that HIV testing and counselling has in influencing behaviour changes of people living with HIV and helping them avoid HIV transmission (Rosenberg et al., 2017).

This study also found consistent condom use to decrease with increasing age. The results of this study are in accordance with a study conducted in rural South Africa, which found that among both men and women condom use decreased as age increased (Rosenberg et al., 2017). Similarly, a study conducted in the Free State indicated that even after controlling for other factors, as age increased the odds of using a condom decreased (OR=0.95) (Chandran et al., 2012). A South African national representative survey (2012) found that 58% of persons aged 15-24 years reported condom use at last sex, compared to 34% among those 25-49 years and the rates were even lower for those aged 50 years and older at 12% (Shisana et al., 2014). The finding that older age groups are less likely to use condoms consistently may also indicate that older men are more likely to be in a stable relationship or they are less concerned about getting infected with HIV (Beksinska et al., 2012). Literature also shows that young people are more likely to use condoms compared to older people because young people are highly exposed to HIV prevention information as they are likely to still be in school (Maticka-Tyndale, 2012).

The current study showed that while circumcision was lower in all the provinces compared to the Eastern Cape; Kwa-Zulu Natal and North West had the lowest odds (OR=0.06 and 0.09, respectively) of circumcision of all the provinces. On the other hand, when looking at consistent condom use, both

these provinces had the highest odds (OR=1.22 and 1.31) of consistent condom use compared to all the other provinces. While this may show that circumcision may not be the main factor in influencing condom use, it may also unveil other factors influencing condom use. Such factors may include the availability of condoms. For instance, the annual progress report for the provincial strategic plan 2012-2016 in Kwa-Zulu Natal showed that the province achieved 95% and over 100% of the male and female condom distribution targeted for the period, respectively. Similarly, the North-West province also achieved noteworthy results of 91% and over 100% male and female condom distribution of their target for the same period, respectively. On the other hand, Gauteng province, Eastern Cape, and Limpopo did not meet their target. The results for Kwa-Zulu Natal and North West are probable explanations of why participant in these provinces had higher odds of consistent condom use compared to those of other provinces.

The current study also showed that those from urban areas, those with an education higher than primary, those employed or still students and those who belonged to a household with a middle or high socio-economic status were significantly more likely to use condoms consistently. Urban residence, having some education and belonging to a household with a middle or high socioeconomic status are all linked to knowledge and better access to sexual and reproductive health information and services, which are also associated with better utilisation of these services (Bankole et al., 2007; Madise et al., 2007; Mantell et al., 2011). Supporting the results of the current study are the results of a study investigating the socio-demographic determinants of condom use in rural Kwa-Zulu Natal, which also found that those who belonged to a household with a middle or high socioeconomic status to be significantly more likely to have ever used a condom and to also have used a condom consistently (Chimbindi et al., 2010). Also, a study conducted in four sub-Saharan African countries found that belonging to a middle class compared to a poor household was not only significantly associated with consistent condom use but also with the knowledge of correct condom use (Bankole et al., 2007). Furthermore, the same study also found that consistent condom use was significantly twice as high for those who had at least secondary education, compared to those who had less than secondary school and also for those who lived in urban compared to rural areas (Bankole et al., 2007). Similarly, a study conducted in Angola found higher levels of education to be positively associated with consistent condom use for both males and females (Prata et al., 2005). According to this study, having 8 to 9 years of education, which is equivalent to secondary education in South Africa, was a significant predictor of condom use. Not only this, but urban residence was also found to be a significant predictor of using a condom at last sex with both a regular or casual sexual partner (Prata et al., 2005).

While only 41% of the current study participants reported consistent condom use and 43% of circumcised men reported to be consistent users of condoms, the logistic regression model revealed a positive association between male circumcision and consistent condom use. When assessing the

relevance of the Risk Compensation Theory, which stipulates that individuals are more likely to engage in an increased risky behaviour in response to a perceived risk reduction following an intervention, we see that the opposite was true for single, black adult males in South Africa (Westercamp et al., 2014).

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study found that circumcised men are more likely to consistently use condoms than uncircumcised men. These results validate previous studies that have demonstrated that male circumcision does not impede on other HIV prevention measures, such as condom use. Furthermore, we can confidently conclude that in this current study risk compensation among circumcised men should not be a concern, since circumcised men engage in protective behaviours. This study has also revealed that perceived risk does not determine behaviour change. This is because the current study found that those who perceived themselves to be at risk of HIV were less likely to use condoms consistently, though one would expect the opposite to be true. This, therefore, means that in relation to the current study, the Risk Compensation Theory does not hold, as it assumes that risky behaviours will result from perceived risk reduction following an intervention.

In addition, while these results have given a positive view of male circumcision as an HIV prevention strategy in South Africa, some of the results regarding condom use are still of much concern. This is particularly the case among those who believe that they will get infected with HIV, men aged 25 years and older and men in most of the provinces. This, therefore, calls for mass HIV education and awareness programmes, mainly targeting the aforementioned groups. Condoms are still by far the most effective method of HIV prevention and should, therefore, continue being used irrespective of circumcision status.

6.2 Recommendations

6.2.1 Recommendations for Policy

- Circumcision does not lead to the decline in condom use, therefore this study recommends that VMMC and traditional circumcision working together with VMMC service providers should continue being rolled out as an HIV prevention strategy as it has the potential to avert over one million HIV infections in the country.
- Educational programmes should be targeted at the population less likely to consistently use condoms. This could benefit those who perceive themselves to be at risk and older men. This would also have positive benefits for their sexual partners.

- The low prevalence of condom use documented for most provinces could be due to the shortage of condoms distributed. Therefore, all provinces should ensure that they meet their targets of distributing male and female condoms, as this could be linked with improvements in condom use.

6.2.2 Recommendations for Future Studies

- Based on the findings of this study, it is recommended that future research should also investigate the association between male circumcision and multiple sexual partnerships as this might reveal whether circumcised men use condoms because they have multiple sexual partners or not.
- Furthermore, studies should also differentiate between medically and traditionally circumcised males; and assess differences in consistent condom use between them.
- Studies should also investigate other factors that may be linked to protective behaviours such as HIV counselling, and HIV awareness campaigns from mass media. This will help policy makers especially if these are found to encourage protective behaviours among those exposed to such information and programmes.

REFERENCES

Agot, K. E., Kiarie, J. N., Nguyen, H. Q., Odhiambo, J. O., Onyango, T. M., & Weiss, N. S. (2007). Male Circumcision in Siaya and Bondo Districts, Kenya: Prospective Cohort Study to Assess Behavioral Disinhibition Following Circumcision. JAIDS Journal of Acquired Immune Deficiency Syndromes, 44(1), 66–70. http://doi.org/10.1097/01.qai.0000242455.05274.20

Annual Progress Report 2014/15. Kwa-Zulu Natal Provincial Strategic Plan 2012-2016. Kwa-Zulu Natal Provincial AIDS Council.

Annual Progress Report 2014/15. North West Provincial Strategic Plan 2012-2016. North West Provincial Aids Council.

Annual Progress Report 2014/15. Gauteng Provincial Strategic Plan 2012-2016. Gauteng Provincial Aids Council.

Annual Progress Report 2014/15. Eastern Cape Provincial Strategic Plan 2012-2016. Eastern Cape Provincial Aids Council.

Annual Progress Report 2014/15. Limpopo Provincial Strategic Plan 2012-2016. Limpopo Provincial Aids Council.

Ashmore, J., & Henwood, R. (2015). Choice or no choice? The need for better branded public sector condoms in South Africa. Southern African Journal of HIV Medicine, 16(1). http://doi.org/10.4102/hivmed.v16i1.353

Atashili, J. (2006). Adult male circumcision to prevent HIV? International Journal of Infectious Diseases, 10(3), 202–205. http://doi.org/10.1016/j.ijid.2005.10.004

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), e298. http://doi.org/10.1371/journal.pmed.0020298

Ayiga, N., & Letamo, G. (2011). Impact of male circumcision on HIV risk compensation through the impediment of condom use in Botswana. African Health Sciences, 11(4), 550–559.

Balekang, G. B., & Dintwa, K. F. (2016). A comparison of risky sexual behaviours between circumcised and uncircumcised men aged 30-44 years in Botswana. African Health Sciences, 16(1), 105–115. https://doi.org/10.4314/ahs.v16i1.14

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. http://doi.org/10.1016/S0140-6736(07)60312-2

Bankole, A., Ahmed, F. H., Neema, S., Ouedraogo, C., & Konyani, S. (2007). Knowledge of correct condom use and consistency of use among adolescents in four countries in Sub-Saharan Africa. African Journal of Reproductive Health, 11(3), 197–220.

Beksinska, M. E., Smit, J. A., & Mantell, J. E. (2012). Progress and challenges to male and female condom use in South Africa. Sexual Health, 9(1), 51–58. http://doi.org/10.1071/SH11011

Bridges, J. F. P., Selck, F. W., Gray, G. E., McIntyre, J. A., & Martinson, N. A. (2011). Condom avoidance and determinants of demand for male circumcision in Johannesburg, South Africa. Health Policy and Planning, 26(4), 298–306. https://doi.org/10.1093/heapol/czq064

Bronselaer, G. A., Schober, J. M., Meyer-Bahlburg, H. F. L., T'Sjoen, G., Vlietinck, R., & Hoebeke, P. B. (2013). Male circumcision decreases penile sensitivity as measured in a large cohort. BJU International, 111(5), 820–827. http://doi.org/10.1111/j.1464-410X.2012.11761.x

Carey, K. B., Scott-Sheldon, L. A. J., Carey, M. P., Cain, D., Mlobeli, R., Vermaak, R., … Kalichman, S. C. (2011). Community Norms for HIV Risk Behaviors among Men in a South African Township. Journal of Behavioral Medicine, 34(1), 32–40. http://doi.org/10.1007/s10865-010-9284-6

Cederbaum, J. A., Gilreath, T. D., & Barman-Adhikari, A. (2014). Perceived risk and condom use among adolescents in sub-Saharan Africa: a latent class analysis. African Journal of Reproductive Health, 18(4), 26–33.

Chandran, T. M., Berkvens, D., Chikobvu, P., Nöstlinger, C., Colebunders, R., Williams, B. G., & Speybroeck, N. (2012). Predictors of condom use and refusal among the population of Free State province in South Africa. BMC Public Health, 12, 381. https://doi.org/10.1186/1471-2458-12-381

Chesney, M. A., Chambers, D. B., & Kahn, J. O. (1997). Risk behavior for HIV infection in participants in preventive HIV vaccine trials: a cautionary note. Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology: Official Publication of the International Retrovirology Association, 16(4), 266–271.

Chikutsa, A., Ncube, A. C., & Mutsau, S. (2014). Male Circumcision and Risky Sexual Behavior in Zimbabwe: Evidence from the 2010-11 Zimbabwe Demographic and Health Survey. African Population Studies, 28(0), 1057. https://doi.org/10.11564/28-0-557

Chikutsa, A., Ncube, A. C., & Mutsau, S. (2015). Association between wanting circumcision and risky sexual behaviour in Zimbabwe: evidence from the 2010–11 Zimbabwe demographic and health survey. Reproductive Health, 12, 15. http://doi.org/10.1186/s12978-015-0001-3

Chimbindi, N. Z., McGrath, N., Herbst, K., San Tint, K., & Newell, M.-L. (2010). Socio-Demographic Determinants of Condom Use Among Sexually Active Young Adults in Rural KwaZulu-Natal, South Africa. The Open AIDS Journal, 4, 88–95. http://doi.org/10.2174/1874613601004010088

Chiringa, I. O., Ramathuba, D. U., & Mashau, N. S. (2016). Factors contributing to the low uptake of medical male circumcision in Mutare Rural District, Zimbabwe. African Journal of Primary Health Care & Family Medicine, 8(2), 6 pages. https://doi.org/10.4102/phcfm.v8i2.966

Connolly, C., Simbayi, L. C., Shanmugam, R., & Nqeketo, A. (2008). Male circumcision and its relationship to HIV infection in South Africa: Results of a national survey in 2002. SAMJ: South African Medical Journal, 98(10), 789–794.

Crosby, R. A., & Holtgrave, D. R. (2006). Will sexual risk behaviour increase after being vaccinated for AIDS? International Journal of STD & AIDS, 17(3), 180–184. https://doi.org/10.1258/095646206775809204

Delva, W., & Karim, Q. A. (2014). The HIV Epidemic in Southern Africa – Is an AIDS-Free Generation Possible? Current HIV/AIDS Reports, 11(2), 99–108. https://doi.org/10.1007/s11904-014-0205-0

Dokubo, E. K., Shiraishi, R. W., Young, P. W., Neal, J. J., Aberle-Grasse, J., Honwana, N., & Mbofana, F. (2014). Awareness of HIV Status, Prevention Knowledge and Condom Use among People Living with HIV in Mozambique. PLOS ONE, 9(9), e106760. https://doi.org/10.1371/journal.pone.0106760

Eaton, L. A., & Kalichman, S. C. (2007). Risk Compensation in HIV Prevention: Implications for Vaccines, Microbicides, and Other Biomedical HIV Prevention Technologies. Current HIV/AIDS Reports, 4(4), 165–172.

Ediau, M., Matovu, J. K., Byaruhanga, R., Tumwesigye, N. M., & Wanyenze, R. K. (2015). Risk factors for HIV infection among circumcised men in Uganda: a case-control study. Journal of the International AIDS Society, 18(1). http://doi.org/10.7448/IAS.18.1.19312

Emmanuel, W., Edward, N., Moses, P., William, R., Geoffrey, O., Monicah, B., & Rosemary, M. (2015). Condom Use Determinants and Practices Among People Living with HIV in Kisii County, Kenya. The Open AIDS Journal, 9, 104–111. https://doi.org/10.2174/1874613601509010104

Farham, B. (2013). Medical male circumcision campaigns face cultural challenges in southern Africa. Continuing Medical Education, 31(8), 313–314.

George, G., Strauss, M., Chirawu, P., Rhodes, B., Frohlich, J., Montague, C., & Govender, K. (2014). Barriers and facilitators to the uptake of voluntary medical male circumcision (VMMC) among adolescent boys in KwaZulu-Natal, South Africa. African Journal of AIDS Research: AJAR, 13(2), 179–187. https://doi.org/10.2989/16085906.2014.943253

Glanz, K., Rimer, B. K., & Viswanath, K. (2008). Health Behavior and Health Education: Theory, Research, and Practice. John Wiley & Sons.

Godlonton, S., Muthuli, A., & Thorton, R. (2011). Behavioral Response to Information? Circumcision, Information and HIV Prevention, BREAD working paper No 313.

Govender, K. (2013). Voluntary Medical Male Circumcision in South Africa : challenges and opportunities. Retrieved from http://reference.sabinet.co.za/document/EJC161444

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. The Lancet, 369(9562), 657–666. http://doi.org/10.1016/S0140-6736(07)60313-4

Gray, R., Kigozi, G., Kong, X., Ssempiija, V., Makumbi, F., Wattya, S., Wawer, M. J. (2012). The effectiveness of male circumcision for HIV prevention and effects on risk behaviors in a posttrial follow-up study. AIDS (London, England), 26(5), 609–615. http://doi.org/10.1097/QAD.0b013e3283504a3f

Grund, J. M., & Hennink, M. M. (2012). A qualitative study of sexual behavior change and risk compensation following adult male circumcision in urban Swaziland. AIDS Care, 24(2), 245–251. http://doi.org/10.1080/09540121.2011.596516

Hargreaves, J. R., Morison, L. A., Kim, J. C., Bonell, C. P., Porter, J. D. H., Watts, C., … Pronyk, P. M. (2008). The association between school attendance, HIV infection and sexual behaviour among young people in rural South Africa. Journal of Epidemiology & Community Health, 62(2), 113–119. https://doi.org/10.1136/jech.2006.053827

Harris, B., Goudge, J., Ataguba, J. E., McIntyre, D., Nxumalo, N., Jikwana, S., & Chersich, M. (2011). Inequities in access to health care in South Africa. Journal of Public Health Policy, 32(1), S102–S123. https://doi.org/10.1057/jphp.2011.35

Hedlund, J. (2000). Risky business: safety regulations, risk compensation, and individual behavior. Injury Prevention, 6(2), 82–89. https://doi.org/10.1136/ip.6.2.82

Hewett, P. C., Hallett, T. B., Mensch, B. S., Dzekedzeke, K., Zimba-Tembo, S., Garnett, G. P., & Todd, P. E. (2012). Sex with stitches: assessing the resumption of sexual activity during the postcircumcision wound-healing period. AIDS (London, England), 26(6), 749–756. https://doi.org/10.1097/QAD.0b013e32835097ff

Hosmer, D. W., & Lemeshow, S. (2004). Applied Logistic Regression. New York: John Wiley & Sons.

Humphries, H., Rooyen, H. van, Knight, L., Barnabas, R., & Celum, C. (2015). "If you are circumcised, you are the best": understandings and perceptions of voluntary medical male circumcision among men from KwaZulu-Natal, South Africa. Culture, Health & Sexuality, 17(7), 920–931. http://doi.org/10.1080/13691058.2014.992045

Ibrahim, M. T. O., Arisegi, S. A., Awosan, K. J. *, & Erhiano, E. E. (2014). Knowledge of HIV/AIDS, risk perception, sexual lifestyle and condom use among drivers in Sokoto, Nigeria. Journal of Infectious Diseases and Immunity, 6(3), 19–25. https://doi.org/10.5897/JIDI2013.0129

Johnson S, Kincaid DL, Figueroa, ME, Delate R, Mahlasela L, and Magni S. (2013).The Third National HIV Communication Survey, 2012. Pretoria: JHHESA.

Katz, I. T., & Wright, A. A. (2008). Circumcision — A Surgical Strategy for HIV Prevention in Africa. New England Journal of Medicine, 359(23), 2412–2415. https://doi.org/10.1056/NEJMp0805791

Kayiki, S. P., & Forste, R. (2011). HIV/AIDS related knowledge and perceived risk associated with condom use among adolescents in Uganda. African Journal of Reproductive Health, 15(1), 57–63.

Keetile, M., & Rakgoasi, S. D. (2014). Male Circumcision; Willingness to undergo Safe Male Circumcision and HIV Risk Behaviors among Men in Botswana. African Population Studies, 28(3), 1345–1361. https://doi.org/10.11564/28-3-630

Kekana, Q., Banyini, M., Jooste, S., Simbayi, L., & Peltzer, K. (2011). Adaptation of an Hiv Behavioural Disinhibition Risk Reduction Intervention for Recently Circumcised South African Men. Gender & Behaviour, 9(1), 3479–3494.

Kenyon, C., Buyze, J., & Colebunders, R. (2013). HIV Prevalence by Race Co-Varies Closely with Concurrency and Number of Sex Partners in South Africa. PLoS ONE, 8(5). https://doi.org/10.1371/journal.pone.0064080

Kharsany, A. B. M., & Karim, Q. A. (2016). HIV Infection and AIDS in Sub-Saharan Africa: Current Status, Challenges and Opportunities. The Open AIDS Journal, 10, 34–48. https://doi.org/10.2174/1874613601610010034

Kiriba, S.P.S., Nansubuga, E., & Tumwesigye, N.M. (2013). Male Circumcision, Sexual Behavior, and HIV Status in Uganda. (Demographic Health Survey Working Papers). Washington DC: United States Agency for International Development.

Kibira, S. P. S., Nansubuga, E., Tumwesigye, N. M., Atuyambe, L. M., & Makumbi, F. (2014). Differences in risky sexual behaviors and HIV prevalence of circumcised and uncircumcised men in Uganda: evidence from a 2011 cross-sectional national survey. Reproductive Health, 11(1), 25. http://doi.org/10.1186/1742-4755-11-25

Kibira, S. P. S., Makumbi, F., Daniel, M., Atuyambe, L. M., & Sandøy, I. F. (2015). Sexual Risk Behaviours and Willingness to Be Circumcised among Uncircumcised Adult Men in Uganda. PloS One, 10(12), e0144843. http://doi.org/10.1371/journal.pone.0144843

Kibira, S. P. S., Sandøy, I. F., Daniel, M., Atuyambe, L. M., & Makumbi, F. E. (2016). A comparison of sexual risk behaviours and HIV seroprevalence among circumcised and uncircumcised men before and after implementation of the safe male circumcision programme in Uganda. BMC Public Health, 16, 7. http://doi.org/10.1186/s12889-015-2668-3

Kibombo, R., Neema, S., & Ahmed, F. H. (2007). Perceptions of risk to HIV Infection among Adolescents in Uganda: Are they Related to Sexual Behaviour? African Journal of Reproductive Health, 11(3), 168–181.

Kipping, R. R., Smith, M., Heron, J., Hickman, M., & Campbell, R. (2014). Multiple risk behaviour in adolescence and socio-economic status: findings from a UK birth cohort. The European Journal of Public Health, cku078. https://doi.org/10.1093/eurpub/cku078

Kong, X., Kigozi, G., Nalugoda, F., Musoke, R., Kagaayi, J., Latkin, C., Gray, R. (2012). Assessment of changes in risk behaviors during 3 years of posttrial follow-up of male circumcision trial participants uncircumcised at trial closure in Rakai, Uganda. American Journal of Epidemiology, 176(10), 875–885. http://doi.org/10.1093/aje/kws179

Lammers, J., van Wijnbergen, S. J., & Willebrands, D. (2013). Condom use, risk perception, and HIV knowledge: a comparison across sexes in Nigeria. HIV/AIDS (Auckland, N.Z.), 5, 283–293. http://doi.org/10.2147/HIV.S31687

Lancaster, H. O., & Seneta, E. (2005). Chi-Square Distribution. In Encyclopedia of Biostatistics. John Wiley & Sons, Ltd. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/0470011815.b2a15018/abstract

Lau, F. K., Jayakumar, S., & Sgaier, S. K. (2015). Understanding the socio-economic and sexual behavioural correlates of male circumcision across eleven voluntary medical male circumcision priority countries in southeastern Africa. BMC Public Health, 15, 813. https://doi.org/10.1186/s12889-015-2135-1

Leddy, A., Chakravarty, D., Dladla, S., de Bruyn, G., & Darbes, L. (2016). Sexual communication self-efficacy, hegemonic masculine norms and condom use among heterosexual couples in South Africa. AIDS Care, 28(2), 228–233. https://doi.org/10.1080/09540121.2015.1080792

L'Engle, K., Lanham, M., Loolpapit, M., & Oguma, I. (2014). Understanding partial protection and HIV risk and behavior following voluntary medical male circumcision rollout in Kenya. Health Education Research, 29(1), 122–130. https://doi.org/10.1093/her/cyt103

Madise, N., Zulu, E., & Ciera, J. (2007). Is poverty a driver for risky sexual behaviour? Evidence from national surveys of adolescents in four African countries : original research article. African Journal of Reproductive Health, 11(3), 83–98.

Maharaj, P. (2005). Patterns of condom use: Perspectives of men in KwaZulu-Natal, South Africa. Development Southern Africa, 22(2), 187–197. https://doi.org/10.1080/03768350500163097

Maharaj, P., & Cleland, J. (2005). Risk perception and condom use among married or cohabiting couples in KwaZulu-Natal, South Africa. International Family Planning Perspectives, 31(1), 24–29. https://doi.org/10.1363/ifpp.31.24.05

Maibvise, C., & Mavundla, T. R. (2014). Reasons for the low uptake of adult male circumcision for the prevention of HIV transmission in Swaziland. African Journal of AIDS Research, 13(3), 281–289. https://doi.org/10.2989/16085906.2014.952652

Mantell, J. E., Smit, J. A., Beksinska, M., Scorgie, F., Milford, C., Balch, E., Stein, Z. A. (2011). Everywhere you go, everyone is saying condom, condom. But are they being used consistently? Reflections of South African male students about male and female condom use. Health Education Research, 26(5), 859–871. https://doi.org/10.1093/her/cyr041

Mantell, J. E., Smit, J. A., Saffitz, J. L., Milford, C., Mosery, N., Mabude, Z., … Stein, Z. A. (2013). Medical male circumcision and HIV risk: perceptions of women in a higher learning

institution in KwaZulu-Natal, South Africa. Sexual Health, 10(2), 112–118. https://doi.org/10.1071/SH12067

Maticka-Tyndale, E. (2012). Condoms in sub-Saharan Africa. Sexual Health, 9(1), 59–72. https://doi.org/10.1071/SH11033

Mattson, C. L., Campbell, R. T., Bailey, R. C., Agot, K., Ndinya-Achola, J. O., & Moses, S. (2008). Risk Compensation Is Not Associated with Male Circumcision in Kisumu, Kenya: A Multi-Faceted Assessment of Men Enrolled in a Randomized Controlled Trial. PLOS ONE, 3(6), e2443. http://doi.org/10.1371/journal.pone.0002443

Maughan-Brown, B., & Venkataramani, A. S. (2012). Learning That Circumcision Is Protective against HIV: Risk Compensation among Men and Women in Cape Town, South Africa. PLOS ONE, 7(7), e40753. http://doi.org/10.1371/journal.pone.0040753

Mbelle, N., Setswe, G., Sifunda, S., Mabaso, M., & Maduna, V. (2014). HIV and AIDS related knowledge, attitudes and behaviours of students and staff at South Africa's technical and vocational education and training colleges, 2014.

Moreno, R., Nababan, H. Y., Ota, E., Wariki, W. M., Ezoe, S., Gilmour, S., & Shibuya, K. (2014). Structural and community-level interventions for increasing condom use to prevent the transmission of HIV and other sexually transmitted infections. In Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD003363.pub3/abstract

Morris, B. J., Wamai, R. G., Henebeng, E. B., Tobian, A. A., Klausner, J. D., Banerjee, J., & Hankins, C. A. (2016). Estimation of country-specific and global prevalence of male circumcision. Population Health Metrics, 14, 4. http://doi.org/10.1186/s12963-016-0073-5

Moyo, W., Levandowski, B. A., MacPhail, C., Rees, H., & Pettifor, A. (2008). Consistent Condom Use in South African Youth's Most Recent Sexual Relationships. AIDS and Behavior, 12(3), 431–440. https://doi.org/10.1007/s10461-007-9343-3

Moyo, S., Mhloyi, M., Chevo, T., & Rusinga, O. (2015). Men's attitudes: A hindrance to the demand for voluntary medical male circumcision – A qualitative study in rural Mhondoro-Ngezi, Zimbabwe. Global Public Health, 10(5–6), 708–720. https://doi.org/10.1080/17441692.2015.1006241

Mugwanya, K. K., Donnell, D., Celum, C., Thomas, K. K., Ndase, P., Mugo, N., … Baeten, J. M. (2013). Sexual Behavior of Heterosexual Men and Women Receiving Antiretroviral Pre-Exposure Prophylaxis for HIV Prevention: A Longitudinal Analysis. The Lancet Infectious Diseases, 13(12), 1021–1028. https://doi.org/10.1016/S1473-3099(13)70226-3

Mukama, T., Ndejjo, R., Musinguzi, G., & Musoke, D. (2015). Perceptions about medical male circumcision and sexual behaviours of adults in rural Uganda: a cross sectional study. Pan African Medical Journal, 22. http://doi.org/10.11604/pamj.2015.22.354.7125

Newell, M.-L., & Bärnighausen, T. (2007). Male circumcision to cut HIV risk in the general population. The Lancet, 369(9562), 617–619. http://doi.org/10.1016/S0140-6736(07)60288-8

Ngome, E. (2016). Demographic, Socio-Economic and Psychosocial Determinants of Current and Consistent Condom Use among Adolescents in Botswana. World Journal of AIDS, 06(04), 137. https://doi.org/10.4236/wja.2016.64017

Osuafor, G. N., & Ayiga, N. (2016). Risky Sexual Behaviour Among Married and Cohabiting Women and its Implication for Sexually Transmitted Infections in Mahikeng, South Africa. Sexuality & Culture, 1–19. http://doi.org/10.1007/s12119-016-9360-3

Pallin, S.C., D. Meekers, O. Lupu, K. Longfield. November (2013). South Africa: A Total Market Approach. PSI/UNFPA Joint Studies on the Total Market for Male Condoms in Six African Countries. Retrieved from www.psi.org/total-market-approach

Peltzer, K. (2000). Factors Affecting Condom Use among South African University Students. East African Medical Journal 77(1), 46-52.

Peltzer, K., & Kanta, X. (2009). Medical circumcision and manhood initiation rituals in the Eastern Cape, South Africa: a post intervention evaluation. Culture, Health & Sexuality, 11(1), 83–97. https://doi.org/10.1080/13691050802389777

Peltzer, K., Matseke, G., Mzolo, T., & Majaja, M. (2009). Determinants of knowledge of HIV status in South Africa: results from a population-based HIV survey. BMC Public Health, 9, 174. https://doi.org/10.1186/1471-2458-9-174

Peltzer, K., Onoya, D., Makonko, E., & Simbayi, L. (2014). Prevalence and Acceptability of Male Circumcision in South Africa. African Journal of Traditional, Complementary, and Alternative Medicines, 11(4), 126–130.

Peltzman, S. (1975). The Effects of Automobile Safety Regulation. Journal of Political Economy, 83(4), 677–725.

Petros, G., Airhihenbuwa, C. O., Simbayi, L., Ramlagan, S., & Brown, B. (2006). HIV/AIDS and "othering" in South Africa: The blame goes on. Culture, Health & Sexuality, 8(1), 67–77. http://doi.org/10.1080/13691050500391489

Pinkerton, S. D. (2001). Sexual Risk Compensation and HIV/STD Transmission: Empirical Evidence and Theoretical Considerations. Risk Analysis, 21(4), 727–736. http://doi.org/10.1111/0272-4332.214146

Prata, N., Vahidnia, F., & Fraser, A. (2005). Gender and relationship differences in condom use among 15-24-year-olds in Angola. International Family Planning Perspectives, 31(4), 192–199. https://doi.org/10.1363/ifpp.31.192.05

Prata, N., Morris, L., Mazive, E., Vahidnia, F., & Stehr, M. (2006). Relationship between HIV Risk Perception and Condom Use: Evidence from a Population-Based Survey in Mozambique. International Family Planning Perspectives, 32(4), 192–200.

Rahman, M., Berenson, A. B., & Herrera, S. R. (2013). Perceived susceptibility to pregnancy and its association with safer sex, contraceptive adherence and subsequent pregnancy among adolescent and young adult women. Contraception, 87(4), 437–442. https://doi.org/10.1016/j.contraception.2012.09.009

Reynolds, H. W., Luseno, W. K., & Speizer, I. S. (2013). Consistent condom use among men with non-marital partners in four sub-Saharan African countries. AIDS Care, 25(5), 592–600. https://doi.org/10.1080/09540121.2012.726340

Riess, T. H., Achieng', M. M., Otieno, S., Ndinya-Achola, J. O., & Bailey, R. C. (2010). "When I was circumcised I was taught certain things": risk compensation and protective sexual behavior among circumcised men in Kisumu, Kenya. PloS One, 5(8), e12366. http://doi.org/10.1371/journal.pone.0012366

Risher, K., Rehle, T., Simbayi, L., Shisana, O., & Celentano, D. D. (2016). Antiretroviral Treatment and Sexual Risk Behavior in South Africa. AIDS and Behavior, 20(4), 710–716. http://doi.org/10.1007/s10461-015-1125-8

Rosenberg, M. S., Gómez-Olivé, F. X., Rohr, J. K., Houle, B. C., Kabudula, C. W., Wagner, R. G., Bärnighausen, T. (2017). Sexual Behaviors and HIV Status: A Population-Based Study Among Older Adults in Rural South Africa. Journal of Acquired Immune Deficiency Syndromes (1999), 74(1), e9–e17. https://doi.org/10.1097/QAI.0000000000001173

SANAC (2015) – "Juicy" Makeover for South Africa's Choice condoms. (n.d.). Retrieved from http://sanac.org.za/2015/06/10/juicy-makeover-for-south-africa-s-choice-condoms/

Secura, G. M., Adams, T., Buckel, C. M., Zhao, Q., & Peipert, J. F. (2014). Change in sexual behavior with provision of no-cost contraception. Obstetrics and Gynecology, 123(4), 771–776. https://doi.org/10.1097/AOG.0000000000000184

Sedgwick, P. (2013). Logistic regression. BMJ, 347, f4488. https://doi.org/10.1136/bmj.f4488

Setswe, G., & Nyasulu, P. (2016). Are sexually transmitted infections the neglected orphan in our response to HIV/AIDS, STI, and TB (HAST) in South Africa? International Journal of Healthcare Management, 9(1), 1–3. http://doi.org/10.1179/2047970015Z.000000000148

Shai, N. J., Jewkes, R., Nduna, M., & Dunkle, K. (2012). Masculinities and condom use patterns among young rural South Africa men: a cross-sectional baseline survey. BMC Public Health, 12, 462. https://doi.org/10.1186/1471-2458-12-462

Shisana, O, Rehle, T, Simbayi LC, Zuma, K, Jooste, S, Zungu N, Labadarios, D, Onoya, D et al. (2014) South African National HIV Prevalence, Incidence and Behaviour Survey, 2012. Cape Town, HSRC Press.

Shisana, O., Risher, K., Celentano, D. D., Zungu, N., Rehle, T., Ngcaweni, B., & Evans, M. G. (2016). Does marital status matter in an HIV hyperendemic country? Findings from the 2012 South African National HIV Prevalence, Incidence and Behaviour Survey. AIDS Care, 28(2), 234–241. https://doi.org/10.1080/09540121.2015.1080790

Simbayi, L. C., Matseke, G., Wabiri, N., Ncitakalo, N., Banyini, M., Tabane, C., & Tshebetshebe, D. (2014). Covariates of condom use in South Africa: findings from a national population-based survey in 2008. AIDS Care, 26(10), 1263–1269. http://doi.org/10.1080/09540121.2014.902419

South African National AIDS Council (SANAC) (2012). National Strategic Plan on HIV, STIs and TB. Pretoria

Smith, J., Nyamukapa, C., Gregson, S., Lewis, J., Magutshwa, S., Schumacher, C., Garnett, G. (2014). The Distribution of Sex Acts and Condom Use within Partnerships in a Rural Sub Saharan African Population. PLOS ONE, 9(2), e88378. https://doi.org/10.1371/journal.pone.0088378

Statistics South Africa (Statssa) (2013). Morbidity and mortality patterns among the youth of South Africa, 2013. Available on the Stats SA website: www.statssa.gov.za

Statistics South Africa (Statssa) (2015). Mid-year population estimates 2015. Available on the Stats SA website: www.statssa.gov.za

Statistics South Africa (Statssa) (2016). Mid-year population estimates 2016. Available on the Stats SA website: www.statssa.gov.za

Szumilas, M. (2010). Explaining Odds Ratios. Journal of the Canadian Academy of Child and Adolescent Psychiatry, 19(3), 227–229 .

Tchuenche, M., Palmer, E., Haté, V., Thambinayagam, A., Loykissoonlal, D., Njeuhmeli, E., & Forsythe, S. (2016). The Cost of Voluntary Medical Male Circumcision in South Africa. PLOS ONE, 11(10), e0160207. https://doi.org/10.1371/journal.pone.0160207

Thompson, D. C., Thompson, R. S., & Rivara, F. P. (2001). Risk compensation theory should be subject to systematic reviews of the scientific evidence. Injury Prevention, 7(2), 86–88. https://doi.org/10.1136/ip.7.2.86

Tram, K. H., & Bertrand, J. T. (2014). Correlates of Male Circumcision in Eastern and Southern African Countries: Establishing a Baseline Prior to VMMC Scale-Up. PLOS ONE, 9(6), e100775. https://doi.org/10.1371/journal.pone.0100775

Van der Hoeven, M., Kruger, A., & Greeff, M. (2012). Differences in health care seeking behaviour between rural and urban communities in South Africa. International Journal for Equity in Health, 11, 31. https://doi.org/10.1186/1475-9276-11-31

Van Howe, R., Howe, R. S. V., & Storms, M. R. (2011). How the circumcision solution in Africa will increase HIV infections. Journal of Public Health in Africa, 2(1), e4. http://doi.org/10.4081/jphia.2011.e4

Vincent, L. (2008). "Boys will be boys": traditional Xhosa male circumcision, HIV and sexual socialisation in contemporary South Africa. Culture, Health & Sexuality, 10(5), 431–446. https://doi.org/10.1080/13691050701861447

Wawer, M. J., Makumbi, F., Kigozi, G., Serwadda, D., Watya, S., Nalugoda, F., … Gray, R. H. (2009). Circumcision in HIV-infected men and its effect on HIV transmission to female partners in Rakai, Uganda: a randomised controlled trial. Lancet (London, England), 374(9685), 229–237. https://doi.org/10.1016/S0140-6736(09)60998-3

Westercamp, N., Agot, K., Jaoko, W., & Bailey, R. C. (2014). Risk compensation following male circumcision: results from a two-year prospective cohort study of recently circumcised and uncircumcised men in Nyanza Province, Kenya. AIDS and Behavior, 18(9), 1764–1775. http://doi.org/10.1007/s10461-014-0846-4

World Health Organisation (2013). Progress in scaling up voluntary medical male circumcision for HIV prevention in East and Southern Africa, January – December 2012. Retrieved from www.who.int

World Health Organisation (2016). Global Health Sector Strategy on Sexually Transmitted Infections 2016–2021. Towards Ending STIs. Retrieved from www.who.int

World Health Organisation (2016). WHO Progress Brief: Voluntary Medical Male Circumcision for HIV Prevention in 14 Priority Countries in East and Southern Africa.

World Health Organisation/The Joint United Nations Programme on HIV/AIDS (2007). Male circumcision: global trends and determinants of prevalence, safety and acceptability. Retrieved from www.who.int

Zhao, J., Song, F., Ren, S., Wang, Y., Wang, L., Liu, W., Sun, Y. (2012). Predictors of Condom Use Behaviors Based on the Health Belief Model (HBM) among Female Sex Workers: A Cross-Sectional Study in Hubei Province, China. PLoS ONE, 7(11). https://doi.org/10.1371/journal.pone.0049542

Zuma, K., Shisana, O., Rehle, T. M., Simbayi, L. C., Jooste, S., Zungu, N., Abdullah, F. (2016). New insights into HIV epidemic in South Africa: key findings from the National HIV Prevalence, Incidence and Behaviour Survey, 2012. African Journal of AIDS Research, 15(1), 67–75. http://doi.org/10.2989/16085906.2016.1153491.

Zungu, N. P., Simbayi, L. C., Mabaso, M., Evans, M., Zuma, K., Ncitakalo, N., & Sifunda, S. (2016). HIV risk perception and behavior among medically and traditionally circumcised males in South Africa. BMC Public Health, 16. http://doi.org/10.1186/s12889-016-3024-y.

APPENDICES

Appendix A: Test for Multicollinearity

	consistent condom use	circumcision status	perceived hiv risk	age	province	place of residence	education	occupation status	socio-economic status
consistent condom use	1.0000								
	1391								
circumcision status	0.0402	1.0000							
	0.1403								
	1347	1804							
perceived hiv risk	-0.0882*	-0.0700*	1.0000						
	0.0014	0.0039							
	1313	1700	1770						
age	-0.0686*	0.0348*	0.0896*	1.0000					
	0.0105	0.1400	0.0002						
	1391	1804	1770	1899					
province	-0.0114	-0.0252	-0.0835*	0.0252	1.0000				
	0.6705	0.2854	0.0004	0.2721					
	1391	1804	1770	1899	1899				
place of residence	0.1073*	0.0495*	0.0267	0.0271	-0.1890*	1.0000			
	0.0001	0.0355	0.2621	0.2374	0.0000				
	1391	1804	1770	1899	1899	1899			
education	0.0525	0.1164*	-0.0725*	-0.1867*	-0.0591*	0.1327*	1.0000		
	0.0508	0.0000	0.0023	0.0000	0.0101	0.0000			
	1386	1798	1764	1893	1893	1893	1893		
occupation status	0.0713*	-0.0200	-0.0443	-0.1862*	-0.0295	-0.0234	0.1098*	1.0000	
	0.0082	0.4024	0.0653	0.0000	0.2046	0.3136	0.0000		
	1374	1763	1729	1854	1854	1854	1849	1854	
socio-economic status	0.0657*	0.0712*	-0.0897*	0.0152	-0.0630*	0.3128*	0.2817*	0.0869*	1.0000
	0.0143	0.0025	0.0002	0.5080	0.0060	0.0000	0.0000	0.0002	
	1391	1804	1770	1899	1899	1899	1893	1854	1899