Male circumcision, sexual risk behaviour and HIV infection in Uganda

A mixed methods study among men age 15-59 years

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To Mathias Kibira (1935-2013) and Josepher Nakiryowa (1954-2011).

Eternal appreciation.

Scientific environment

I was admitted or a Master's degree in International Health, in August 2014 and as a doctoral candidate in August 2015 at the Faculty of Medicine, University of Bergen. The entire training component of this PhD programme was carried out at the Centre for International Health (CIH), Department of Global Public Health and Primary Care. The Research was carried out in Uganda. During the data collection period, I was based at the School of Public Health, Makerere University.

Professor Ingvild Fossgard Sandøy at the Centre for International Health supervised this work. The co-supervisors were: Associate Professor Marguerite Daniel at the Department of Health Promotion and Development, Faculty of Psychology, University of Bergen; Associate Professor Lynn Atuyambe at the Department of Community Health and Behavioural Sciences, School of Public Health, Makerere University; and Associate Professor Fredrick Makumbi at the Department of Epidemiology and Biostatistics, School of Public Health, Makerere University, Uganda.

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Table of contents

Abstract

Introduction: HIV/AIDS is a significant public health threat, especially in the sub Saharan African region. Enormous global efforts to control and prevent new infections are still needed on top of managing the huge number of over 36 million people living with the virus. Transmission through heterosexual intercourse remains the main contributor to the HIV epidemic in sub Saharan Africa. The WHO in 2007 recommended adoption of safe male circumcision (SMC) as part of the comprehensive HIV prevention interventions. However, like other risk reduction interventions, SMC is prone to challenges when implemented at such large-scale population levels. Behavioural risk compensation and, sociocultural beliefs and misconceptions in the post-circumcision period may affect successful implementation. Therefore, it is prudent to explore the existence of risk compensation and the beliefs that may shape sexual behaviour of men both before and after circumcision, so as to contribute to the success of the SMC programme scale-up.

General objective: To estimate the associations of male circumcision with sexual risk behaviour and HIV prevalence before and just after the national scale up of the safe male circumcision (SMC) programme in Uganda, and to understand the sexual behaviour choices among men circumcised under the SMC programme in Wakiso district, Uganda.

Methods: A mixed method study was conducted in Uganda that included an analysis of the Uganda AIDS Indicator surveys of 2004 and 2011 (papers I and II), and a qualitative sub study in 2015 and 2016. The two surveys had nationally representative samples and employed a two-stage stratified cluster sampling design. The analysis in paper I is based on data from 14,875 (6,906 in 2004 and 7,969 in 2011) circumcised and uncircumcised men, while paper II includes 5,776 uncircumcised men from the 2011 survey alone. Both samples are of men who reported to ever have had sex and were aged 15-59 years. In paper I, the dependent variables were HIV sero-status obtained from blood sample tests in both surveys, and sexual risk behaviours, while

the main independent variable was self-reported circumcision status. In paper II, willingness to be circumcised was the dependent variable while the sexual risk behaviours were the independent variables.

In the qualitative sub study, SMC clients were enrolled and followed up after receiving services at health facilities in Wakiso district located in central Uganda (papers III and IV). In 2015 twenty-five participants were purposively selected from health facilities where they reported for voluntarily receive male circumcision. They were interviewed twice, just after circumcision and six months later. Baseline in-depth interview topics included discussions of motives for circumcision, influences on the decision, sexual behaviours, experiences with health education received and any known beliefs. Follow-up interview topics included experiences with healing, beliefs and post circumcision sexual behaviours.

Results: Circumcised men reported higher prevalence of all sexual risk behaviours than uncircumcised men, except for transactional sex. Use of condoms with the last non-marital sexual partner among circumcised men was lower in the 2011 survey (PR 0.88; 95% CI: 0.79-0.99) compared with the 2004 survey (PR 1.07; 95% CI: 0.98-1.18), but there were no other statistically significant changes in sexual risk behaviours between the two surveys. Circumcised men were less likely to test HIV positive than the uncircumcised in both surveys, (PR 0.63; 95% CI: 0.48-0.82) in 2004 and (PR 0.62; 95% CI: 0.49-0.80) in 2011 (paper I). Willingness to be circumcised was higher in uncircumcised men reporting multiple partners (PR 1.19; 95% CI: 1.11-1.29), non-marital sex with (PR 1.71; 95% CI: 1.59-1.85) and without a condom (PR 1.47; 95% CI: 1.35-1.59), or transactional sex (PR 1.61; 95% CI: 1.39-1.87) in the 2011 survey (paper II) compared to those who did not report these risk behaviours.

Findings from the qualitative study showed that the important factors influencing men to opt for circumcision were female sexual partners and a perceived need to reduce HIV transmission risk. According to participants' reports, emphasis was mainly put on the immediate problems of wound care and the surgical procedure during health education for circumcision clients at health facilities, and less on post

circumcision sexual behaviour. All the men, however, were aware that circumcision only offers partial risk reduction for HIV infection (paper III).

In the baseline interviews, the men talked about beliefs that could influence their sexual behaviour, while in the follow up interviews they discussed how these had indeed shaped their behaviour after circumcision. All men had heard that it was important that the initial sexual intercourse post circumcision was with someone else other than the stable partner. Some of the men strongly believed in this and consequently ended up engaging in one-off sex without using condoms. There was also some misunderstanding of what comprised complete wound healing, and indeed a few men had sex before the completion of the recommended abstinence period. Men also correctly believed that the risk of acquiring HIV remained even after SMC and as a result the majority continued to practice safe sexual behaviour such as maintaining one sexual partner or using condoms with extra marital partners (paper IV).

Conclusion: The higher level of willingness to be circumcised among men reporting sexual risk behaviour may suggest that the early adopters of SMC were likely to be those in particular need of this additional HIV protective measure. There was no clear evidence of behavioural risk compensation after circumcision in the 2011 UAIS although sexual risk behaviours were more common among circumcised than uncircumcised men. The qualitative study indicated gaps in health education for clients at health facilities, with no attention being given by health care providers to detrimental beliefs influencing sexual risk behaviour decisions, yet these beliefs were widespread among men who were interviewed.

Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
ARVs	Antiretroviral drugs
HC	Health Centre
HDREC	Higher Degrees, Research and Ethics Committee
HIV	Human Immunodeficiency Virus
PEPFAR	United States President's Emergency Plan For AIDS Relief
SMC	Safe Male Circumcision
STIs	Sexually Transmitted Infections
TTCV	Tetanus Toxoid Containing Vaccine
UAIS	Uganda AIDS Indicator Survey
UNAIDS	Joint United Nations Programme on HIV/AIDS
VMMC	Voluntary Male Medical Circumcision
WHO	World Health Organisation

List of publications

This thesis is based on the following original papers, which I will refer to by their respective roman numerals I-IV.

I. Kibira, S.P., Sandoy, I.F., Daniel, M., Atuyambe, L.M., and Makumbi, F.E., 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*, 2016. **16**(1): p. 7.

II. Kibira, S.P., Makumbi, F., Daniel, M., Atuyambe, L.M., and Sandoy, I.F., Sexual Risk Behaviours and Willingness to Be Circumcised among Uncircumcised Adult Men in Uganda. *PLoS One*, 2015. **10**(12): p. e0144843.

III. Kibira, S.P., Daniel, M., Atuyambe, L.M., Makumbi, F.E., Sandoy, I.F., Exploring drivers for safe male circumcision: experiences with health education and understanding of partial HIV protection among newly circumcised men in Wakiso, Uganda. *PLoS One***,** 2017. **12**(3): p. e0175228

IV. Kibira, S.P., Atuyambe, L.M., Sandoy, I.F., Makumbi, F.E., Daniel, M., "Now that you are circumcised, you cannot have first sex with your wife": Post circumcision sexual behaviours and beliefs among men in Wakiso district, Uganda. *Journal of the International AIDS Society*. 2017. **20**(1): p. 1-9

1. Introduction

1.1 The HIV Epidemic

The human immunodeficiency virus/ acquired immune deficiency syndrome (HIV/AIDS) is a public health burden with an estimated 36.7 million people (34.0 – 39.8 million) globally living with the virus at the end of the year 2015 [1]. Since the start of the epidemic, the Joint United Nations programme on HIV/AIDS (UNAIDS) estimates that 78 million people (69.5 – 87.6 million) have been infected with HIV. Of these, an estimated 35 million people (29.6 – 40.8 million) have died from AIDS related illnesses [2]. Although there are marked global reductions in new HIV infections and AIDS deaths, there are still unacceptably high numbers of new infections among adults and children. In the year 2015 alone, an estimated 2.1 million people (1.9 million adults) were infected [3]. UNAIDS and the World Health Organisation (WHO) categorize HIV epidemics into four scenarios based on prevalence and modes of transmission: (1) the low-level scenarios where the HIV prevalence is below 1%; (2) the concentrated epidemic where prevalence is greater than 5% in one or more sub-populations but less than 1% in the general population; (3) the generalized epidemic where prevalence is between 1–15% in pregnant women attending antenatal clinics; and (4) the hyperendemic scenarios where prevalence exceeds 15% in the general adult population [4]. There are varied modes of transmission for HIV, but sexual activity accounts for over 80% of the global infections. Heterosexual transmission specifically is the main driving force of the epidemic in sub-Saharan Africa [5].

Over 70% of the estimated global 36 million HIV positive people live in sub Saharan Africa [2, 5] and more than 65% of the annual new infections also occur in this region [2]. The epidemic has been more deadly and costly in sub Saharan Africa than anywhere in the world. It should also be noted that there are marked disparities even within sub Saharan Africa. Over 46% of the global infections are concentrated in only a few countries of east and southern Africa, including Uganda [1]. The 2016 UNAIDS report indicates that of the estimated 2.1 million global new infections,

more than half were in the east and southern African region alone [6]. However, the largest reductions in adult infections have also occurred here [3].

In Uganda, HIV/AIDS was first reported in the early 1980s in the southwestern district of Rakai on the shores of Lake Victoria [7] and by 1986, it was a generalised epidemic. The new government at the time was quick to establish a national AIDS control programme under the Ministry of Health [8] and the Uganda AIDS Commission in 1992 to provide overall leadership in the coordination and management of an effective HIV/AIDS national response. HIV/AIDS has had far reaching ramifications in Uganda that span all spheres of life at different levels; individuals, households, communities, and national political economy. It is now a heterogeneous epidemic that is affecting various sub-groups of the population, resulting in multiple and diverse epidemics [9]. It has had significant effects on morbidity and caused premature mortality among populations of both economically productive ages and children. It also caused drastic organisational changes in the health and other sectors as Uganda responded to its treatment and prevention with significant support of development partners. It continues to pose significant public health and other development challenges to date, including contributing the largest numbers of years of life lost in Uganda [10].

There are also variations in the burden of the epidemic within Uganda, with the prevalence being highest in the urban areas compared to the rural areas. Prevalence also varies by region and districts [11, 12] (Figure 1). The central region of the country with the largest urban population bears the biggest burden, as well as the mid northern region where a two-decade armed insurgency forced the population to live in internally displaced people's camps, that further fuelled the epidemic. HIV is also more common among women than men and within the age groups of 30 to 49 years for both sexes [12, 13].

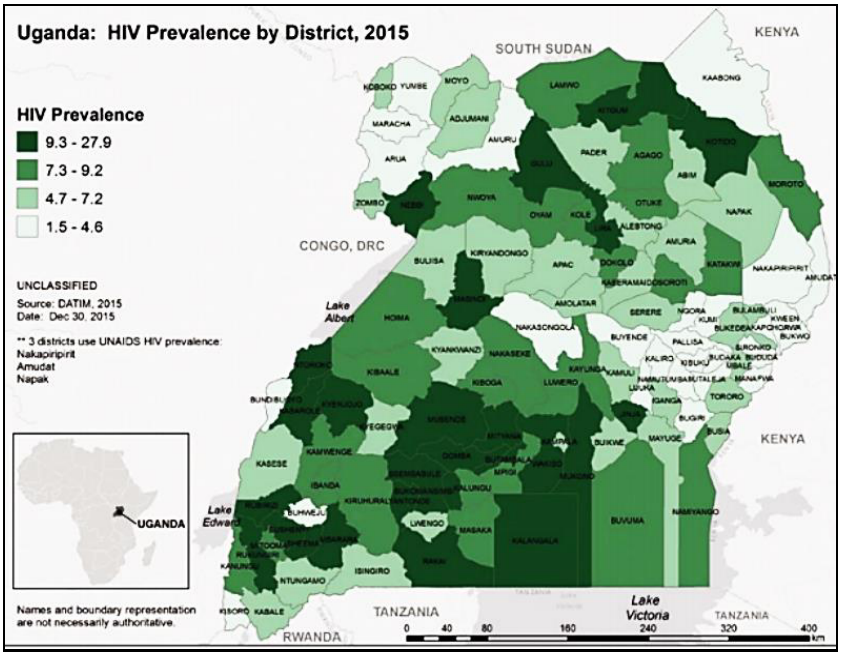

Figure 1: Distribution of HIV prevalence by district, Uganda 2015 [11].

Most of the data used in HIV/AIDS monitoring to indicate magnitude and epidemic trends in Uganda are generated from sentinel sites located all over the country, which were established in 1989 to provide this information [12]. By 2010, there were 30 sentinel sites with surveillance surveys conducted annually at each site with collection of blood specimens and demographic data among pregnant women and people reporting with sexually transmitted infections (STIs) [14]. One of the limitations of estimating HIV prevalence from sentinel surveillance system is that it is only based on pregnant women in given locations where the sentinel clinics are located. Therefore, the country through the Ministry of Health and technical support from ICF international, USA, has also conducted specific national population-based AIDS indicator surveys (UAIS) in 2004, 2011 and most recently in 2016 to provide additional data that can be used to inform strategic planning, programme evaluation, policy formulation and calibration of the sentinel surveillance system [12, 13].

The epidemic in Uganda has evolved from hyper endemic scenarios characterised by rapid expansion with limited control measures in the late 1980s, some contraction in

the mid-1990s and stabilization in the early 2000s [14]. There were then reported increases in new HIV infections in 2010/2011 [5, 15]. However, the country has now had reductions in new infections between 2011 and 2014 [15]. Despite these reported reductions in new infections, Uganda's HIV prevalence is still trending upwards because of rising longevity attributed to anti-retroviral therapy and continued spread. The reduction in new infections is also still below the targeted maximum of 71,500 cases [15] and Uganda is the only country in the region with an infection rate greater than HIV-related mortality [16]. Approximately 1.5 million people were living with HIV in 2014, rising from 1.4 million in 2011. Due to this, Uganda continues to be one of the high burden countries in the world [15, 16] with a generalised epidemic, where further efforts in prevention such as the sustainable implementation of the safe male circumcision (SMC) programme are vital.

1.2 HIV prevention interventions in Uganda

One of the goals of the National HIV and AIDS strategic plan 2015/16 - 2019/2020 is to reduce the number of new youth and adult infections by 70% and the number of new paediatrics HIV infections by 95% by the year 2020. There are three objectives under this prevention goal: (1) To increase adoption of safer sexual behaviours and reduction in sexual risk behaviours; (2) To scale up coverage and utilisation of biomedical HIV prevention interventions delivered as part of integrated health care services and; (3) To mitigate underlying socio-cultural, gender and other factors that drive the HIV epidemic [17]. The Ministry of Health and partners recognise that the HIV epidemic is driven by multiple behavioural, biomedical and structural factors, and therefore no single prevention intervention can deal with all HIV infections. The country therefore implements a combination prevention approach that includes behavioural, biomedical and structural interventions, to contribute to reductions in new infections [17-19].

Behavioural interventions are meant to foster adoption of safer sexual behaviours through promotion of abstinence and delayed sexual debut for young people, being faithful to one sexual partner, use of condoms at every episode of high-risk sex, and increasing comprehensive knowledge of HIV. Such interventions also aim to reduce sexual risk behaviours such as unsafe sex, multiple concurrent sexual partnerships, cross-generational and transactional sex [18]. Social behavioural change and communication messages on sexual and reproductive health and HIV awareness are part of the interventions under this package. These messages are developed and implemented by different partners, cultural institutions, and ministries. Behavioural interventions also include comprehensive condom programming aimed at increasing availability, access to and use of condoms [20].

The biomedical interventions implemented include the elimination of mother to child transmission (eMTCT) of HIV, Anti-Retroviral Therapy (ART), Post-exposure prophylaxis (PEP), oral pre-exposure prophylaxis (PrEP), blood transfusion safety, STI screening and treatment, and SMC [18].

Post-exposure prophylaxis is the short-term use of antiretroviral (ARV) drugs to reduce the likelihood of acquiring HIV infection after potential exposure to needle-stick injuries, road traffic accidents, unprotected sex, rape and defilement. Oral pre-exposure prophylaxis is the use of ARVs as an additional prevention measure for HIV negative people who are at substantial risk of HIV exposure, and not always able to have safer sex, such as commercial sex workers, other key populations and HIV negative partners in discordant relationships. Antiretroviral therapy also helps to suppress viral load to undetectable levels and reduces the risk of HIV transmission. The recommendation is to start everybody that tested HIV positive on ART after assessment by a health worker, regardless of WHO clinical stage [18, 21]. There is evidence that although there is an added cost, early initiation of ART could reduce HIV incidence at the population level and offer significant benefits [22, 23].

The eMTCT strategy comprises a package of interventions that should be offered as part of maternal, neonatal, child and adolescent health services. The package includes: (a) Services for non-pregnant women mainly focusing on primary

prevention of HIV infection and prevention of unintended pregnancies among women living with HIV; (b) Services during pregnancy that focus on prevention of HIV transmission from women living with HIV to their babies, provision of treatment, care, and support to women infected with HIV, HIV testing and counselling for all pregnant women; (c) Services during labour and delivery such as safer delivery to reduce infant exposure to HIV, refills for ARVs and septrin, adherence counselling, and new born prophylaxis; (d) Services offered in the postpartum phase such as, early infant diagnosis, ART for infected infants, support for infant feeding, and provision of family planning methods to prevent unwanted pregnancy among others. This is a vital intervention because transmission of HIV from mother to child is the second most predominant mode of transmission, after heterosexual transmission in Uganda [18]. Screening for STIs, especially for key populations where they are likely to be more prevalent, is important because they often coexist with HIV and also increase the risk of HIV transmission [19]. Ensuring 100% blood transfusion safety and adherence to universal precautions in all health facilities is also a key biomedical intervention to prevent any HIV transmission risk when people receive donated blood [18].

Structural HIV prevention approaches seek to address the physical, social, cultural, organizational, legal, community features of the environment that influence personal risk and shape social vulnerability to HIV infection [24]. An example of the interventions in Uganda under the structural approaches is the prevention and management of gender based violence which is one of the most common structural predisposing factors that increase the risk of acquiring HIV in Uganda [18], especially among women. Some of the activities here include, orienting local and cultural leaders on their mandate to prevent and manage gender based violence and, promotion of male involvement in HIV prevention for their own health and that of their partners [20].

Many of the activities that form the core of the prevention interventions have largely been externally funded. Indeed, the entire fight against HIV in Uganda has received a lot of foreign funding and the national response is still heavily donor dependent [17]. However, an act of parliament which established the HIV and AIDS trust fund was passed in July 2014 to bridge the financing gap. The trust fund aims to secure a sustainable and predictable means of procuring goods and services for HIV counselling, testing and treatment by mobilising local resources for the national HIV and AIDS response [20, 25]. Its operationalisation was set to begin in the 2016-2017 financial year.

1.3 Male circumcision

1.3.1 History and prevalence

Male circumcision is the removal of all or part of the foreskin that covers the glans of the human penis. It is one of the oldest known surgical procedures that has been practiced since ancient times [26], although non-surgical means using PrePex and ShangRing devices have been introduced [27, 28]. Recent global estimates indicate that about 38% of men are circumcised [29, 30]. Circumcision is practiced for religious, cultural, social as well as medical reasons in various settings worldwide soon after birth, at the beginning of adolescence and in adulthood [31].

In Uganda, before the introduction of the SMC programme, male circumcision was mainly performed for cultural and religious reasons by Muslims and traditionally circumcising ethnic groups. About 13.6% of the national population are Muslims [32] and the males are expected to practice circumcision as a central part of Islam [33]. Also, in Uganda four ethnic groups are known to traditionally practice male circumcision [34]. The Bagisu and Sabiny/Sebei in eastern Uganda and the Bakonzo and Baamba in western Uganda [35], who together form about 8.3% of the national population [32]. The amount of foreskin removed varies among these ethnic groups within Uganda. Further, although there are no fixed age limits, for the Baamba and Bakonzo, even children aged five and below can be circumcised while among the

Bagisu and Sabiny, circumcision (*Imbalu*) is mainly an initiation into adulthood for older boys [34]. Similar to many settings in sub Saharan Africa where it is practiced [36], traditional circumcision in Uganda is not a mere surgical procedure. It has many sociocultural values and beliefs attached that involve members of family and the community, each playing different roles in the process. For example, among the Bagisu and Sabiny, circumcision is performed bi-annually during the leap years [37] with the ceremony usually involving demonstration of bravery. An uncircumcised adult man is culturally "not man enough" [38]. Such a man may not make key cultural decisions that impact on the extended family or community. Traditionally, the boy in this context was also educated about his duties as an adult member of the community. Circumcision is also culturally obligated, although the timing may at times be individually negotiated when a boy is ready or the family decides [36]. Coerced circumcisions of older boys and men still occur among the Bagisu [39]. The practice of circumcision involves the senior circumciser and an assistant who ensures the candidates are prepared well for circumcision. In the past, one knife was used on several boys without sterilisation but this dangerous practice has been discouraged [34] in the wake of HIV/AIDS.

In 2005/06, before the introduction of the SMC programme in Uganda, 25% of men 15-59 years of age were estimated to be circumcised [13]. Although prevalence of circumcision did not increase tremendously between 2005 and 2011, there was high desire to be circumcised, with 45% of men reporting willingness to be circumcised in a 2011 survey [12] that was conducted after the SMC programme had been earlier rolled out [35, 40]. By the year 2014, over 40% of men were estimated to be circumcised in Uganda [15], several of them attributed to the national SMC programme.

1.3.2 The safe male circumcision programme for HIV prevention

The global ambition is to end the AIDS epidemic as a public health threat by the year 2030 [6]. One of the milestones to end the epidemic agreed upon by the United

Nations General Assembly in June 2016, is to globally reduce new HIV infections to less than 500,000 cases by the year 2020 [1]. Safe male circumcision is one of the interventions that help to reduce new infections. Male circumcision reduces heterosexual HIV transmission risk from infected women to men [41-46]. The male foreskin contains HIV-1 target cells, making it highly susceptible to infection [47, 48]. Male circumcision also reduces the prevalence of high risk human papilloma virus and incidence of herpes simplex virus 2 in men and, genital ulcers in female partners of circumcised HIV negative men [49-52]. Although there is no evidence of direct reduced risk of HIV infection from an infected man to a negative woman [53], circumcision may in the long run reduce the transmission risk to women if the prevalence of HIV among men is lowered. In 2007, WHO and UNAIDS issued guidelines that recommended countries with high HIV prevalence but low levels of male circumcision to include voluntary medical male circumcision (called SMC in Uganda) in the available package of HIV prevention interventions; abstinence, being faithful, using condoms [54, 55] and test and treatment. Reliable evidence shows that SMC is the most cost-effective option in the prevention of HIV in hyper endemic countries [56, 57]. The benefit is also high for countries with epidemic HIV [58] such as Uganda. An earlier study in 2007 from the Rakai cohort in Uganda, estimated the cost per male HIV infection averted to be 2,631 US$, with only 39 circumcisions required to prevent one infection over 10 years then, assuming a circumcision efficacy of 60% [59]. In the hyper endemic countries with adult prevalence >15%, the estimated benefit from scaling up SMC to 90% of HIV negative men by 2030 could be as high as 28 US$ for every dollar invested [56].

The SMC service provision has been lauded for possibly providing a point of entry for reaching men with other sexual and reproductive health services, including HIV testing and counselling services. The WHO recommends that comprehensive information about partial HIV risk reduction should be part of health education and counselling. If the WHO service provision guidelines [31] are well followed, it can provide the much-needed linkages to care for those testing positive, and access to other prevention information and services. Safer sex education information, provision

of condoms and information about their use, and management of sexually transmitted infections (STIs), which are important services for HIV prevention should be offered during this probably first point of contact with the health facilities for many young men [60]. Examples of the reproductive health services that should be integrated into SMC service provision are specified in the WHO manual for male circumcision under local anaesthesia [31] (Figure 2).

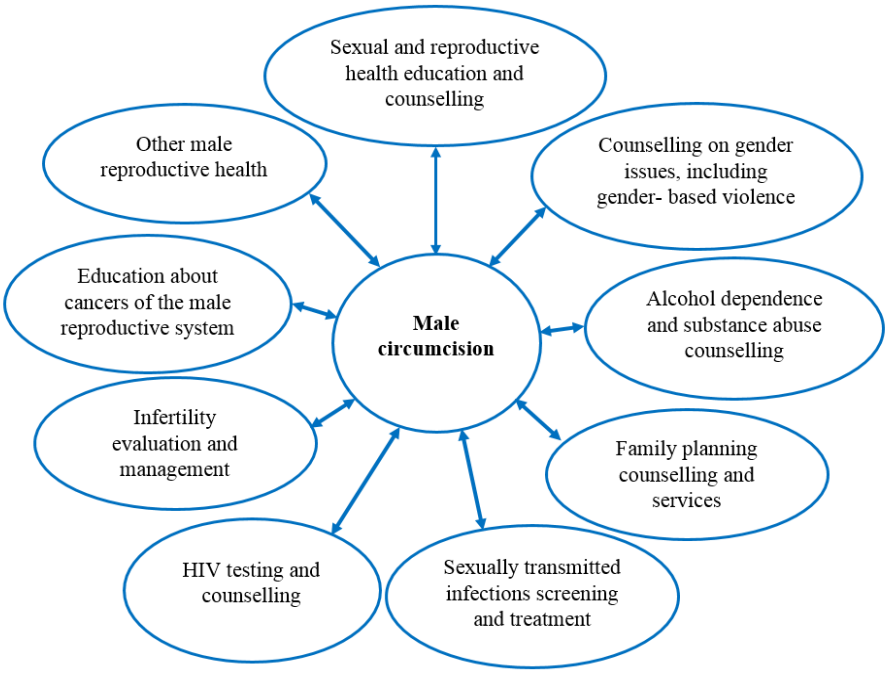

Figure 2: Male circumcision as an entry point for other health services for men [31]

The WHO manual acknowledges in general terms that counsellors need to be conversant with the standard education on SMC offered in the settings where they operate to ensure consistent information and messages [31]. But, there are no clear health education guidelines on addressing potentially dangerous sexual beliefs in the programmatic setting in Uganda, although some may be inadvertently addressed if they arise in the course of counselling and health education sessions from the client side.

The existing health sector development plan in Uganda, has a strong focus placed on health promotion and disease prevention using a multi-sectoral approach [10], and the country aims to reduce the number of youth and adult HIV infections by 70% by the year 2020 with an overall long term ambitious goal of zero new infections [17]. Safe male circumcision is one of the ways to achieve such goals. The Uganda Ministry of Health and its partners began preparations for scale up of circumcision through the national SMC programme soon after the WHO recommendation in 2007. At the beginning, health workers were provided with accurate information using flip charts and question-answer booklets to assist clients, while media training sessions were held to equip journalists with information about SMC and the association with HIV prevention. The media then played a key role to educate the general public about the intervention through radio and television talk shows, newspaper columns [61, 62] and educational materials such as brochures for men [63]. In the year 2010, a national policy guiding the programme was launched [40] together with a national communication strategy [35] to further direct the process of implementation in a coordinated manner. The priority issues that were to be handled through the SMC communication strategy [35] were: the lack of understanding of the relationship between SMC and HIV prevention; the broader health benefits of SMC; and need to operationalise the SMC policy through adoption, domestication and dissemination at all levels; the myths and misconceptions surrounding male circumcision. The myths were mainly around the barriers to SMC for uncircumcised men, such as fear of pain, and misperception that circumcision would be interpreted as change of religion. For circumcised men, challenges addressed in the strategy were: A possible false sense of security assuming complete protection from HIV; increasing number of sexual partners without use of condoms; having sex before healing, and sharing of equipment used for traditional circumcision [35]. It is possible that at the time, these were the only well-known beliefs/barriers.

Although there were various obstacles to SMC scale up including scepticism from the Uganda's President about the ramifications of the intervention [61, 64], efforts to

bring the majority of stake holders on board continued. Further social marketing efforts to increase demand were carried out in 2011, such as the "stand proud, get circumcised" campaign [63] that used a provocative approach that spoke to men through women. This was designed to convince more men who had intentions of circumcision to get SMC services while encouraging women to support their partners to get circumcised and encouraging adherence to post circumcision practices that promote healing. Safe male circumcision therefore, is one of the key HIV prevention interventions that the Ministry of Health has scaled-up for the communicable disease prevention and control. Others are HIV counselling and testing, targeted behavioural change communication for sexual risk behaviours, and access to condoms [10], which can be combined with SMC.

In Uganda, traditional circumcisions were integrated within the SMC programme, thus the slight difference in the name from voluntary medical male circumcision (VMMC) as it is known in other priority countries to SMC. Traditional circumcisers were re-oriented to perform the procedure safely, required to use sterilised instruments during the cultural rituals, and educated about unsafe circumcisions [65]. For example, the district health office in Mbale district, the major municipality of the region where the Bagisu ethnic group live, has been reported to be actively involved in ensuring circumcisers have safety and hygiene training before the roll out during the leap year, and are they awarded certificates as proof [34]. Such efforts to preserve the sociocultural significance of the traditional male circumcision process may have facilitated the successful implementation and minimised the resistance reported elsewhere [66]. The number of men seeking circumcision was high countrywide since the implementation started until 2014 and service provision has also increased. However, the WHO/UNAIDS target of achieving 80% circumcision prevalence by the year 2015 has not been met [67].

In the political declaration of 2016 on HIV and AIDS, the United Nations General Assembly set a very ambitious target of an additional 25 million circumcisions

among young men in high HIV incidence countries like Uganda by the year 2020. This ambitious target will require five million circumcisions to be performed annually as opposed to the 3.2 million and 2.6 performed in 2014 and 2015 respectively [1]. In 2010, Uganda set a target to circumcise 4.2 million men by the end of 2015 but achieved a total of 2,671,134 or 63.5% of the target [68]. Over 1.4 million clients were circumcised between 2009 and 2013 [69, 70]. Although the target was not achieved, there have been strides made in service coverage (Figure 3). By 2015, the SMC services were provided in 851 health facilities (10 referral facilities, 103 hospitals, 150 Health Centre (HC) IVs, 273 HC IIIs, 212 HC IIs, 102 specialized and general clinics across the country [71]. The hospitals and HCs are located at the government administrative levels, the national, districts and lower local councils providing varied services as summarised in table 1 [72].

Table 1. Summary of services offered at different facility levels

Facility level	Coverage	Services offered
HCII	Parish level	Preventative, promotive & outpatient curative services.
HCIII	Sub-County	HCII services plus maternity, in-patient care, laboratory services.
HCIV	County level	HCIII services, blood transfusion, and emergency surgery services.
General/district hospital	District level	HCIV services, other general services, in-service training, consultation and research to community based healthcare programmes.
Regional referral hospital	Region	General hospital Service, Consultants, and tertiary services.
National referral hospital	National	Advanced tertiary services and super specialists.

The ultimate aim is to have a prevalence of 80% of men in the ages 15-49 years being circumcised. Achieving such a critical mass of circumcised men will result into reduction in new infections among them and subsequently further prevention of transmission to women and their babies. There have been intensified efforts in the last

few years to increase access to SMC and choice between the conventional surgical circumcision using dorsal slit and the non-surgical methods with WHO pre-qualified devices such as the elastic collar compression device (PrePex) [15, 28]. However, it is also estimated that despite these efforts in service provision, the demand for SMC still outstrips supply for services in the country [73]. Mixed approaches such as conducting mobile services through outreach camps as well as health facility based procedures have been used to match service demand and there is continued integration of SMC as part of the routine health services at facilities. There have also been efforts focussing on capacity building and the procurement of reusable SMC kits [15], which are meant to address the problems of enormous waste generated from disposable kits at health facilities.

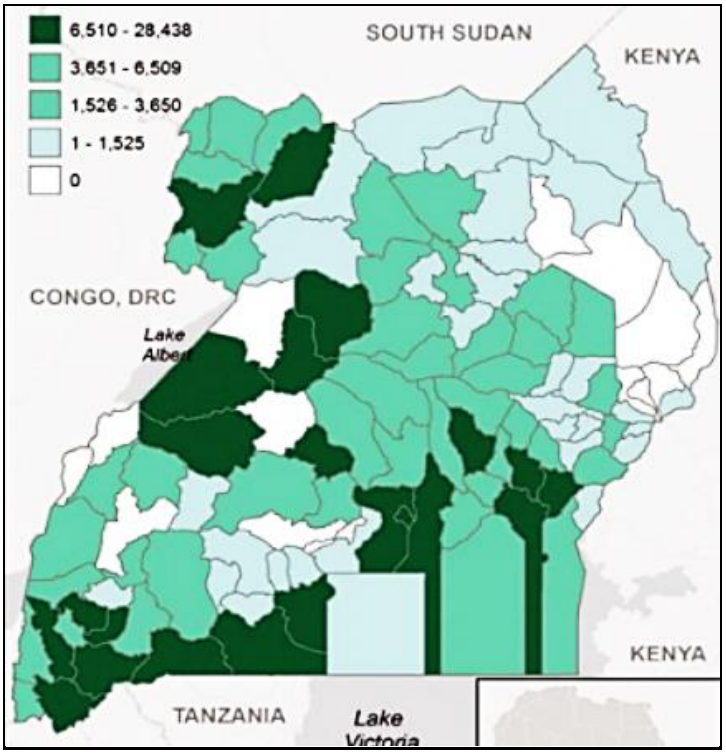

Figure 3: Number of safe male circumcisions, by district, Uganda 2015 [11].

A recent surge in reported cases of tetanus that were suspected to be related to SMC has affected the programme [15, 20, 74]. There has been a change in service provision following the WHO recommendation of 2015 [75] and its update of 2016 [76] that require men to receive one or more doses of tetanus-toxoid-containing vaccine (TTCV) before being circumcised. This may require several visits to a health facility, which means a longer waiting time before the circumcision is done. There have also been challenges of inadequate stocks of the TTCV and a further need to train some health workers on vaccination [20].

The United States government through the President's Emergency Plan for AIDS Relief (PEPFAR) has been the primary financier of the male circumcision programmes in eastern and southern Africa [73]. It has also been co-funded by WHO for the training of healthcare workers, service delivery through implementing partners and procurement of circumcision commodities [15]. In 2016, the Global Fund grant included some SMC kits [73]. In Uganda, there have been several implementing partners directly funded by PEPFAR that have supported the Ministry of Health in providing SMC services. However, their numbers have fluctuated over time depending on funding priorities. In April 2017 there were about 15 implementing partners in operation. (Table 2):

Table 2: Implementing partners for safe male circumcision in Uganda

Baylor College of Medicine
The AIDS Support Organisation (TASO)
Mildmay Uganda
Infectious Diseases Institute (IDI)
Uganda Catholic Medical Bureau (UCMB)
Rakai Health Sciences Programme (RHSP)
Strengthening Uganda's Systems for Treating AIDS Nationally (SUSTAIN)
Uganda Private Health Support programme (UPHS)
Walter Reed

HIV/Health Initiatives in Workplaces Activity (HIWA)
RTI International
Regional Health Initiatives to Enhance Services in East and Central Uganda, and South-Western Uganda (RHITES EC and RHITES SW)
Amref health Africa*
Makerere University Joint AIDS Programme (MJAP)*
Strengthening TB and HIV & AIDS Response - Eastern Uganda (STAR-E)*

**Expected to wind up activities in 2017.*

Although UNAIDS has advocated for increased domestic funding to ensure sustainability of SMC [1], this is still limited in Uganda. In fact, one of the challenges facing SMC programme implementation in the country highlighted by the Uganda AIDS commission is the low funding level [15] that may affect long term sustainability. The national SMC coordinator has also noted the huge funding gap and thus inability to meet the high demand [77]. The programme's sustainability still relies on the mercy of the major donor and a change in funding priorities would heavily dent the progress achieved so far.

Even with availability of funding, it should be noted that sustainable implementation of the SMC programme does not only depend on successfully performing the circumcision itself (surgical or non-surgical) in a cost-effective manner and in a safe environment alone. It also strongly relies on the sexual behaviour of men and women after circumcision. Therefore, although it is indeed a one off efficacious intervention in itself, human relationships can have far reaching implications on how successful it will be over time. Communities in Uganda and elsewhere, including women who are the sexual partners and/ or mothers of the men and/ or boys that SMC directly targets, have expressed acceptability, support, influence on partners to seek SMC, but also caution and concern with the SMC intervention in different settings [78-83]. One of such concerns is the possibility of increased sexual risk taking or a laxity in

adherence to safer sexual behaviours among circumcised men and their sexual partners (casual or stable).

1.4 Sexual risk behaviour and potential risk compensation

Some of the indicators of sexual behaviour monitored in the national AIDS Indicator surveys (UAIS) [12, 13] are those that increase the heterosexual risk of HIV infection and STIs [84]. These include: (i) having multiple sexual partners in the 12 months preceding each survey, (ii) transactional sex (payment or receipt of money/gifts in exchange for sex) in the 12 months preceding each survey (iii) having had sex with a non-marital partner in the 12 months preceding a survey, and (iv) non-use of condoms at the last non-marital sex. These measures of sexual risk behaviour among others have been monitored over time in both Uganda Demographic and Health Surveys and UAIS [12, 13, 85], and elsewhere. Men are asked questions about whether they had sex in the 12 months that preceded the surveys, about the number of sexual partners that they had during that survey period, which kind of relationship they had with the sexual partners (whether casual, stable, or transactional relationship), and use of condoms with each of those partners [12, 13]. Below is a brief description of each of the sexual risk behaviour indicators that were measured in this study.

1.4.1 Sexual risk behaviour measured in the study

Multiple sexual partnerships

Respondents in surveys who report more than one sexual partner in 12 months are categorised by the UNAIDS as having multiple sexual partnerships irrespective of the levels of risk of the partners [84]. This indicator was included in this study because it has been documented as one of the main drivers of the HIV epidemic in Uganda [9]. Some of these sexual partnerships may be concurrent, which are theoretically even riskier than serial multiple sexual partnerships. People with concurrent sexual

partnerships are those involved in overlapping sexual partnerships where intercourse with one partner occurs between two acts of intercourse with another partner [86]. However, concurrency of these multiple sexual partnerships was not estimated in this study.

Sex with non-marital partners and condom use

Sex with any non-cohabiting, non-marital partner is considered to be of higher risk than sex with a cohabiting partner, regardless of the duration of the relationship. This is because non-marital partners may be less likely to know the HIV status of their partners. Further, partners who do not live together – who have sex only occasionally – are those who are most likely to have multiple partners over the course of a year. They therefore may carry a higher risk of HIV transmission than those who cohabit and probably have relatively frequent sex [84], with the same partner. Although studies indicate a higher prevalence of HIV among married people than the never married, the prevalence is much higher among those who are divorced, separated and widowed [12]. In the past, the levels of risk in a sexual partnership were based on time. The terms 'regular' and 'non-regular' partners were used, where regular refers to a non-marital sexual partnership that lasts or is expected by the respondent to last more than 12 months. However, due to potential limitations of these definitions where higher risk partners like commercial sex workers frequented by a respondent may be categorised as regular with lower risk, this measure was proposed on the basis of cohabitation and/ or marriage. This indicator aims to portray the proportion of the population that engages in relatively high-risk partnerships and therefore are more likely to be exposed to sexual networks within which HIV can circulate easily [84].

Correct and consistent use of condoms is very effective in the prevention of STI transmission including HIV [87, 88]. It is a measure of protection against HIV, especially among people with multiple sexual partners or whose partners engage in multiple sexual relationships. Due to the greater risk that non-marital sexual activities may have (as explained above), use of condoms during such sex is considered

essential. If condoms were used at each sexual encounter with a non-marital or non-cohabiting partner, a heterosexually transmitted HIV epidemic would be almost impossible to sustain. The UNAIDS defines this measure as the percent of respondents who say they used a condom the last time they had sex with a non-marital, non-cohabiting partner, of those who have had sex with such a partner in the last 12 months [84].

Transactional sex

Transactional sex is the exchange of money, favours or gifts for sex [12]. It is associated with higher risk of contracting HIV [89] and STIs, mainly because power relations are compromised in most of such relationships [90]. The person providing the gift, favour or money is more likely to be empowered than the recipient. There are also higher chances that people who engage in transactional sex have multiple sexual partners [89, 91]. Men reporting such sex may include those who had intercourse with commercial sex workers, a special population that is known to have a much higher prevalence of HIV (35-52%) than the general population in Uganda [17, 92]. In the surveys (UAIS) used in this study, men were asked if they paid anyone in exchange for sex during the previous 12 months.

1.4.2 Potential risk compensation

In this section, I review the relevant literature on behavioural risk compensation in relation to male circumcision and HIV, as well as literature that provides some explanations for the reported protective and sexual risk behaviours following circumcision.

In the HIV/AIDS context the term ‘risk compensation’ describes a compensatory increase in behaviours that carry a risk of HIV exposure, which occurs as a result of a perception of reduced personal risk [86]. Data on the sexual behaviours in the general population in Uganda that carry HIV risk indicate increased sexual risk behaviours such as multiple sexual partnerships and non-use of condoms, especially among men, between 2001 and 2011 [12, 93]. This coincided with the widespread availability of

anti-retroviral drugs and possible complacency about the HIV/AIDS problem. Relatedly, increased sexual risk behaviours have been documented among men living with HIV on ART [94]. There have also been concerns of risk compensation with HIV vaccine trials, where evidence of increases in sexual risk behaviours after vaccination among some groups have been documented [95-97].

Although SMC has enormous potential to reduce the HIV epidemic [98, 99] at relatively low cost, there have been concerns that promoting population level preventive interventions of such scale may potentially be limited by behavioural risk compensation [100-104]. As a result of overrating the efficacy of male circumcision beyond mere partial protection from HIV, circumcised men may perceive their risk to HIV and sexually transmitted infections to be lower and ultimately increase sexual risk behaviours. Such risk behaviours may include increased frequency of unprotected sex with multiple high-risk partners [105-107], inconsistent use of condoms and early resumption of sex after circumcision. Female partners may also greatly overestimate the protection of SMC [79, 104] and reduce their level of carefulness regarding demand for condom use or concern about the HIV status of their sexual partners [108]. In a context like Uganda's, such effects would complicate the problem with an already reported increase in sexual risk among men in general [12, 93]. In a simulation study on the potential public health impact of SMC in Rakai, Uganda, before the scale up of SMC, it was reported that irrespective of the possible circumcision efficacy, behavioural risk compensation could completely offset any benefits afforded by circumcision [59].

There have been mixed results regarding behavioural modifications following male circumcision from the RCTs in Uganda [44], South Africa [46] and Kenya [45]. For example, there was no evidence of risk compensation in Rakai, Uganda both within the trial and during the post-trial periods [44, 109-111]. In contrast, there was a reduction in reported inconsistent condom use among uncircumcised men (control group) but not among the circumcised men (intervention group) in Kisumu, Kenya

after 24 months of follow up. The authors reported that circumcised men exhibited slightly riskier behaviour on all the measures assessed at month 24; unprotected sexual intercourse with any partner, having multiple sexual partners and consistent condom use in the previous 6 months, and having sexual intercourse with a casual partner the last time they had sex. The differences were significant for two of the measures; reporting unprotected sexual intercourse with any partner and inconsistent condom use in the previous 6 months [45]. Similarly, in Orange Farm, South Africa, the men in the intervention group reported more sexual partners in the 4 to 21-month recall periods after circumcision than the control group [46]. In all the trials, participants in both arms had received intensive health education and counselling [111].

There are some studies in the general population that have estimated associations between sexual risk behaviour and male circumcision [112-116]. In Kisumu, Kenya, a longitudinal study designed to particularly compare sexual behaviour among circumcised and uncircumcised men in a programmatic setting found no evidence of behavioural risk compensation, despite significant reduction in HIV risk perception among the circumcised men. Instead, circumcised and uncircumcised men who were exposed to the SMC programme and the information messages respectively reported that they adopted safer sexual behaviours. For instance, there was a significant increase in condom use in both groups [113]. In the cohort study conducted in Siaya and Bondo districts of western Kenya, the authors found no differences in sexual risk behaviour (average number of risky sex partners per month or condom use) one year after enrolment among circumcised and uncircumcised men, except for the first month post-circumcision, when uncircumcised men engaged in more risky sex than those who had just been circumcised [112].

In three random household surveys conducted between 2008 and 2013 to assess SMC changes in sexual risk behaviours in Kisumu, Kenya, Westercamp and colleagues [117] reported minimal behavioural risk compensation. They found that the proportion of circumcised and uncircumcised men reporting multiple sexual partners

significantly reduced, while condom use at the last non-marital sex significantly increased among both men and women. However, they also found that among men circumcised in clinics after SMC programme scale-up, a significantly larger proportion reported multiple sexual partners in the previous year compared to those who were circumcised traditionally. They, however, argue that this minimal behavioural risk compensation is unlikely to have a significant impact on the protective effect of circumcision against HIV infection [117].

Studies from analyses of national surveys' data in Africa have also revealed mixed results. A Botswana study found that circumcised men were less likely to report condom use at the last sexual intercourse than the uncircumcised, but the differences were not statistically significant [114]. In a Ugandan study however, circumcised men reported significantly higher prevalence of sexual risk behaviours including non-use of condoms at the last non-marital sex and having multiple sexual partners than the uncircumcised [115]. A more recent study from a combined analysis of national surveys in 10 SMC prioritised African countries (Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, Tanzania, Uganda, Zambia and Zimbabwe) conducted before and after the SMC intervention periods, concluded that SMC campaigns were associated with little or no sexual behavioural risk compensation, although there were differences between countries [118]. Outside Africa, in a lower HIV prevalence setting of the Dominican Republic, participants in a recent cohort study reported increased number of sexual partners after circumcision [116].

Qualitative studies can provide an explanation for some of the behaviour choices that are reported in the quantitative studies following circumcision. There are some studies in sub Saharan Africa that have provided some understanding of both risky and protective sexual behaviours post circumcision [101, 119, 120]. Riess and colleagues in southwestern Kenya reported mixed findings, but with largely protective sexual behaviour among the majority of the study participants. Some of the men that reported safer sexual behaviour provided explanations such as having

knowledge of the partial protection from circumcision, and having taken an HIV test as part of the SMC process and receiving negative results [101]. Grund and Hennink in urban Swaziland [119] also report largely HIV protective behaviours after SMC and that HIV counselling and health education received during the process of circumcision contributed to this [119]. From both studies, men reporting protective behaviours believed that behaving in a risky way would only reverse the partial protection offered by SMC while some reported that they also found it easier to wear condoms with a circumcised penis than before [101, 119]. In a qualitative study conducted among participants from the Rakai, Uganda SMC trial, Matovu and colleagues also noted that the most likely explanation for the reported increase in consistent condom use and decline in the proportion of men reporting non-marital partners after 24 months of follow-up in both arms of the trial, was the health education received. Participants received risk reduction counselling and intensive health education in the pre-and post-operative periods of the trial, and additional individual counselling whenever they came in contact with the trial clinicians [111].

Qualitative studies have also reported possible explanations from both men and women for the sexual risk behaviour following circumcision in the different settings. In some of the studies, there were reports of increased numbers of sexual partners especially for a short period after circumcision, non-use of condoms with the sexual partners and having sex before the recommended healing period. Other studies have only reported these as fears by the community members that may possibly explain post SMC sexual behaviours. In a study among fishing communities on Lake Victoria, Uganda [78], possible partner infidelity was reported in the FGDs of women and men as a concern after circumcision because they believed the circumcised man would experience increased libido. Some community members in FGDs also reported a misconception that vaginal fluids heal wounds and therefore could be helpful in hastening the healing of the circumcision wound, a belief also noted in another recent study [121]. They also reported that first sex after circumcision was not supposed to be with a man's own wife, and they believed it was a curse to do so [78]. Cleansing sex after circumcision was also reported in South Africa, arising from a belief that

there was “unclean blood” shared during circumcision, which should be cleansed off during the first sexual intercourse post circumcision with someone who would not be the future partner of the man [122].

In Kisumu, western Kenya, the explanations given by participants who engaged with multiple sexual partners included perceiving themselves to be more desirable to women as sexual partners after being circumcised, and the desire to be adventurous and experiment sexually [101]. Sexual adventure and experimentation with the “new tool” as they referred to the circumcised penis, were also reported in a study by Grund and colleagues in urban Swaziland [119] as reasons for the sexual risk behaviour. In this study, some men who made ‘mistakes’ and failed to use condoms also perceived circumcision as a good ‘backup to the condoms’ [119]. Similarly, female sex workers in Lusaka, Zambia, reported a surge in the number of circumcised clients, and some of whom used their circumcision state to bargain for non-condom use [106]. Such men could have overrated the protection that SMC offers. Some female sex workers also reported having intercourse with the male clients before their circumcision wounds healed [106]. Although there was no explanation as to why they thought this happened, it could be related to the “cleansing” belief reported elsewhere [78, 122], and not necessarily behavioural risk compensation. In a study conducted in Western Cape, South Africa [120], the explanation for some participants having sex before complete wound healing varied. Due to the living conditions, where couples lived in congested households, it was hard to avoid sexual arousal during this period. This study reported tensions experienced during the healing phase when men feared they would fail to satisfy their partners sexually and maintain a harmonious relationship. Participants also said that they tried non-penetrative sex to cope with sexual arousal during the healing period such as kissing, fondling, oral sex and mutual masturbation. However, in some instances, they lost control and these acts intensified into penetrative intercourse. Others had sex after intoxication with alcohol [120].

1.5 Conceptual framework

In this thesis, I used the quadrants of Ken Wilber's integral framework [123, 124] to map the different parts of this mixed method study. A priori I tried to apply some models/theories (e.g. the Theory of Planned Behaviour and the Health Belief Model) but none of them fit all the sub studies appropriately although they may be useful in explaining some of the findings/ results. The integral framework was applied post hoc and is based on an intuitive understanding of life and reality as an undivided whole. It has been used in integral health care before [125]. The integral framework includes four quadrants, all of which need to have attention for the successful implementation of comprehensive health promotion programmes such as SMC.

At the centre of my modification of the integral framework (Figure 4) is the SMC programme that contributes to the prevention of HIV infection as part of a comprehensive strategy. The elements within the quadrants of the framework relate to each other to influence sustainable SMC programme implementation. The four quadrants are: "I" which encompasses the inside of the individual; "IT" that is the outer of the individual; "WE" which is the inside of the collective/society and; "ITS" that entails the outer of the collective. The quadrants include aspects of the target population for the SMC programme, their personal beliefs, service providers and the health services, the societal values and beliefs, and the policies. They are the four basic ways of comprehensively looking at the SMC programme in this context. Ignoring one of the quadrants may result in challenges to the sustainability of SMC.

In the upper left quadrant is the inner individual part of the integral framework. This includes the parts that relate directly to the individual men who participate as clients or potential clients of circumcision. They are the key components because the SMC programme cannot exist without them. Understanding their needs and experiences is essential to the successful sustainable execution of the programme. The individual men have subjective personal beliefs and attitudes, inner values, and motivations (papers III and IV). The elements in the "I" influence the elements in the "IT", but

these do not exist without the effect of the "WE" (the collective/society) because in the SMC programme, each client/ potential client/ already circumcised man ("I") is part of the society ("WE").

The "WE" is the lower left quadrant of the framework (the inner collective). It entails the intersubjective factors which are essential to human interaction and therefore behaviour outcomes. These include the collective beliefs held by the families and communities, cultural beliefs, society norms and values in the before and after circumcision period. It also includes the role of peers (friends and already circumcised men who may influence those who are newly circumcised, or the decision of the uncircumcised to accept or to avoid circumcision. The interpersonal relationships between men and women, and specifically the sexual partners of the individual men are also part of this quadrant. These partners may influence several decisions, both to seek circumcision and regarding the ensuing sexual behaviours (risky or protective). The cultural beliefs in this quadrant may evolve, and include myths that could be detrimental to the SMC programme. If these are left unattended to, they can directly affect the "IT" and ultimately the success of the programme. In attempting to understand the behaviour choices, the qualitative sub study (papers III and IV) included sociocultural beliefs as understood by the participants and how these played a role in influencing sexual behaviour in the context of male circumcision. It should be noted that at the beginning of the study, little was known about the various beliefs male clients seeking SMC held, and therefore the conceptualisation of the study was with an open mind to establish what exactly existed in the community. The beliefs that manifested are discussed further in the findings and discussion chapters as well as in papers III and IV.

The upper right quadrant (the "IT") comprises of the outside of the individual person. In this quadrant are the practices/behaviours that affect the individual and may be influenced by the personal beliefs, values, motives among others. In the context of this study, these include the circumcision itself (surgery), and the measured

individual sexual behaviours in the surveys (number of sexual partners, non-marital sex, condom use, transitional sex). These are included in papers I and II. Conventional health promotion interventions usually aim to modify behaviours for example to reduce the risk of HIV infection. This quadrant also includes other sexual practices that arise from the interaction of the beliefs in the two left quadrants, which I discuss in papers III and IV.

The fourth quadrant in this framework is the "ITS" (the lower right side). In this study, it includes the health facilities where SMC is offered, health workers that offer the services, health services provided such as health education and counselling for SMC, STI screening, HIV testing, the WHO guidelines that stretch far in all the priority countries, the content of service provision, and the social marketing of the SMC programme. This is the outer collective part of the framework that stretches beyond the local context. This lower right quadrant is sometimes isolated from the context of other quadrants, especially the left side. For example, personal attitudes and collective beliefs may not be taken into consideration, yet they influence the performance in this quadrant and elements here need to be tailored to the personal/population needs. In this study, I only focussed on the individual reports of the clients in the in-depth interviews to understand elements of service provision at the health facilities and how they influenced sexual behaviour after circumcision (papers III and IV).

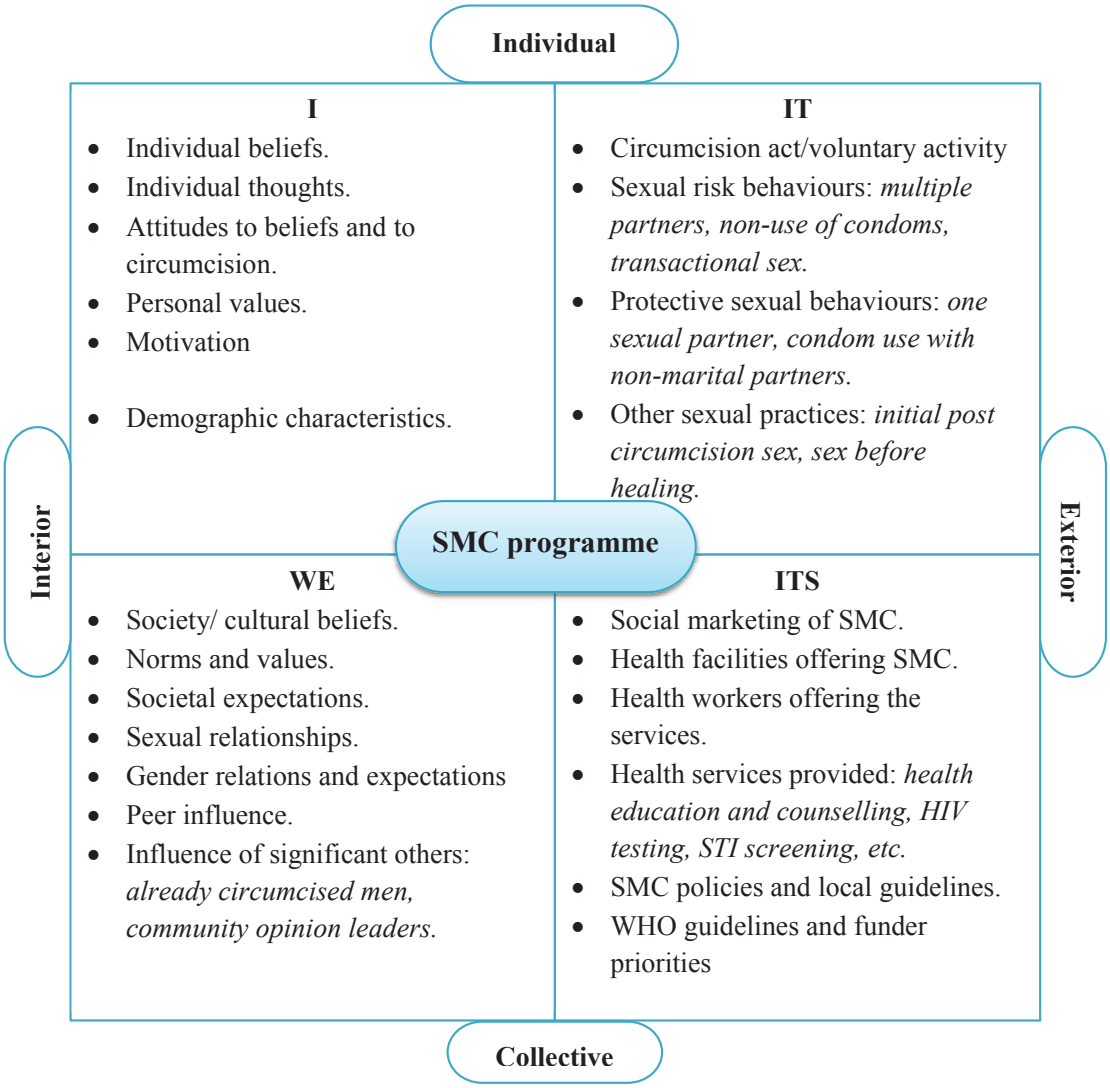

Figure 4: Adapted integral framework displaying the quadrants of the study

2. Justification for the studies

Heterosexual transmission is the biggest contributor to the HIV epidemic in Uganda, responsible for over 80% of new infections [9]. In a population with such heterosexual infection rates, SMC is a very important prevention intervention. However, SMC, like other risk reduction interventions can be prone to challenges such as behavioural risk compensation and other sexual risk behaviours arising from beliefs in the post-circumcision period. To contribute to the success of the intervention, it ought to be implemented with an understanding of the sexual behaviour of men before and after circumcision, the environment that influences them and aspects of the services that they receive at the health facilities. In this context, the emphasis and justification of the sub studies comprised in this thesis is described below.

The adoption of SMC as part of the HIV prevention strategy could have had effects on the sexual behaviour of circumcised and uncircumcised men. In the early phase, there were concerns about potential behavioural risk compensation [100-103] from promoting such large-scale population level prevention interventions. At the time of conceptualisation of this study, there were few studies [101, 106, 112-115] apart from the three randomised clinical trials [44-46] that had examined the association between male circumcision and sexual risk behaviour. Specifically, in Uganda, an analysis of the 2011 Uganda AIDS indicator survey alone, showed higher odds of engaging in sexual risk behaviours among circumcised men than the uncircumcised. However, there were no comparisons with the period before the implementation of the national SMC programme. To address this gap, paper I, therefore, estimated whether there were differences in the associations between sexual risk behaviours and circumcision status, and HIV sero-status and circumcision status between the year 2004 and 2011. These two surveys of 2004 and 2011 were conducted before and just after implementing the national SMC programme respectively.

Apart from the circumcised men, there were uncircumcised men who were willing and those who were reluctant to be circumcised after the Ministry of Health started implementing the SMC programme in Uganda. I hypothesised that it is possible that the potential early adopters of SMC may have a different sexual risk profile than the later adopters and those that do not get circumcised. It is likely that those who expressed willingness to be circumcised represented the 'early adopters' [126] of the SMC intervention in the Uganda. In Kenya, a study found that early adopters of male circumcision perceived themselves to be at higher risk than later adopters [113]. There were also few published studies elsewhere [113, 127, 128] that had assessed the associations between sexual risk behaviours and willingness to be circumcised in the general population, and none in Uganda at the time. It was important to examine willingness to be circumcised among uncircumcised men with varied sexual behaviours in the Ugandan context to assess whether the national SMC programme was reaching the men with the highest need of increased protection. Paper II, therefore, compared the sexual risk profile of men who were willing to be circumcised to those who were reluctant, interviewed in the 2011 UAIS.

After a preliminary analysis of the data that formed papers I and II, I sought to understand why the men that were circumcised made different behavioural choices. This justified the qualitative sub study that was conducted in Wakiso district, central Uganda where the SMC programme had the highest reported numbers of circumcisions in 2013. It is crucial for SMC clients to appreciate that circumcision provides only partial protection against HIV [33] so that they can be motivated to take additional precautions. It is not known if indeed men receive and remember information to this effect. It was important to explore if and what messages the men remembered after receiving SMC services. The reasons that influence men to seek SMC may also affect their post circumcision sexual behaviours. There were some studies at the time in sub Saharan Africa that identified some of the drivers for SMC but these were largely based on community views and male participants that were not yet circumcised [78, 129-134]. Only a few studies included self-reports of

circumcised men [81, 135, 136] and were all outside Uganda. In this vein, paper III, therefore, explored the drivers of men's SMC decisions and their experiences with health education at health facilities. I also sought to establish the personal understanding of partial HIV protection that SMC offers after they had received the services as expected.

Further, although some studies outside Uganda [101, 119, 120] provided some understanding of post circumcision behaviour, these were cross-sectional and with a substantial recall period of up to 12 months. A prospective qualitative study in the Ugandan context, with a shorter follow-up period was deemed to probably yield more dependable findings to understand why some men made certain behaviour choices after circumcision. I also specifically sought to understand if there were cultural or social beliefs and whether these had any influence on the behavioural choices made. It should be noted that cultural beliefs regarding circumcision may differ in varied settings, and could evolve over time as information from SMC programmes continues to be widely disseminated.

3. Study objectives

3.1 Overall objective

To estimate the associations of male circumcision with sexual risk behaviour and HIV prevalence before and just after the national scale up of the safe male circumcision programme in Uganda, and to understand the sexual behaviour choices among men circumcised under the national programme in Wakiso district.

3.2 Specific objectives

i. To measure whether there are differences in the associations between sexual risk behaviours and circumcision status between the 2004 and 2011 Uganda AIDS indicator surveys (Paper I).

ii. To determine whether there are differences in the associations between HIV sero-status and circumcision status between the 2004 and 2011 Uganda AIDS indicator surveys (Paper I).

iii. To compare the sexual risk profile of men who were willing to be circumcised to those who were reluctant in the 2011 Uganda AIDS indicator survey (Paper II).

iv. To explore the drivers of men's circumcision decisions, their experience with health education at service points and understanding of partial protection from HIV in Wakiso district (Paper III).

v. To explore the beliefs that may influence sexual behaviours among circumcised men in a programme setting in Wakiso district (Paper IV).

4. Methods

4.1 Study setting and Population

The study was conducted in Uganda, a land-locked East African country. The quantitative analyses were based on two nationally representative surveys while the qualitative sub-study was conducted in Wakiso district. Uganda is a landlocked sub-Saharan African country located in the eastern part of the continent along the equator. In the most recent national population census in 2014 [32], Uganda had a population of 34,634,650 with men comprising 49.2% (17,060,832), an annual population growth rate of 3.0% and a total fertility rate of 5.8 children. About 65% of the population aged 18 years and above were married or living with a partner. Although predominantly rural, Uganda is a fast urbanising country with about 7.4 million (21.4%) urban inhabitants, up from 2.9 million in 2002. The country has one of the youngest populations globally with 34.8% of men and women aged 10 to 24 years.

There has been a marked improvement in the life expectancy at birth, from 50.2 years in 2002 [137] to 63.3 years (62.2 for men and 64.2 for women) in 2014 [32]. HIV/AIDS, as one of the biggest causes of mortality in Uganda, has negatively impacted on the life expectancy for decades. In 2014 alone, there were an estimated 31,000 HIV related deaths [138]. However, as earlier noted, since the advent of ART, there is a marked reduction in such deaths, which could partly explain the huge gains in life expectancy reported in the national census. Further efforts in prevention of HIV such as SMC are expected to yield more gains in life expectancy over the next years. The average literacy rate is 72.2% (men 77.4% and women 67.6%). Uganda's main economic activity is agriculture, engaging 68.4% of the working population. The main source of information for most households is the radio (55%). Over 100 FM radio stations are spread across the country, which broadcast in several Ugandan languages as well as English. However, 20% of the households reported in 2014 that they still rely on word of mouth as a major source of information. This may have implications for social marketing for SMC where messages may be altered as they are

transmitted by word of mouth from primary recipients. Uganda has diverse backgrounds in culture and religion, although it is predominantly Christian [32].

Although Wakiso is located in central Uganda, which is predominantly inhabited by the Baganda ethnic group, the district has a cosmopolitan population due to its proximity to the country's capital city, Kampala. It also has both rural and urbanised areas. The main language used in the district is Luganda but there are several people that speak other dialects especially of the Bantu group. In the 2014 Uganda national population and housing census [32], the country's population was 34,634,650 with Wakiso contributing 5.8% (1,997,418). This makes it the largest district in the country. Men in the district comprised 48.2% (962,121) while the urban population was 59.2% (1,182,901). The district at the time of the study had 103 health facilities including 4 at hospital level, 5 at health centre IV, 37 at health centre III and 57 at health centre II level [72]. In the year 2012/13 estimates (the latest available at the planning phase of the study), the district contributed over 48,000 newly circumcised men aged 18+ to the national safe male circumcision programme, the largest number in the country. The central 1 sub-region where Wakiso district is located had the highest HIV prevalence of 10.6% (12.5% women and 8.4% Men) at the time of conceptualising this study [12]. Figure 5 shows the geographical location of Wakiso district within Uganda.

Figure 5: Map of Uganda and location of Wakiso district

The study population for this thesis comprised of men aged 15-59 years, who were 46.5% of the male population in 2014. In paper I, both circumcised and uncircumcised men were included while paper II only comprised of uncircumcised men. Papers III and IV included newly circumcised men from age 18 to 46 years who were interviewed just after receiving the services or the next day.

4.2 Design, Sampling and data collection

4.2.1 Design

This thesis is based on a sequential mixed methods approach. Mixed-method design is where the researcher conducts quantitative and qualitative mini-studies in one overall research study and integrates the findings [139]. I used both quantitative and qualitative methods in answering the key questions in the sub-studies. Papers I and II are quantitative based on data from the 2004 and the 2011 Uganda AIDS Indicator Surveys, which used cross sectional designs. Papers III and IV are from a qualitative descriptive design [140, 141] based on the data collected from SMC clients in Wakiso district, central Uganda. I further discuss the qualitative descriptive approach in the methodological discussion section, in Chapter 6. The mixed method design in this thesis is sequential [142] because the preliminary quantitative analyses from the two national surveys were conducted first and informed the design of the qualitative description. The discussion of the sub studies is integrated in the thesis, but not in the different papers. Figure 6 shows a summarised structure of the four papers in this thesis.

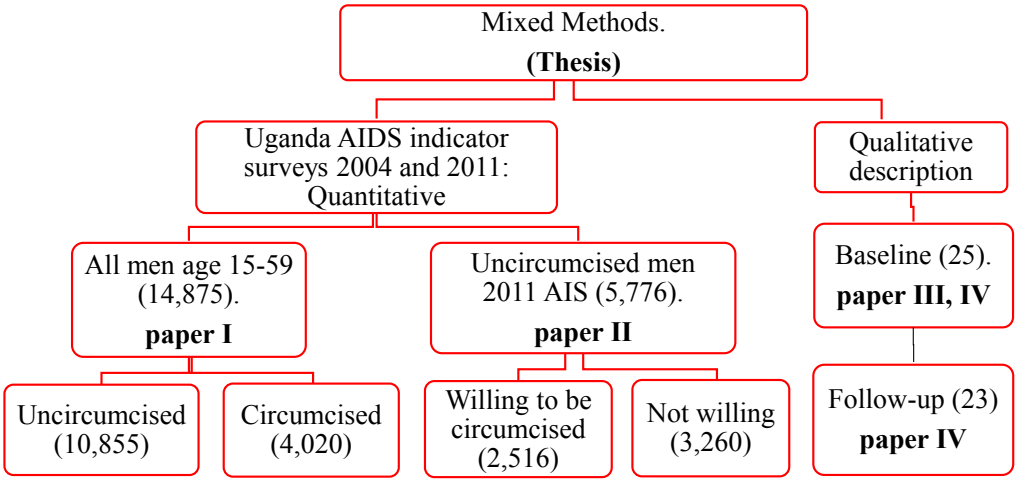

Figure 6: Structure of the sub studies forming the thesis and number of men

There are philosophical assumptions that relate to the mixed method design in this study which I briefly explain. The main ontological position for this study is pragmatism, which has been argued to be the philosophical partner for mixed methods research [139]. A mixed methods design has a strong foothold in the methodological pluralism camp [143]. The argument is against a dichotomy between qualitative and quantitative research paradigms in favour of the efficient use of both [142, 143]. In pragmatism, the belief is that reality is constantly renegotiated, debated, interpreted, and therefore the best methods, techniques and procedures that a research should employ are those that suit the needs and purposes at hand [142, 144].

This study holds both objective and subjective epistemic positions. Pragmatism believes that we can have both of these epistemological orientations in research [145]. In quantitative studies (the surveys in this case), objectivity remains a regulatory ideal, even though dualism is impossible to maintain as Guba and Lincoln note [146]. In qualitative studies, subjectivism is openly embraced, where the researcher's influences can for example affect the discussion or shape the questions asked to the participants in interviews.

Axiologically, in pragmatism, values are believed to play a role in research [145]. This study, especially the qualitative sub study, is laden with values. I openly acknowledge these in the section, methodological discussion, in chapter 6. There are also potential limitations that may arise from axiological positions of respondents or interviewers in the quantitative surveys, which I also discuss in detail in chapter 6.

4.2.2 Sampling and data collection

Quantitative (papers I and II)

For papers I and II, the 2004 and 2011 Uganda AIDS indicator surveys were used. The 2004 survey was conducted before the designing of the SMC policy and implementation of the SMC programme in the country. However, the 2011 AIDS indicator survey was conducted after the SMC implementation was underway. This timing of the surveys was the primary reason for the choice of using these datasets in this study. The two surveys had nationally representative samples and both employed a two-stage stratified cluster sampling design [12, 13]. In the first stage, the clusters were randomly selected from strata that were defined by urban or rural residence and geographical regions. Households were then selected for interview to obtain eligible individual respondents at the second stage of the design. The clusters used in the two surveys were obtained from a list of enumeration areas accruing from the 2002 Uganda population and housing census.

At the first stage, 417 clusters in 2004 and 470 in the 2011 survey were selected. The second stage in both surveys, involved sampling 25 households for interview from each of the selected clusters. The sampling was systematic with a random starting point. A fixed sampling interval was obtained by dividing the total number of households in the cluster by the sample size of 25 households. Individual interviews were conducted with all eligible respondents who were permanent residents of the households or visitors who had spent the survey night in the household and aged 15-59 years. They were further requested to voluntarily provide a blood sample for HIV

testing. In this study, I only used data for male respondents, aged 15-59 years. In the 2004 survey, out of the 9,842 eligible households, 9,529 were interviewed, giving a response rate of 96.1%. In these households 8,830 men completed individual interviews out of 9,905 that were eligible, giving a response rate of 89.1%. In the 2011 survey, 11,340 were interviewed from the 11,434 eligible households (response rate, 99.2%), while 9,588 men were interviewed from the 9,983 that were eligible (response rate, 96%). The response rate for HIV testing was 83.4% in the 2004 survey and 94.2% in 2011. Paper I is based on data from a combined 14,875 men in both surveys who reported to ever have had sex and had complete HIV status data. Paper II is based on the 2011 Uganda AIDS indicator survey alone, with 5,776 uncircumcised men that reported to ever have had sex at the time of the survey.

Trained male research assistants collected survey data between August 2004 and January 2005 (2004 Uganda AIDS indicator survey), and between February and September 2011 (2011 Uganda AIDS indicator survey). Data collected included respondents' self-reported circumcision status, sexual behaviours and socio-demographic characteristics. For the HIV sero-status, laboratory technicians collected blood samples (venous blood or dried blood spots for those who refused venous blood draw) for HIV testing. HIV tests for both surveys were conducted at a central laboratory found at the Uganda Virus Research Institute, Entebbe. Tests were conducted using Murex HIV 1.2.0 (Abbott) assay. All the samples that were HIV-reactive with Murex were re-tested with Vironostika HIV Uni-Form II Plus-O to confirm their sero-status. The discordant results were resolved using the ANILAB Systems HIV enzyme immunoassay. For quality control purposes all the positive specimens and 5% of the negative specimens were re-tested at the Centers for Disease Control laboratory in Uganda using the same testing algorithm as detailed in the two main survey reports [12, 13].

In paper I, the dependent variables were HIV sero-status obtained from blood sample tests in both surveys, and the following sexual risk behaviours [84] among sexually active circumcised and uncircumcised men: (i) having multiple sexual partners,

defined as reporting two or more sexual partners, (ii) having had sex with non-marital partners, (iii) non-use of condoms at the last non-marital sex, and (iv) transactional sex (payment or receipt of money/gifts in exchange for sex). All these questions referred to behaviours that took place in the 12 months preceding each of the surveys. Condom use at last non-marital sex only included men who reported having such sex. The main independent variable was self-reported circumcision status, while other explanatory variables were socio-demographic characteristics, personal HIV risk perception as well as knowledge of the protection offered by male circumcision against HIV infection (for the 2011 Uganda AIDS indicator survey). In paper II, the dependent variable was willingness to be circumcised while the sexual risk behaviours (described above for paper I) were the independent variables.

Qualitative (papers III and IV)

For the qualitative description, the participants were purposively selected. The objective was to understand what influences adult men to go for circumcision, their beliefs and sexual behaviour. Therefore, representation was not a primary requirement. As Mays and Pope suggest [147], the sampling aim in such a study is to identify specific groups of people who either possess characteristics or live in circumstances relevant to the social phenomenon being studied. Participants are identified because they will enable exploration of a particular aspect of behaviour relevant to the research. This approach also allows the deliberate inclusion of a wide range of types of participants [147, 148]. In line with this, I purposively selected adult men who sought SMC services at the public health facilities in Wakiso district at the time of the first phase of data collection between May and June 2015.

The eligible men were selected from five public health facilities of level III and IV depending on availability of those that met the prior set criteria. The following were the eligibility criteria: being an adult in the age range 18-59 years, able to provide written informed consent, married or living with a partner at the time of initial interview, and seeking circumcision voluntarily (not prescribed for medical

conditions). It also included consent to be contacted for a follow up interview six months after circumcision, but clearly emphasising that they had a right to withdraw from the study at any one point. Given the context of Wakiso district, the demographic characteristics of the participants were varied: ethnicity (seven ethnic groups), speaking varied languages, age range (18 to 46 years), education level (primary, secondary and tertiary), occupation (casual labourers, businessmen and professionals), residence (rural and urban), and number of stable sexual partners (one to three).

These eligible participants were recruited at the health facilities through health workers who informed them about the possibility to participate in the study when they came for SMC. With verbal consent, we then approached them, took them through the informed consent process (Appendix I), explaining further details about the study and they signed a consent form. All men that were approached voluntarily agreed to participate in the study. Interviews were conducted until no new information emerged from the added interviews [149]. Saturation was reached after 19 interviews but given the uncertainty of reaching all the men for the follow up, I purposely included an additional six men to cater for possible "loss to follow up." Indeed, two men could not be reached in the follow up interview phase. One could not be traced through his provided address, and the other declined for reasons that he did not disclose.

I used in-depth interviews for several reasons. First, such interviews involve open-ended topic guides that explore personal accounts of sensitive information, such as sexual behaviour. Secondly, they offered participants a higher level of privacy than any other method to disclose their personal sexual behavioural experiences, well assured of confidentiality. In-depth interviews also allowed comprehensive understanding of sexual experiences following male circumcision with detailed discussion between an interviewer and participant as opposed to a group interview. This is the most appropriate method for such information [150].

The data collection process engaged four people; two trained male research assistants, a supervisor (involved in one interview) and myself. Four languages were used to conduct the interviews; most participants were interviewed in Luganda (the main local language of the district), a few in Lusoga, English and one in Runyankore. All initial interviews were conducted either soon after client's receipt of circumcision service at the health facility premises, or a day after at their respective homes if the participant preferred. The follow up interviews were held in the participants' homes, places of work and locations near their work places that allowed privacy. Interview guides (Appendix II) were designed to discuss participants' motives for circumcision, influences for their decision, current sexual behaviours, experiences with counselling/ health education received (if any), and expectations after circumcision in the baseline interviews. The follow-up interviews included experiences with healing, beliefs and sexual behaviours following circumcision.

4.3 Data management and Analyses

Quantitative

Analyses for the quantitative data were conducted using Stata version 13 (StataCorp 2013). In preparation for analysis, men's individual data files and the HIV sero status data files were prepared for merging, using unique identifiers (cluster number, household number and line number of each individual) for each survey. The merged survey datasets for each survey (2004 and 2011), were then appended to get one overall dataset with 14,875 men (6,906 in 2004 and 7,969 in 2011). Observations in the appended dataset were identified for each of the specific survey (2004 or 2011) using a generated "survey" identifier variable (Paper I). For paper II, only the 2011 AIDS survey data were used, with 5,776 men who reported to be uncircumcised and to ever have had sex at the time of the survey.

The measure of association used for these analyses were prevalence ratios (PR) and their corresponding 95% confidence intervals [151-153] obtained via modified Poisson regression models using generalized linear models with family (Poisson),

link (log) and robust standard errors. In paper I, we first estimated the associations between male circumcision and sexual risk behaviours, as well as male circumcision and HIV sero-status for each of the surveys. In the adjusted analyses of sexual risk behaviour, socio-demographic characteristics were controlled for. An interaction term between male circumcision and survey year was introduced in combined regression models for each of the sexual risk behaviours to further test whether the survey period was an important factor. In paper II, only the uncircumcised men in the 2011 survey were included in the analyses to estimate the associations between the sexual risk behaviours and willingness to be circumcised. The measures of associations were the same as paper I but the sexual risk behaviours were the independent variables. In all analyses, sample weights were used and we also adjusted for clustering of observations within the same cluster/enumeration area.

Qualitative

For papers III and IV, all interviews were audio recorded and then simultaneously transcribed and translated to English. The transcripts were imported into Atlas.Ti 7 qualitative data management software for coding and analysis. Attride-Sterling's thematic network analysis method was used [154]. In the first step, the data in the transcripts was coded. The initial coding was done together with assistance from two colleagues (PhD candidates) who were not part of the data collection process. The initial coding was used to devise a coding framework that was applied to the rest of the transcripts. The codes were also discussed with two supervisors. I then identified basic themes by exploring the links between the codes and clustering them. The basic themes were further arranged into organising themes, and I deduced global themes that reflected the research questions in each of the two papers (III and IV). In the last step, the interpretation of the relevant links, patterns and concepts arising from the data is further explored in the discussion of the findings in the papers and the thesis.

4.4 Ethical considerations

For the 2004 and 2011 Uganda AIDS indicator surveys data used in the papers I and II, each survey protocol was reviewed and approved by the Science and Ethics

Committee of the Uganda Virus Research Institute, ICF International's Institutional Review Board, and a review committee at the Centers for Disease Control and Prevention in Atlanta, USA. The Ethics Committee of the Uganda National Council for Science and Technology also cleared them. Informed consent for interviews and another for taking blood samples were obtained, and potentially identifying personal information destroyed before linking HIV data to the socio-demographic and behavioural data collected from individual questionnaires. For the 2004 survey, HIV test results were not provided, but the respondents who wanted to know their HIV status were given a voucher for a free voluntary counselling and testing visit at nearby health facilities [13]. For the 2011 survey, rapid HIV test results were provided immediately as well as counselling. CD4 results were also provided six weeks post interview at the nearby health facilities [12]. I obtained permission to use both surveys' data from ICF international, USA, and the Ministry of Health, Uganda. More detailed information on ethical approval is included in paper I.

For the qualitative sub studies (papers III and IV) protocol, I applied for ethical approval but were exempted from ethical review in Norway by the Regional Ethical Committee of Western Norway (REK vest) in March 2015 (reference 2015/477). In Uganda where the data collection was conducted, the Higher Degrees, Research and Ethics Committee (HDREC) of Makerere University School of Public Health (registration 288) and the Uganda National Council for Science and Technology (SS 3764) approved this protocol in April and May 2015 respectively (Appendix III). Before data collection, I also obtained written permission from the district health office of Wakiso district and the respective health facilities where men sought SMC services. Both research assistants had recently received training in the ethical conduct of human subjects' research. All participants signed an informed consent form. There was personal information such as telephone contacts and addresses obtained at baseline for follow-up purposes, and these were kept separate from the transcripts. The audio files from the interviews were erased soon after transcription was completed. In the transcripts, all personal identifying information such as real names

of people mentioned in the interviews were altered (pseudonyms) to anonymise the data. For the findings sections of the papers (III and IV), I used unique codes (P1 to P25) to refer to participants. The participants were compensated for their time with 20,000 Uganda shillings (about 7 US$ at the time) in each of the two interview phases.

5. Results

This chapter summarises the quantitative and qualitative results from papers 1-IV.

5.1 Differences in sexual risk behaviour and HIV between circumcised and uncircumcised men (I)

Paper I shows estimates of the associations between sexual risk behaviours and circumcision status, as well as HIV sero-status and circumcision in 2004 and 2011 surveys. There were 14,875 observations analysed in the two surveys. The percent of circumcised men varied by survey, 26% in 2004 and 28% in 2011 (see paper I, Table 1). The main result in this paper is that circumcised men reported a higher prevalence of all sexual risk behaviours than the uncircumcised men from both survey periods. In the adjusted analyses, being circumcised was significantly associated with reporting multiple sexual partners in both surveys (2004: adjusted PR 1.38; 95% CI 1.26 - 1.51]; 2011: adjusted PR 1.23; 95% CI 1.11 - 1.36). This association was significantly higher in 2004 than in 2011. Being circumcised was also associated with reporting sex with non-marital sexual partners in the 2004 survey (adjusted PR 1.12; 95% CI 1.06 - 1.20) but not in the 2011 survey (adjusted PR 1.05; 95% CI 0.99 – 1.13). Results showed no difference in 2004 between the two groups regarding condom use at last non-marital sex. However, in 2011, circumcised men were less likely to report use of condoms at the last sex with a non-marital partner than uncircumcised men (adjusted PR 0.85; CI 0.76 - 0.96). There was no significant association between transactional sex in any of the two surveys (see paper I, Table 3). In both surveys, being circumcised was significantly associated with lower HIV prevalence. In the adjusted analyses (adjusted for background characteristics and sexual risk behaviours) comparing circumcised to uncircumcised men, the risk of being HIV positive was 43% lower in the 2004 survey (adjusted PR 0.57; CI 0.44 - 0.75) and 34% lower in the 2011 survey (adjusted PR 0.66; CI 0.51 - 0.84) (see paper I, Table 5).

5.2 Sexual risk behaviour of men and willingness to be circumcised (II)

This is a summary of the risk profile of men who were willing to be circumcised and those who were not willing or not sure. The results are based on the 2011 survey that was conducted after the implementation of the SMC programme was underway and the SMC policy was in place. There were 5,776 uncircumcised men in the survey and 44% of them reported willingness to be circumcised.

In this study, the crude analyses showed all the sexual risk behaviours to be significantly associated with willingness to be circumcised. Uncircumcised men who reported multiple sexual partners in the 12 months preceding the survey were more likely to report willingness to be circumcised (PR 1.19; 95% CI: 1.11-1.29) than those who did not report multiple sexual partners. Engagement in transactional sex was also significantly associated with willingness to be circumcised (PR 1.61; 95% CI: 1.39-1.87). However, after adjusting for age, residence, religion, wealth status, and education level, the associations for these two sexual risk behaviours were no longer statistically significant.

Compared to men who reported no sex with a non-marital partner, men reporting use of condoms at the last sex with a non-marital partner were 1.71 (95% CI: 1.59 - 1.85) times more likely to report willingness to be circumcised. Similarly, men who had sex with a non-marital partner without use of condoms were 1.47 (95% CI: 1.35 - 1.59) times more likely to report willingness to be circumcised. These associations were also significant after adjusting for background characteristics (see paper II, Table 2).

5.3 Key drivers for circumcision decisions (III)

Findings in paper III show the key drivers for men's circumcision decisions, experiences with health education at health facilities and their understanding of partial HIV risk reduction from circumcision (see paper III, Table 2). The participant voices are presented in quotations within the findings sections of papers III and IV.

Men's circumcision decisions were mainly driven by a personal need to reduce the risk of HIV/STIs, the influence of sexual partners, positive community perception of male circumcision and personal hygiene. As expected, nearly all men wanted to reduce the risk of infection with HIV and STIs such as gonorrhoea and syphilis. The information about risk reduction for HIV/STIs was mainly from community mobilisations, mass media messages by the SMC programme, their peers and circumcised colleagues, as well as directly from health facilities/workers.

The men's sexual partners emerged as important drivers that influenced most decisions. Men reported that their partners either directly or indirectly expressed desire to see them circumcised. Men also perceived circumcision to enhance sexual performance and reported that women preferred circumcised sexual partners.

There were also men who wanted to protect their sexual partners from risk of infection with cervical cancer and HIV. These had heard that circumcision reduces the risk of cervical cancer among the partners. In contrast, there were men who feared that their sexual partners engaged in extra marital sex and sought circumcision to enhance their protection.

Men also discussed hygiene as a key driver. Better penile hygiene was also given by their partners while persuading them to seek circumcision. Further, a strong wave of community positivity about circumcised men in general also influenced decisions. Many people that the men knew thought that circumcision was fashionable.

Timing was a crucial factor in decision-making. Many men made their decisions at the particular time they did because either they or their sexual partners were away from home for days or weeks. One man also ensured he was circumcised at the time when his wife had just given birth; a period where sexual abstinence is expected. This was to ensure quick healing free from "sexual temptations." The presence of their partners was perceived as an undesirable disturbance that would cause unwanted erections with sutured sexual organs and delay circumcision wound healing.

5.4 Experience with health education and understanding of partial HIV protection (III)

We explored the experience of men when they sought SMC services at health facilities regarding the kind of messages that were delivered to them. Summary results here are presented using four organising themes. These include: health education about surgical procedure and healing, HIV/STI risk reduction and other benefits of SMC, post healing sexual behaviour and HIV Testing, minimal or no health education at all.

Nearly all participants received some kind of health education that rotated around the conduct of the surgical procedure, length of the healing period, care for the wound and clear warning not to resume sex before the communicated healing period was over. Health workers allayed fears of the perceived pain that men expected to have and reassurance about use of anaesthesia. Men were also cautioned to follow the guidelines for proper healing and maintain the six weeks waiting period. Health education also involved emphasis on the role of circumcision in HIV/STI partial risk reduction as well as other benefits such as reduction in cervical cancer risk to women and improved hygiene.

There were reported challenges among men regarding remembering of pre-SMC health education messages. Five men said they did not remember most messages due to pre-surgical anxiety. Only nine said they were cautioned on the importance of safer sexual behaviour after healing, such as condom use and/or avoid multiple sexual partnerships. There were also glaring gaps in health education. Five men did not receive any kind of health education at the health facilities and one reported a rushed counselling session with no opportunity to ask questions.

5.5 Understanding of partial risk reduction for HIV (III)

In paper III, we also explored men's understanding of the concept of partial risk reduction for HIV after they had received SMC services. Such knowledge may influence sexual behaviour after circumcision.

Nearly all men were able to explain that circumcision only reduced the risk of HIV infection, with some specifically mentioning the 60% risk reduction in their own contextual analogies. Most explained that removing the foreskin is crucial in reducing the chances of getting HIV infection because it hardens the glans and also eliminates the suitable area for the virus to survive. They received this information during health education as well as other sources like friends and other circumcised men.

There were also misconceptions among four men about the benefits of circumcision. They believed that circumcision also directly reduces HIV risk to a woman, it provides absolute protection from "minor" STIs, a circumcised man can wipe or wash the penis in case they have unprotected sex as a measure to further reduce infection risk.

5.6 Beliefs influencing post circumcision sexual behaviour (IV)

In paper IV, we explored the beliefs influencing sexual behaviour among circumcised men before circumcision, during and after wound healing. These are summarised under four themes: (1) Beliefs regarding sexual cleansing, (2) Beliefs regarding HIV transmission risk, (3) Beliefs regarding healing, and (4) Beliefs regarding sexual capabilities post circumcision (see paper IV, Figure 1).

Men correctly believed that there was still an existing risk of HIV transmission after circumcision. As a result, majority had either maintained or adopted safer sexual behaviour to continue protecting themselves and their partner against HIV risk. Some

reported one sexual partner and those who had multiple partners reported condom use with the extra marital partner.

There was a belief regarding sexual cleansing post circumcision. All men at follow-up reported that people they knew or they themselves believed that a circumcised man should have one-off post circumcision sex with a casual partner after healing before they have sex with their wife or stable partner. There were varied reasons for this belief: (1) that the woman would become promiscuous after this intercourse, (2) the sex would bring a bad omen to the woman that a man acquires during circumcision, although there was no further explanation for this, (3) such a woman would become wasted and physically unattractive to men. This belief was from their circumcised friends, relatives, other men and women in the community, and surprisingly their sexual partners. It was also mainly reported to originate from parts of eastern Uganda that practice cultural circumcision. There were men who worried about this belief during the baseline interviews and four were strongly inclined to find casual partners to have sex with soon after healing. Indeed, four men had first sexual intercourse post SMC with a casual partner in fear of the consequences of not complying with this belief, while one man was also waiting to have such sex.

Men further had beliefs regarding wound healing. Four men had heard that vaginal fluids aid wound healing including the circumcision wound, but none of the men in this study followed this. Two men misunderstood what comprised complete healing and reported having had sexual intercourse before the recommended abstinence period of six weeks ended, with one having sex as early as after two weeks. There was also a rare but protective belief that one man had heard at baseline; that a man should not look at their partner after circumcision because their surgical wound may become infected. However, other men when prompted in the follow up interviews did not know this belief.

Men also believed that circumcision enhanced their sexual capabilities with better sexual stimulation and satisfaction for their partners. Half of the men had reported this belief as one of the drivers for their circumcision decision and also expressed a

felt change after resumption of sex. Seven men further said that their partners confirmed to having better sexual experiences after they were circumcised.

6. Discussion

The sections of this chapter include the key methodological issues and how these may affect the interpretation of the results and findings of this study. The key results and findings are also discussed showing linkages between the sub studies. Finally, the conclusions drawn from the study and the relevant research, programme and policy recommendations are also highlighted.

6.1. Methodological considerations

6.1.1. Mixed Method design

Overall, the study utilised a sequential mixed method design [145] with a secondary analysis of a nationally representative sample survey data (I and II) and a qualitative descriptive approach (III and IV). Both methods were combined in this sequential design because I set out to examine different aspects of the research question. Although a mixed method design has several challenges [145, 155], it was the appropriate design to address the objectives in the thesis [156]. The central premise of a mixed method design is that using quantitative and qualitative approaches in combination offers an improved understanding of research problems than either approach alone [144]. The design is sequential because a preliminary analysis of the quantitative data was first conducted, prior to the qualitative sub study meant to further understand behavioural aspects of male circumcision. The study was able to estimate associations using a quantitative approach and qualitatively provide potential explanations for the sexual behaviours of circumcised men that may affect the implementation of the SMC programme in Uganda.

One of the challenges of a mixed method design lies in the interpretation of the results/ findings from the different sub studies. Mixed method researchers experience the ambiguity of how to best approach the potential connections between their quantitative results and qualitative findings [155]. As Bryman notes, there are no established templates or clear rule of thumb to doing this integration [155]. In this

thesis, I discuss how the results and findings from the quantitative and qualitative papers relate to each other.

6.1.2. Quantitative sub studies

The quantitative sub studies (I and II) used a cross-sectional survey design. A survey design according to Creswell can provide a quantitative description of trends, attitudes, or opinions of a population by studying a sample of that population and from which generalizations can be made back to the population [144]. In a survey design, the study domain is a segment of a demographic population, and the population surveyed can be very large or relatively small [157]. In my case the quantitative sub studies were based on two large nationally representative surveys covering household population. The specific samples for the sub studies were men aged 15-59 years from the household population. The surveys can also involve many different outcomes of interest with several determinants including demographic sub-populations and various types of risk factors. The interest may be whether a factor has an association with the outcome or whether there is effect modification [157]. In papers I and II, the interests were: whether circumcision status was associated with HIV status and sexual risk behaviours (I) and whether sexual risk behaviours were associated with willingness to be circumcised (II). For paper I, there was also an assessment of whether the sexual behaviours varied by survey period/year and demographic factors.

The key limitation of cross sectional designs is the inability to draw causal inferences. From the analysis of surveys data (I and II), we could only estimate associations between circumcision, sexual behaviour, and HIV status as well as between sexual risk behaviour and willingness to be circumcised. A prospective cohort study would have been a better design to establish causal relationships between circumcision and changes in sexual risk behaviours. However, such studies have very clear time, logistical and financial constrains which were not affordable at this stage. There are

other issues that may affect the internal and external validity of studies and these are further described below.

Internal Validity and Reliability

Internal validity is the degree to which a study is free from bias [158]. It is the ability of a study to measure what it is indeed intended to measure. It depends on the methods used to select the study subjects, collect the relevant information, and conduct analyses. Internal validity is also a prerequisite for external validity although there are indeed small amounts of bias that are often inevitable [158]. Reliability on the other hand is the overall consistency in the measurements. To achieve reliability, the study must be consistent in the data collection and analytical procedures, and should account for personal and method biases that may have influenced the results [159]. Thorough training of interviewers to ask the questions in the same way to all respondents and close field supervision for example, can improve the reliability during data collection. All the interviews in these surveys were conducted using standardised questionnaires and by male interviewers who were well trained to ask questions in the same way to all the respondents and in a private environment. They were also cautioned not to be judgemental no matter what answers the respondents provided.

The biases that may affect internal validity and how they were addressed in the quantitative sub studies are explained in the subsequent sub sections.

Selection bias

Selection bias results from measures that are used to select study participants or factors that influence loss to follow-up [157]. At the core of this bias, is that there are systematic differences in characteristics between the actual respondents in the study and those that do not participate. Even among those that are lost to follow up, there may be variations in characteristics, resulting in differential loss. In the surveys that I analysed for papers I and II, loss to follow up was not an issue since these were cross sectional studies by nature and did not follow up any individuals.

The selection of respondents into the study needed attention to minimise bias. Although all eligible individual males (15-59 years) in the 25 households that were sampled from each cluster were selected for an interview, there could still have been some bias: Non-participation due to absence at the time of the interviewer visits could lead to bias. This does not only lead to risk of age misreporting in the household interview, but also those who are absent may be systematically different from those that are found at home in terms of demographic characteristics, such as education and occupation. Individual age misreporting may have happened in cases where some people may not know their exact dates of birth. There were several measures however taken to control for such selection bias. Interviewers were trained to use other means of obtaining dates of birth like calendars of main historical events known in the specific settings. The other potential source of this bias can arise from the interviewer themselves. Unscrupulous interviewers can alter the reported ages of respondents in the household questionnaire making them ineligible for individual interviews. The intention is to avoid conducting many long individual interviews in one household. However, there were field supervisors and one of their roles was to ensure all eligible individuals were interviewed in the surveys. The proportions of men in the different age groups in both surveys analysed in this thesis [12, 13] is comparable with those in the 2006 [160] and the 2011 [85] Uganda demographic and health surveys, which were carried out in similar periods. This consistency provides confidence that the above potential sources of selection bias in such surveys were not a big problem for this study.

Information bias

Information bias results from errors in the information collected from or about study respondents and the way they report this information. Study respondents may provide inaccurate information about the variables of interest. This could be due to inability to accurately remember what is required (recall bias) or intentionally adapting their

answers to what they believe is socially acceptable in their settings (social desirability bias).

In papers I and II, the results could have been affected by social desirability bias especially because circumcision status, the sexual risk behaviours and willingness to be circumcised were obtained using individual men's self-reports in face-to-face interviews. When answering questions from another person, the participants may provide altered responses based on societal expectations [161] or depending on the overall relationship built with the interviewer during the consent process and interview. Further, determining circumcision status using self-reports may not be the most accurate measure. Other means could include the use of pictures and direct observation; although this is complicated in such large surveys. Several studies [162-165] in varied settings have documented evidence of misclassification of circumcision status during self-reports when compared to physical examination. There could also have been recall bias due to inability to genuinely remember the sexual behaviours. Collecting reliable sexual behaviour data is always a challenge [166], and reporting sexual behaviour over a shorter period of time is likely to be more accurate compared to longer periods like the 12-months used in these surveys. The reliability of reporting sexual behaviours generally decreases with longer periods of recall [166, 167]. Social desirability in reporting sexual behaviour is also a challenge. However, in settings like the typical Ugandan context where women are socially expected to have less adventurous sexual lifestyles [168], social desirability bias such as underreporting sexual risk behaviours is more likely to affect women than men [169, 170].

Information bias can lead to misclassification; the inaccurate classification of an individual, a value, or an attribute into a category other than that to which it should be assigned. It can be non-differential or may be differential, if the probability of misclassification varies between groups [158]. Misclassification is most dangerous if it is differential. Self-reported circumcision status in this study, if miss reported may have been minimal. The prevalence of circumcision reported in the UAIS is consistent with the 2011 Uganda demographic and health survey estimates [85]. If the misclassification biases exist, they are not likely to be differential. It is possible that a

few men in the 2011 survey that went through medical circumcision after the SMC policy was in effect, could indeed have received advice on expected sexual behaviours at health facilities. However, the same messages of expected behaviours are supposed provided to those who get HIV counselling and testing, and to the public through media. Given that HIV prevention knowledge is high in the country, both circumcised and uncircumcised men may have had similar potential for misclassification of sexual risk behaviours. The reporting of sexual behaviour thus, was not likely to be linked with self-reporting of one's circumcision status (I), or one's willingness to be circumcised (II). The results in paper II were also consistent with other studies in the sub Saharan African region [127, 128], which also strengthened their validity.

Confounding

Confounding occurs when all or part of the apparent association between the exposure and the outcome is accounted for by other variables that affect the outcome and which are not themselves affected by the exposure [158]. It should, therefore, be carefully thought-out in observational studies. Confounding can be controlled for at design and during analysis. In the design stage, there can be randomisation, restriction, and matching, depending on the type of study. During the analysis phase, stratification and controlling for confounding in multivariable analysis can be used. Typically, if the coefficient of a variable changes by at least 10% before and after adjusting for a third variable, then confounding may be indicated. In the two papers (I and II), potential confounding was controlled for during analysis using multivariable regression models.

Clustering

In some types of observational studies, observations are collected from naturally occurring groups, such as neighbourhoods, which makes observations related or clustered [171]. In the surveys in this study (I and II), individual males were from

households within selected census enumeration areas. Statistical models assume independence of observations. However, where such assumption is violated, adjustments can be made so as to estimate more appropriate standard errors, and thus confidence intervals and corresponding p-values [171]. In the analyses, clustering was therefore handled at the level of enumeration areas so as to provide robust standard errors for all the estimated coefficients.

External Validity

External validity is the degree to which results of a study may apply, be generalized, or be transported to populations that did not participate in the study [158]. The results in papers I and II can be extrapolated to the adult male population in Uganda because both surveys had nationally representative samples with high response rates [12, 13]. These studies relate better to the general population than many randomised controlled trials. Indeed, the socio-demographic characteristics of the weighted sample of men for both papers I and II were similar to the national demographic profile of Uganda.

Further ethical considerations in the AIDS indicator surveys

There were high response rates in the two surveys, similar to rates in other surveys conducted by the Uganda Bureau of Statistics, which is mandated by an act of Parliament in Uganda to collect official statistics. Although the Ministry of Health that conducted the surveys does not necessarily hold the same power, being a government entity that people are well aware of may have compelled some to participate in the surveys. Some people may fear that their refusal to participate may be associated with jeopardising government programmes to plan for better health services. The informed consent form that was read to the respondents before the start of the household and individual interviews, and before sample collection, may have minimised this problem. However, it still needs mention. In fact, one of the statements in the consent form reads in part: “The government would like to know how common HIV and syphilis are in the country so that they can plan for better services for people affected or infected with HIV and syphilis.” While this is true, it

could persuade participation especially if households or individuals know that they are directly affected by HIV.

Another reason for the high response rates in these surveys could be because there were direct health services offered by the field teams to the consenting respondents. In the 2004 survey, the respondents that wanted to know their HIV status were given a voucher for a free voluntary counselling and testing visit at a nearby health facility or an outreach point established by the survey project. In 2011, real time HIV test results as well as counselling services were provided for respondents, in addition to obtaining CD4 results at a nearby health facility six weeks after the interview. These health services that were brought closer to the people; at home or at outreach points could have enticed many to participate. Even though the consent form read, in part: "You may not benefit directly from being part of the study," such services are clear direct health benefits that may attract people who may not have had them ever brought this close before.

6.1.3. Qualitative sub study

The sub study forming the basis of papers III and IV used a qualitative descriptive approach [140, 141]. Lambert and colleagues (2012) portray this as an approach that has 'no prior commitment to any one theoretical view of a target phenomenon, unlike other qualitative approaches like grounded theory, which may be overloaded by pre-existing theoretical obligations' [141]. Sandelowski (2000) describes qualitative description as "a method that researchers can claim unashamedly without resorting to methodological acrobatics" [140]. The qualitative descriptive approach often 'draws from the naturalistic inquiry that commits to studying participants or things as much as possible in their natural state within the context of the research arena.' Both Lambert and Sandelowski note however, that although qualitative descriptive studies are different from the other qualitative research designs, they may have some of the overtones of the other approaches [140, 141]. The qualitative description in this thesis

has phenomenological overtones. Phenomenology is the study of phenomena as they are experienced through consciousness [172]. Although the qualitative sub-study in this thesis is a description of lived experiences of men undergoing circumcision, it is not pure phenomenology in itself. The interpretation of the findings in this study is likely to result in easy consensus because I stayed close to the data [140].

A qualitative descriptive design was considered best because it enabled me to have an understanding of the experiences of adult men in their own social context as described in the findings chapter and papers III and IV. Sandelowski (2000) notes that although it is less interpretive than for example phenomenology, it is not a mere description. In a qualitative description, the researcher seeks to have an accurate meaning that participants attach to particular events that they would also agree to (interpretive validity). One needs to stay closer to the data than in for example grounded theory or pure phenomenological designs [140]. I sought to understand what influenced adult sexually active men already in stable relationships to come for safe male circumcision at the particular period they did, their experience of the actual circumcision procedure, the healing and the post healing periods. I also explored how they behaved and what influenced their sexual behaviours. I present the findings in a way that is as close to their original accounts as possible, but provide some interpretation in the discussion sections of the papers, III and IV. The assumption was that these men have more information than the other men who have not sought circumcision, but who could potentially have answered some of the general questions in this study. Naturally, people experiencing a phenomenon of interest may seek more information about it and may also be influenced by what is going on around the community or wider society about the same.

Trustworthiness

Validity and reliability

In the context of qualitative research, validity reflects the “truth” of the findings [172]. Validity can be improved through obtaining thick description, which provides an opportunity to see replication [173, 174]. It also concerns the attention to the quality of analysis and the actual techniques to aid the credibility of interpretation.

In the methods chapter of this thesis, I describe the context from which the data were collected to give the study situational validity. As Chenail (1995) argues, "without the setting, there can be no context and with no context for the data, there can be no significant meaning in the analysis" [175]. The description provides a sense of where the data "once lived." Given the cosmopolitan nature of Wakiso district, I aimed to consider the varied cultures and backgrounds to present the diverse experiences that may be shaped by such attributes.

Participants were recruited through the health facilities when they came for circumcision. Although this was the most efficient way to recruit newly circumcised men with fresh experiences, it could have posed some limitations. It may have biased the way participants answered service related questions such as receipt of health education, with concerns about confidentiality of their answers. Further, it is worth noting that nearly all the men received circumcision as a free service at the public facilities, and the baseline interviews were carried out soon after receiving these services. The discussions about health education for some may have been biased towards reporting positive experiences. I note this from interviews where the participants seemed to defend the fact that they had not received health education. A participant reported for example that the health worker could have rightly assumed that he (participant) was knowledgeable about expected post circumcision behaviour since he was voluntarily seeking the service. Such men could have had lower expectations given that these were free services. It is also possible that they did not expect high quality service from public facilities in general. In fact, some men who received perceived "good care" expressed their surprise to the "exceptional" treatment accorded to them in a public facility without paying for services; something they did not experience when seeking regular health services. However, I expect that the thorough informed consent process and in-depth interviewing minimised such potential biases.

During the interviews, the research assistants and I tried to put aside the personal knowledge about male circumcision, and the recommended behaviours/ practices during the healing period and after healing [176]. In doing this, the participants' perspectives obtained were not "contaminated" with the interviewers' knowledge of the "truth" or what is "right". However, some men asked questions to the interviewer regarding the beliefs they shared with us in trying to seek for the truth. Ethically, I felt obliged to convey the correct messages when for instance some men reported that they were considering to engage in sexual risk behaviour during the healing period or after due to their own or social beliefs surrounding circumcision. This may have influenced the ensuing discussion in the follow up interviews. Worth noting, however, is that some men still shared their sexual risk-taking behaviours in the follow-up interviews even though they had received detailed information to correct the myths leading to such behaviours. For example, a few of them still informed the interviewer that they had the first post circumcision sex with someone other than their main sexual partner.

I also brought in various perspectives during the research process to further build on the credibility of the research. Credibility is the equivalent of internal validity in quantitative research [174]. During data collection, I engaged two research assistants instead of interviewing all the participants myself. Chilisa [174] contends that triangulation of investigators is one of the ways of enhancing credibility. It assumes that the team members bring diversity and help investigate the phenomenon from varied perspectives [174]. Involving two research assistants ensured that we discussed the initial interviews and were able to enhance the quality of follow up questions in the proceeding interviews. Both of the interviewers were university graduates, married, aged 30 and 41 years, and fluent in Luganda (main language of the setting). One of them also originated from a different region of the country although he was resident in the district. His involvement could have been reassuring to the participants originating from his region while I, being bilingual (speaking two local dialects) was also able to connect easily with participants from two other

regions of the country. The interviewers were also relatively new to the field of male circumcision while I had the experience from being involved in such studies before.

I also enhanced the credibility by referring to the transcripts in the first phase of data collection when the follow up interviews were conducted to establish consistency or identify discrepancies in the discussions of participants. Study credibility can be threatened by participants adjusting to social desirability or deliberately giving false information [174]. The follow up interviews and phone calls to participants in between the baseline and follow up ensured some prolonged engagement with them and thus enhanced rapport that one would probably miss in single point interviews. The follow up process ensured that both researchers and participants were connected. Participants were therefore probably able to share sensitive information about their sexual behaviour, irrespective of whether it was socially desirable, as well as other practices during the healing period. They possibly would not have shared such information in a brief cross-sectional survey interview.

Further, during the data analysis I coded part of the transcripts with two other PhD candidates at the University of Bergen. These were "outsiders" (one Ghanaian and another Norwegian) who were open to what appeared as "normal" behaviour in my own context, and challenged the common-sense accounts of what transpired in the transcripts. Having an outsider and an indigenous researcher in the data analysis can enhance the credibility of the study [159, 174]. I also participated in coding data for the two candidates, which encouraged a more imaginative approach to code my own data. In the analysis process, my four supervisors from different contexts (Norway, United Kingdom and Uganda) as well as fields (psychology, epidemiology, biostatistics, health promotion) also contributed different perspectives in reviewing the coding framework and/ or the interpretation of the data. This ensured that the assumptions I brought to my data were not closed off from other perspectives of inquiry.

However, to preserve data quality, even though I involved two research assistants in the interview process, I personally transcribed all the 48 audio-recorded interviews. This ensured that I listened to every minute of each interview. This helped to improve the probing after the first few interviews and also eased the coding process because I had the insight of every interview. Because nearly all interviews needed to be translated, doing this personally ensured that all accounts were transcribed verbatim. I also had daily debriefing sessions [177] with the two research assistants throughout the data collection weeks that widened our vision and improved the probing process. This was especially helpful in the initial stages of data collection.

Transferability and Conceptual generalisability

Transferability means the extension of conceptual findings to other settings. The key question to ask is to what extent the findings are transferable to other locations, or what is likely to be relevant in situations elsewhere [159, 172]. It is the equivalent of external validity in quantitative research [174]. One of the ways to ensure trust in qualitative studies is the exposition of methods to enable other researchers to possibly replicate the study in another setting. In the methods chapter as well as in the papers (III and IV) I provide a detailed description of the site, the characteristics of the participants and the procedures used to collect the data. I sampled participants who were married and sexually active. Like in any other qualitative design, the goal in the qualitative descriptive approach is to obtain participants that are expected to have rich information regarding the phenomenon of interest [141]. The selected men were expected to share their experiences of sexual behaviour before and after circumcision [174]. I also refer to other studies for comparison of my own findings, and indeed some findings from this study are comparable to those in other countries in sub-Saharan Africa. In addition, I provide thick descriptions where possible from the accounts of the participants, and as Chilisa asserts, thus the research participants should be able to ‘see themselves’ in the descriptions [174].

Conceptual generalisability refers to how far the findings from a study can help in understanding the situations happening elsewhere in similar settings [172]. The qualitative sub study was conducted with only 25 married men, although with varied characteristics. They all stayed in Wakiso district located in central Uganda, which has a very cosmopolitan population due to its proximity to the country's capital city, and is the most densely populated district in Uganda according to the 2014 National census [32]. This is a unique district, but because of the varied cultural backgrounds, I believe that the views from the men may be transferrable to other parts of the country and maybe even to other settings in sub Saharan Africa. The specific beliefs about circumcision, the particular sexual behaviours that are linked with the practice, and the misconceptions that the men in this study have, may not necessarily be similar in other districts. i.e. we need to be cognisant of the fact that like all qualitative studies, this study is not representative of the Ugandan population. However, the finding that there are harmful beliefs about circumcision, which could affect the SMC programme may be generalizable.

Reflexivity

The principle of reflexivity means that the researchers should be conscious about their own position in the research process right from designing the tools, data collection and interpretation of the findings [178]. There is need to identify preconceived opinions or beliefs about the phenomenon being researched or the participants, which may influence what is asked, heard and/or reported [179]. The truth-value of the research is affected by the closeness of the researcher and participants that builds over the prolonged interactions [174]. It is impossible to have a study that is not tainted by values, and where the researcher stands outside these values and subjectivities. Reflexivity is one way of taking subjectivity seriously while still producing useful accounts [172]. It helps one present the personal biases plainly to enhance the credibility of the findings [180] and create authenticity in the research process [178]. The effects of personal demographics such as sex, age, and

professional status, and the potential gap between the researcher and participants also need to be discussed [148]. I kept a reflexive periodical during the data collection phase to be able to provide an account of my own beliefs and thoughts about this study. Below is the reflection.

Reflecting on my role in generating and analysing the data, there are several considerations that may have shaped the data. Firstly, we had an advantage of being seen as part of the community when we introduced ourselves as residents of the district even though it is diverse. Secondly, we were interviewing fellow men, which probably helped in opening up to sensitive issues especially concerning sexual behaviour without the feeling of embarrassment or perceived judgement. Thirdly, our social status relative to most participants could have been seen as of a higher tier given our institutional base (of the university setting and seemingly close to the health providers that command a certain kind of respect in the community). We thus had a “double face” as “native professionals”. Mentioning that I was from the School of Public health, although a social scientist, could have made participants perceive me as being a health worker and thus as someone who had more knowledge about the subject of circumcision than they had. This may have influenced their response to some questions. Fourthly, my own positive attitude towards circumcision based on the knowledge of its population level protective effect could have affected the way I phrased questions. Without knowing, the research assistants could have been biased by my own attitudes as well.

As indicated above, recruitment was through the health workers who also happened to have been involved in the circumcision process of the men. The health workers requested if the men would be interested in participating in a study of this kind. Health workers are generally well respected in the communities and this could have contributed to universal participation in the study. When we approached the individual men, we explained that we wanted to listen to their own personal experiences in their own perspective, and opinions from their social networks. We explained our purely research relationship with the health workers and that the

information obtained was primarily for research purposes. I believe this increased participants' confidence and made them open up during the interviews.

I noticed that participants were closer to us in the follow-up interviews. Due to the telephone conversations that I held with them between the baseline and last interview, they expressed their gratitude for the care that I offered after they were circumcised. Because we also at times made long trips to the homes of some participants for the follow up, we seemed to be "caring" about their post-operative condition. It was probably hard in this context to distinguish us from the health service they had received, even after repeated emphasis of our independence. Often the first question I asked during the phone calls in the follow up period was whether the individual had healed well. This is the ideal polite and acceptable introduction according to the social norms of the study area that I could not avoid. However, it may have indeed "confirmed" to some participants that I was a caring "musawo" (health worker) even with all the explanations.

Further ethical considerations in the qualitative sub study

Although we were native researchers, there were issues that arose during the data collection process about which decisions had to be made. I was aware of varied cultures of the men in the study given the varied cultural backgrounds they had. I urged my research assistants to be sensitive and avoid judgement but still provide advice (or refer to me) when some men asked for opinions or shared their misperceptions about sexual practices following circumcision. Some of the sensitive issues addressed were the beliefs that several men had heard or believed in about post circumcision sexual practices. Some men in the baseline interviews indicated that they were worried while others clearly noted that they would adhere to the beliefs urging them to have first sexual intercourse with a one-off partner to avoid the "curse" upon their main sexual partner. My research assistants and I did not remain neutral observers in such cases and had to alley these fears after the interviews even though I knew it could influence the discussion in the follow up interviews. Ethically

I felt obliged to sensitise these men against engaging in dangerous sexual practices that would put their lives as well as those of their partners in danger. My two research assistants were also well equipped to encourage these men to seek further advice from the health workers, referred them to me or provided the right answers where they could.

As Shenton suggests, one of the tactics to improve honesty among participants is to ensure that each person approached is given opportunities to refuse to participate in the study [177]. In emphasising this, I ensured that data collection involved only those who were genuinely willing and prepared to share their personal experiences freely both at baseline and follow-up. Men were encouraged to be frank from the outset of each of the two interviews, establishing rapport right from the start.

6.2. Discussion of the results

In this section, I discuss the main results and findings from the sub studies integrated. In the quantitative sub studies, circumcised men reported a higher prevalence of sexual risk behaviours than the uncircumcised. I also found higher levels of willingness to be circumcised among uncircumcised men who reported sexual risk behaviours. In the qualitative sub study, female sexual partners influenced most of the decisions to seek SMC. At the health facilities, health education mainly focused on the immediate problems of the surgical procedure and wound care, and there was little discussion of the men's beliefs regarding post circumcision sexual behaviour. I found that men were knowledgeable about the fact that circumcision is only partially protective against HIV, but the interviews also revealed possible underlying explanations for the post circumcision protective and sexual risk behaviours in a programme setting.

What emerges from the combined sub-studies is that there seemed to be minimal behavioural risk compensation among the circumcised men. Even though circumcised men reported higher levels of sexual risk in the quantitative studies, there were no

changes over time in this category between the period before and after the national scale up of the SMC programme, except for a reduction in condom use with their non-marital partners. This was the first study to make such a comparison in Uganda. The finding of higher willingness to be circumcised among uncircumcised men who reported sexual risk behaviours could imply that those in need of SMC realised this themselves. Similar findings have been reported in a recent study in Rakai Uganda [181]. The sexual risk behaviours found among the newly circumcised men in the qualitative sub study mostly relate to a couple of misleading beliefs. The detrimental sexual behaviour only seemed to occur in the immediate short-term phase after circumcision to fulfil the expectations from the belief regarding appropriate first time post-circumcision sex. These behaviours seemed to be well reasoned out and planned, sometimes even prior to circumcision in fear of the perceived "disastrous" consequences to the men and their partners, such as, ensuing partner promiscuity and health problems. It emerged, thus, that in trying to protect their main partners, some men adhered to the misconception to have first post-circumcision sex with someone other than their wife/stable partner. This is a manifestation of how the internal individual elements, the inner collective/ society factors and the outer individual elements of the quadrants of the integral framework used in this study are linked.

Higher sexual risk behaviour among the circumcised than uncircumcised men

In paper I, there was lower use of condoms with the last non-marital sexual partner among circumcised men reporting non-marital sex in the 2011 survey compared with the 2004 survey. There are possible explanations: (a) This may not necessarily be a reflection of a reduction after circumcision, but may indicate that the men circumcised between 2005 and 2011 were higher risk takers; (b) Although causality cannot be assessed in this study, it could also be related to behavioural risk compensation since there were higher levels of awareness in the country in 2011 about the protective effect of circumcision against HIV infection. The impression is further strengthened by the fact that the lower use of condoms was not found among

uncircumcised men. This poses a concern to the implementation of the SMC programme in Uganda. It is well known that condoms are far more effective against heterosexual HIV transmission [88, 182] than male circumcision alone, if correctly and consistently used. If lower rates of condom use were indeed a result of perceived protection from circumcision, this is dangerous and could affect the beneficial effect of circumcision against HIV infection, even with its reported high efficacy levels [99, 183]. Inconsistent condom use, especially with high risk partners in multiple sexual relationships may increase the risk of HIV transmission. Among young men in a study in Eastern Uganda, erratic use of condoms after circumcision was associated with increased risk of HIV infection [184].

The results show that, although circumcised men reported a higher prevalence of multiple sexual partners in both 2004 and 2011 than the uncircumcised, the differences between the two periods were not statistically significant within each category of circumcision status. This indicates there was no clear evidence of behavioural risk compensation specifically regarding increased sexual partners as a result of the SMC campaign then. Cohort studies [110, 181] in Rakai, Uganda also did not show risk compensation. However, although the current study did not estimate concurrency, it is known as one of the main drivers for heterosexual HIV infection in Africa [9, 185, 186]. If indeed these relationships overlap, coupled with non-use of condoms, this heightens the risk of HIV in case one or more of the partners in the sexual network is infected [187, 188].

The results in paper I offered further support to the already known evidence that circumcision offers partial protection against HIV infection [41, 44-46]. The prevalence of HIV was significantly lower among the circumcised than the uncircumcised in both the 2004 and 2011 surveys, even when circumcised men reported a slightly higher frequency of sexual risk behaviours.

Sexual risk behaviour of men and willingness to be circumcised

In paper II, there was a higher likelihood of willingness to be circumcised among

men who reported sex with multiple partners and transactional sex, as well as among those reporting sex with a non-marital partner. Also, men who did not use a condom during the last non-marital sex in the preceding 12 months were most likely to report willingness to be circumcised. In the quantitative studies conducted around the same period in Zimbabwe [127] and Botswana [128], willingness to be circumcised was also associated with more sexual risk behaviours. Men who engaged in sexual risk behaviours may have perceived circumcision as protection from the risk of HIV, which is also the main driver of circumcision decisions reported in the qualitative sub study (III). In contrast with the quantitative sub study, most of the participants in the qualitative sub study did not report engaging in sexual risk behaviour in the period before they came for circumcision. Most reported only one stable sexual partner and no casual partners. There are some possible explanations for this: (a) Because I included only married men in the qualitative longitudinal study, many sexually active unmarried high risk young men may have been excluded in the process. (b) There could also be a positive effect of social marketing that emphasises partial protection, a concept that may not have been very clear to the population in the early phase of the SMC programme in 2011 (II) compared to 2015 (III). These elements in the lower right quadrant of the conceptual framework may require some time to have an impact on the target population, whose interaction with the social marketing messages is influenced by individual and society beliefs and values.

The key drivers for circumcision decisions

The leading drivers of circumcision decisions in the qualitative sub study (III) were, a reduction of the risk of HIV infection and the influence of female sexual partners. The risk reduction for HIV was not a surprising influence because SMC social marketing rotates around this central reason. Female sexual partners had both direct and indirect ways that they used to influence men to seek SMC. It is not common in patriarchal societies to have women influencing final decision making for men's health, but similar influence for circumcision has also been reported in Zambia [79, 130, 132], Kenya [189], Tanzania [81], Botswana [135] and in a recent study in

Uganda published after paper III [190]. This may be one of the few areas of men's life where female partners seem to have direct influence on men's decision making. In the context of the conceptual framework in this study, the sexual partners of the men are part of the lower left quadrant ("WE") and their influence drives men's motivations in the upper left quadrant to seek circumcision. This further shows the importance of addressing the whole for successful implementation of the SMC intervention. Continued involvement of women in SMC could come with several reproductive health benefits such as enhancing adherence to sexual behaviour change recommendations and avoiding risk compensation [79], jointly tackling sexual related myths and enhancing access to couple counselling and testing for HIV prevention [191]. Sexual health is pertinent to men, and in this study, they believed that circumcision would enhance sexual performance, further confirming that circumcision decisions are beyond the inner individual quadrant of the framework. Circumcised men in other settings have reported better sexual satisfaction after SMC [116]. Participants in the current study also believed that women preferred circumcised men when making choices for sexual partners, and indeed some women have reported this preference in other studies before [131, 189, 192] or actual better satisfaction [193]. For the men in this study, I note that their perception of enhanced sexual performance and partner preference may have been shaped by the SMC social marketing campaigns in Uganda that have apparently successfully used women as key players in attracting men to circumcise [63, 194, 195]. Another important factor in the decision to seek circumcision in this study was the timing. This was mainly in relation to presence or absence of men's sexual partners or physiological conditions such as the postnatal period, when the spouse was not expected to desire sexual pleasure. The intention was to ensure successful coping during the healing phase. This is one aspect that may not have been fully understood in the implementation of the SMC programme, but which is a display of the innovative ways that could be tapped into to improve adherence to the recommended healing period of at least six weeks. The linkages between the elements in the "WE" and "I" quadrants of the integral framework are evident in such a scenario.

Understanding of partial protection for HIV

The sexual risk behaviour reported among circumcised men in paper I could have reflected that at the time, the circumcised men had not fully understood the concept of partial risk reduction for HIV, leading to a misguided sense of sexual freedom [119]. This explanation is based on the fact that these were the early stages of the SMC campaign in Uganda. However, in the qualitative sub study (III), all the participants had knowledge that circumcision only offered partial protection from HIV. Such knowledge was also reported in a quantitative study in Rakai, Uganda [196], and in a qualitative study in Kisumu, Kenya [197]. Both studies were conducted in the clinical trial areas during the scale up phase. For the current study (paper III), it is encouraging for the SMC campaign that many targeted men seem to appreciate the partial protection. However, due to the variation in sources of the information which included health education at facilities, social marketing messages on radio and TV, peers and circumcised friends, there were some misconceptions reported as well in this study. There was a perception that circumcision also reduced the risk of HIV transmission from men to women directly and, absolutely protected them from other 'minor' STIs. Both misunderstandings have been reported in a study among women in Zambia [79], while the latter has also been found in another recent qualitative study in Uganda [121]. These could be due to misunderstanding of information from formal sources or they could be obtained from less reliable informal sources within communities.

Beliefs influencing post circumcision sexual behaviour and the role of health education

In paper IV, there were some beliefs around circumcision that may have led to sexual risk behaviour among men and which could propel the HIV transmission risk post SMC. For example, all men in the study reported a belief that the initial sexual intercourse post circumcision was for cleansing. Some young men in the study had one off sex without use of condoms with casual partners adhering to this belief,

which may increase the risk of HIV infection. This behaviour has also been highlighted in other places in Uganda [78, 121, 198-200] and outside [122]. Another reported belief was that vaginal fluids accelerate wound healing as also indicated in a study among fishing communities in Uganda [121], although I did not find any man adhering to this. This however, should not be ignored because there may be men in the general population abiding by such a detrimental belief and this could increase their risk of HIV infection after circumcision, in lieu of reducing it.

Health education at the health facilities or outreach circumcision points should ideally present an opportunity for health workers to counter negative beliefs that are potentially detrimental to the success of the SMC programme and the fight against HIV. However, it is worrying to note that men reported that these beliefs were not addressed during the health education (III). It is possible that health workers underestimate the prevalence of these misconceptions in the communities and therefore do not include them in health education. While the WHO recommends comprehensive pre SMC health education and counselling and presents circumcision as an entry point to offer reproductive health services for men among others [31], there seemed to be gaps in following this for many of the men in this study. Client counselling gaps at some facilities in Uganda were also reported in 2013 [201]. However, even the WHO health education and counselling guidelines seem to miss out on addressing any existing contextual and cultural beliefs that may affect men's sexual behaviour post circumcision in the different programme countries. Failure to deal with these myths and beliefs could mean that the "I" and the "WE" quadrants of the integral framework [123] are ignored and continue to influence behaviours in the "IT" quadrant.

The study findings reveal marked differences in the reported health education that was received at the health facilities which had fulltime support of the implementing partner. Men that were circumcised at such facilities where there were dedicated health workers specifically to handle SMC, reported to have received more detailed health education and additional reproductive health services like HIV testing and

counselling. But, there were still gaps as noted above. Some men circumcised at facilities that did not have dedicated health workers for SMC services, reported no health education at all. It is most likely that the quality of health education at the public health facilities is affected by the several competing services that need to be provided to other clients, which may overwhelm the limited number of health workers. The Uganda AIDS Commission in its 2015 report acknowledges the challenges of heavy workload for the few staff that limits attention to labour intensive procedures like SMC [15]. Comprehensive health education can create potential behaviour change agents, with a cohort of knowledgeable circumcised men who may educate their peers and positively influence post SMC sexual behaviour. From the evidence in this study, this is currently a missed opportunity at least in the study area.

There were also men who reported sexual intercourse before the recommended abstinence period as a result of probably a misunderstanding of what comprised complete wound healing. Such sex increases chances of HIV infection [184] with the risk to women much higher than among those with an uncircumcised partner [53]. Such non-adherence by circumcised men to the recommended healing period has also been reported in other studies [106, 120, 202-204]. Even though the healing period was emphasised for all men that received health education, it is possible that the timing of health education could make a difference. Conducting further health education after the operation or during the follow up visit can possibly be helpful in attracting the complete attention of the client since there would be no anxiety from any pending surgery. Further understanding of reasons why such sex may happen, such as the fear of partner infidelity during the healing period [131] implicitly expressed in this study also can be addressed in health education and in the general SMC social marketing messages. However, with challenges of limited staffing and poor follow-up where several clients do not return for review especially if SMC accredited facility is far [15], or have no observable complications [190], this problem may continue to prevail.

The study findings also revealed beliefs related to circumcision that were protective. The men in the qualitative sub-study (IV) believed that there was a continued risk of HIV transmission after SMC. Indeed, most of them maintained safe sexual behaviour. This protective belief could also have counteracted the potential sexual experimentation [119] that one would have expected to result from the belief that circumcision offered better sexual stimulation for women. The behaviour reported in the qualitative study is in contrast with the higher sexual risk behaviours among the circumcised men that I found in the quantitative sub study (I). It should be noted however, that the men in the quantitative sub study were circumcised under varied conditions; cultural, religious and medical circumcision, and most were circumcised long before the SMC programme started. The latter thus did not have any health education in relation to HIV risk and circumcision. This could explain the observed sexual risk behaviour. Although the qualitative study cannot be generalised to the entire population, this finding of continued safer sexual behaviour should be encouraging for the implementers of the SMC programme. There seemed to be no behavioural risk compensation per se. Further, health education, if well conducted, can influence positive behaviour change after circumcision. Some of the men in the study attributed their positive decisions to the awareness from pre-circumcision health education and SMC public campaigns that include partial protection messages. Perhaps, these can be improved further by delivering messages in packages that are easily appreciated by men of different demographic backgrounds (younger, older, different cultures, etc.).

The role of informal sources of information for men that influence their decisions to seek circumcision and their post circumcision sexual behaviour was marked. Sexual partners of men, friends and other community members of varied characteristics play a role in the diffusion of beliefs. I also noted that men who had gone through the circumcision experience were often consulted for advice before and soon after circumcision [190]. It did not matter whether these had medically, culturally or religiously been circumcised. This is yet another example of the relationship where elements in the “WE” quadrant of the integral framework influence the motivation to

seek circumcision (in the “I” quadrant). It is possible that in the usual programme implementation, some of these elements in the “WE” quadrant such as informal sources may not be given due attention, downplaying their role. It is possible to assume that the main source of information is the formal social marketing from the media, health facilities and other planned sources (the “ITS” quadrant) laid out in the programme planning documents, but this study showed that the sources of information are more complex. There is limited control over what kind of information such sources provide and thus targeting them through the general population messages may be vital. Although risk compensation was not evident in this study, the existence of a couple of risky beliefs (the “I” and “WE” quadrants of the framework) that seemed to influence sexual behaviour (the “IT” quadrant of the framework) is worth noting for the SMC programmers (the “ITS” quadrant). These may be infiltrating the communities uncontrolled.

7. Conclusions

- Sexual risk behaviours, including non-use of condoms with non-marital partners were more common in the circumcised relative to the uncircumcised men before and after scale-up of the SMC policy in Uganda (I).

- There was no clear evidence of behavioural risk compensation among circumcised men in this study (I).

- Irrespective of the higher sexual risk behaviours among circumcised men, the HIV prevalence was significantly lower in the circumcised compared to the uncircumcised in both surveys (I).

- Willingness to uptake circumcision was significantly higher among men with higher sexual risk behaviours, suggesting that the early adopters of SMC were likely to be those in particular need of this additional HIV protective measure. (II).

- There was a positive perception about the national SMC campaigns, which influenced men to seek services and enabled female partners to impact on the men's circumcision decision-making process (III).

- The main focus of health education seemed to be on the immediate concerns of the surgery and healing, at the expense of desired post circumcision safer sexual behaviour (III). There were several cases of sexual risk behaviour, resulting from an existing belief about post circumcision sex or misunderstanding of what comprised full wound healing. All these seem to be rational behaviours guided by well evaluated decisions that are partly due to lack of correct and comprehensive information. The detrimental cultural or society beliefs influencing these decisions were unfortunately not addressed in the standard counselling/ health education sessions preceding SMC and are not included in messages to the general

population during SMC promotion (IV).

- Most men followed up in the qualitative study maintained or adopted safer sexual behaviour after circumcision, following knowledge that there was continued risk of HIV transmission (IV).

8. Recommendations

8.1. Possible implications for programmes and policy

- Considering the high level of sexual risk behaviour among potential early adopters and the many sources of information responsible for driving circumcision decisions, all health facilities need to follow standard health education and counselling procedures for all men prior and after circumcision. If these are followed, clients will be well informed, especially about post SMC sexual behaviour that is key to reduction of risky behaviours.

- The SMC materials that are disseminated to the general public should include the beliefs that could lead to sexual risk behaviours. This should also be a mainstay of the routine sensitisation to SMC clients at the health facilities. The SMC campaign information relating to behaviour change/ maintenance needs to target not only potential clients by also their partners and the general public.

- The health facilities could tap into the wealth of experienced, medically-circumcised men that have had prior counselling and health education to encourage newly circumcised men to abide by the recommended sexual behaviour post circumcision and correct detrimental beliefs. Key human resources at many public health facilities are already overstretched by large numbers of clients for multiple health needs. Some men may also fear to be 'judged' if they asked questions about the 'planned' risky behaviour, such as cleansing sex, to female health workers. In cases like these, they may opt for other sources for clarification; usually fellow men as was the case in this study.

- Voluntary involvement of partners in the health education and counselling for the married men seeking circumcision may help in minimising sexual risk-taking behaviours post SMC. This is especially where some partners play a role in influencing men to avoid or to have first sexual intercourse with another person after circumcision or to have sex before complete wound healing. If both circumcised men and their partners have comprehensive knowledge, they are more likely to have no fear for perceived consequences of non-adherence to detrimental beliefs.

8.2. Research recommendations

- More high-quality cohort studies in programme settings away from clinical trial areas will yield more information on whether there is behaviour risk compensation after circumcision.

- Including the date when a man was circumcised and the reason for circumcision, in the national AIDS indicator surveys and demographic and health surveys that have questions about circumcision will improve the exploration of sexual behaviours of men circumcised under the national programme versus those who are culturally and/ or religiously circumcised. In addition, where possible, but mindful of how loaded these national survey questionnaires are, including questions on some of the key misconceptions identified in this study to gauge how widespread these are may be important for implementers of the SMC programme.

- More qualitative research that includes the female partners of the circumcision clients may yield diverging findings regarding the sexual behaviour of men and the partners during and after the healing period. It could also yield deeper understanding of other sexual beliefs around circumcision that may be important for programme improvement. Women may informally receive some information about SMC while seeking ‘female’ specific reproductive health services.

Exploring partners' perspectives on male circumcision may also help establish better ways of involving them in the process to further maintain or adopt safer sexual behaviours, or prevent sexual risk taking.

- More research in evaluating the quality of health education and counselling offered prior to SMC at the health facilities is needed. This would entail using different methods such as simulated clients to attend sessions and observe what is actually provided/ discussed. In this study, I relied on what the clients reported to establish whether they were counselled or offered health education and what kind of information they received. This may be subject to biases, as I openly note in the limitations.

9. References

1. UNAIDS, Prevention gap report. 2016, *Joint United Nations Programme on HIV/AIDS*: Geneva, Switzerland.
2. UNAIDS, Fact Sheet 2016. 2016, *Joint United Nations Programme on HIV/AIDS*: Geneva, Switzerland.
3. UNAIDS, Global AIDS update. 2016, *Joint United Nations Programme on HIV/AIDS*: Geneva, Switzerland.
4. UNAIDS, Practical Guidelines for Intensifying HIV Prevention: Towards Universal Access. 2007, *Joint United Nations Programme on HIV/AIDS*: Geneva, Switzerland.
5. UNAIDS, The Gap Report. 2014, *Joint United Nations Programme on HIV/AIDS*: Geneva, Switzerland.
6. UNAIDS, 2016-2021 Strategy: On the Fast-Track to end AIDS. 2016, *Joint United Nations Programme on HIV/AIDS*: Geneva, Switzerland.
7. Serwadda, D., Mugerwa, R.D., Sewankambo, N.K., Lwegaba, A., Carswell, J.W., Kirya, G.B., Bayley, A.C., Downing, R.G., Tedder, R.S., Clayden, S.A., and et al., Slim disease: a new disease in Uganda and its association with HTLV-III infection. *Lancet*, 1985. **2**(8460): p. 849-52.
8. Okware, S.I., Towards a national AIDS-control program in Uganda. *West J Med*, 1987. **147**(6): p. 726-9.
9. Wabwire-Mangen, F., Odiit, M., Kirungi, W., Kaweesa, K., D., and Wanyama, O., J., Uganda HIV Prevention Response and Modes of Transmission Analysis. 2009, *Uganda AIDS Commission, UNAIDS*: Kampala.
10. Government of Uganda. Ministry of Health, Health Sector Development Plan 2015/16 - 2019/20. 2015, *Ministry of Health*: Kampala.
11. U.S. President's Emergency Plan for AIDS Relief, PEPFAR 2016 Annual Report to Congress. 2016, *U.S. Department of State*: Washington, D.C.
12. Ministry of Health and ICF International, Uganda AIDS Indicator Survey 2011. 2012, *MOH and ICF International*: Kampala, Uganda and Calverton Maryland, USA.
13. Ministry of Health and ORC Macro, Uganda HIV/AIDS Sero-behavioural Survey 2004-2005. 2006, *MOH and ORC Macro*: Calverton, Maryland, USA.
14. STD/AIDS Control Programme, The Status of the HIV/AIDS Epidemic in Uganda. The HIV/AIDS Epidemiological Surveillance Report 2010. 2010, *Ministry of Health Uganda*: Kampala.
15. Uganda AIDS Commission, The HIV and AIDS Uganda progress report 2014. 2015, *UAC*: Kampala.
16. U.S. President's Emergency Plan for AIDS Relief, PEPFAR 2017 Annual Report to Congress. 2017, *U.S. Department of State*: Washington, D.C.
17. Uganda AIDS Commission, National HIV and AIDS Strategic Plan 2015/2016-2019/2020, An AIDS free Uganda, My responsibility! 2015, *UAC, Republic of Uganda*: Kampala.
18. Ministry of Health, Consolidated guidelines for prevention and treatment of HIV in Uganda. 2016, *MOH*: Kampala.
19. Bekker, L.G., Beyrer, C., and Quinn, T.C., Behavioral and biomedical combination strategies for HIV prevention. *Cold Spring Harb Perspect Med*, 2012. **2**(8).

20. Uganda AIDS Commission, The Uganda HIV and AIDS country progress report: July 2015- June 2016. 2016, *UAC*: Kampala, Uganda.
21. World Health Organisation, Guidelines on when to start antiretrovial therapy and on pre-exposure prophylasxis for HIV 2015, *WHO*: Geneva, Switzerland.
22. Tanser, F., Barnighausen, T., Grapsa, E., Zaidi, J., and Newell, M.L., High coverage of ART associated with decline in risk of HIV acquisition in rural KwaZulu-Natal, South Africa. *Science*, 2013. **339**(6122): p. 966-71.
23. Stover, J., Gopalappa, C., Mahy, M., Doherty, M.C., Easterbrook, P.J., Weiler, G., and Ghys, P.D., The impact and cost of the 2013 WHO recommendations on eligibility for antiretroviral therapy. *AIDS*, 2014. **28 Suppl 2**: p. S225-30.
24. Gupta, G.R., Parkhurst, J.O., Ogden, J.A., Aggleton, P., and Mahal, A., Structural approaches to HIV prevention. *Lancet*, 2008. **372**(9640): p. 764-75.
25. The Republic of Uganda, The HIV and AIDS prevention and control act, 2014. 2014: Kampala.
26. Dunsmuir, W.D. and Gordon, E.M., The history of circumcision. *BJU International*, 1999. **83**(Suppl. 1): p. 1-12.
27. Mavhu, W., Hatzold, K., Ncube, G., Xaba, S., Madidi, N., Keatinge, J., Dhodho, E., Samkange, C.A., Tshimanga, M., Mangwiro, T., Mugurungi, O., Njeuhmeli, E., and Cowan, F.M., Safety and Acceptability of the PrePex Device When Used in Routine Male Circumcision Service Delivery During Active Surveillance in Zimbabwe. *J Acquir Immune Defic Syndr*, 2016. **72 Suppl 1**: p. S63-8.
28. World Health Organisation, WHO list of prequalified male circumcision devices. 2016, *WHO*: Geneva.
29. Morris, B.J., Wamai, R.G., Henebeng, E.B., Tobian, A.A., Klausner, J.D., Banerjee, J., and Hankins, C.A., Erratum to: Estimation of country-specific and global prevalence of male circumcision. *Popul Health Metr*, 2016. **14**: p. 11.
30. Morris, B.J., Wamai, R.G., Henebeng, E.B., Tobian, A.A., Klausner, J.D., Banerjee, J., and Hankins, C.A., Estimation of country-specific and global prevalence of male circumcision. *Popul Health Metr*, 2016. **14**: p. 4.
31. World Health Organization and United Nations Joint Programme on HIV/AIDS, Manual for male circumcision under local anaesthesia. WHO/UNAIDS/JHPIEGO, Version 3.1. 2009. 2009, *WHO, UNAIDS*: Geneva, Switzerland.
32. Uganda Bureau of Statistics, The National Population and Housing Census 2014- Main Report. 2016, *UBOS*: Kampala, Uganda.
33. UNAIDS. Male Circumcision: Context, Criteria and Culture (part 1). 2007 20/04/2017]; *Available from:* http://www.unaids.org/en/resources/presscentre/featurestories/2007/february/20070226mcpt1.
34. Sabet Sarvestani, A., Bufumbo, L., Geiger, J.D., and Sienko, K.H., Traditional male circumcision in Uganda: a qualitative focus group discussion analysis. *PLoS One*, 2012. **7**(10): p. e45316.
35. The Republic of Uganda. Ministry of Health, Safe male circumcision for HIV prevention. National communication strategy. 2010, *Ministry of Health*: Kampala, Uganda.
36. World Health Organization, Traditional male circumcision among young people : A public health perspective in the context of HIV prevention. 2009, *WHO*: Geneva, Switzerland.
37. Bailey, R., C., Neema, S., and Othieno, R., Sexual Behaviors and Other HIV Risk Factors in Circumcised and Uncircumcised Men in Uganda. *Journal of Acquired Immune Deficiency Syndromes*, 1999. **22**(3): p. 213-315.

38. Sicherman, C., Individual and community in Timothy Wangusa's Upon this mountain. *The International Fiction Review*, 1993. **20**(1).
39. Mafabi, D., Forced to face the knife, in *Daily Monitor*. 2012, *Monitor Publications Ltd*: Kampala.
40. Government of Uganda. Ministry of Health, Safe Male Circumcision Policy. 2010, *Ministry of Health*: Kampala, Uganda.
41. Siegfried, N., Muller, M., Volmink, J., Deeks, J., Egger, M., Low, N., Weiss, H., Walker, S., and Williamson, P., Male circumcision for prevention of heterosexual acquisition of HIV in men. *Cochrane Database Syst Rev*, 2003(3): p. CD003362.
42. Auvert, B., Buve, A., Ferry, B., Carael, M., Morison, L., Lagarde, E., Robinson, N.J., Kahindo, M., Chege, J., Rutenberg, N., Musonda, R., Laourou, M., and Akam, E., Ecological and individual level analysis of risk factors for HIV infection in four urban populations in sub-Saharan Africa with different levels of HIV infection. *AIDS*, 2001. **15 Suppl 4**: p. S15-30.
43. Weiss, H.A., Quigley, M.A., and Hayes, R.J., Male circumcision and risk of HIV infection in sub-Saharan Africa: a systematic review and meta-analysis. *AIDS*, 2000. **14**(15): p. 2361-70.
44. Gray, R.H., Kigozi, G., Serwadda, D., Makumbi, F., Watya, S., Nalugoda, F., Kiwanuka, N., Moulton, L.H., Chaudhary, M.A., Chen, M.Z., Sewankambo, N.K., Wabwire-Mangen, F., Bacon, M.C., Williams, C.F., Opendi, P., Reynolds, S.J., Laeyendecker, O., Quinn, T.C., and Wawer, M.J., Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. *Lancet*, 2007. **369**(9562): p. 657-66.
45. Bailey, R.C., Moses, S., Parker, C.B., Agot, K., Maclean, I., Krieger, J.N., Williams, C.F., Campbell, R.T., and Ndinya-Achola, J.O., Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomized controlled trial. *Lancet*, 2007. **369**(9562): p. 643–656.
46. Auvert, B., Taljaard, D., Lagarde, E., Sobngwi-Tambekou, J., Sitta, R., and Puren, A., Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. *PLoS Med*, 2005. **2**(11): p. e298.
47. Donoval, B.A., Landay, A.L., Moses, S., Agot, K., Ndinya-Achola, J.O., Nyagaya, E.A., MacLean, I., and Bailey, R.C., HIV-1 target cells in foreskins of African men with varying histories of sexually transmitted infections. *Am J Clin Pathol*, 2006. **125**(3): p. 386-91.
48. Kigozi, G., Wawer, M., Ssettuba, A., Kagaayi, J., Nalugoda, F., Watya, S., Mangen, F.W., Kiwanuka, N., Bacon, M.C., Lutalo, T., Serwadda, D., and Gray, R.H., Foreskin surface area and HIV acquisition in Rakai, Uganda (size matters). *AIDS*, 2009. **23**(16): p. 2209-13.
49. Auvert, B., Sobngwi-Tambekou, J., Cutler, E., Nieuwoudt, M., Lissouba, P., Puren, A., and Taljaard, D., Effect of male circumcision on the prevalence of high-risk human papillomavirus in young men: results of a randomized controlled trial conducted in Orange Farm, South Africa. *J Infect Dis*, 2009. **199**(1): p. 14-9.
50. Tobian, A.A., Serwadda, D., Quinn, T.C., Kigozi, G., Gravitt, P.E., Laeyendecker, O., Charvat, B., Ssempijja, V., Riedesel, M., Oliver, A.E., Nowak, R.G., Moulton, L.H., Chen, M.Z., Reynolds, S.J., Wawer, M.J., and Gray, R.H., Male circumcision for the prevention of HSV-2 and HPV infections and syphilis. *N Engl J Med*, 2009. **360**(13): p. 1298-309.
51. Wawer, M.J., Tobian, A.A., Kigozi, G., Kong, X., Gravitt, P.E., Serwadda, D., Nalugoda, F., Makumbi, F., Ssempijja, V., Sewankambo, N., Watya, S., Eaton, K.P.,

Oliver, A.E., Chen, M.Z., Reynolds, S.J., Quinn, T.C., and Gray, R.H., Effect of circumcision of HIV-negative men on transmission of human papillomavirus to HIV-negative women: a randomised trial in Rakai, Uganda. *Lancet*, 2011. **377**(9761): p. 209-18.
52. Nurminen, M., On the epidemiologic notion of confounding and confounder identification. *Scand J Work Environ Health*, 1997. **23**(1): p. 64-8.
53. Wawer, M.J., Makumbi, F., Kigozi, G., Serwadda, D., Watya, S., Nalugoda, F., Buwembo, D., Ssempijja, V., Kiwanuka, N., Moulton, L.H., Sewankambo, N.K., Reynolds, S.J., Quinn, T.C., Opendi, P., Iga, B., Ridzon, R., Laeyendecker, O., and Gray, R.H., Circumcision in HIV-infected men and its effect on HIV transmission to female partners in Rakai, Uganda: a randomised controlled trial. *Lancet*, 2009. **374**(9685): p. 229-37.
54. HIV/AIDS, W.H.O.a.J.U.N.P.o., New Data on Male Circumcision and HIV Prevention: Policy and Programme Implications. 2007, *WHO*: Geneva, Switzerland.
55. World Health Organisation and Joint United Nations Programme on HIV/AIDS, Joint Strategic Action Framework to Accelerate the Scale-Up of Voluntary Medical Male Circumcision for HIV Prevention in Eastern and Southern Africa 2012-2016. 2011, *WHO, UNAIDS*: Geneva, Switzerland.
56. Geldsetzer, P., Bloom, D.E., Humair, S., and Bärnighausen, T., Benefits and Costs of the HIV/AIDS Targets for the Post-2015 Development Agenda, in *Post-2015 Consensus: Health Perspective - HIV/AIDS*. 2015, *Copenhagen Consensus Center*.
57. Kripke, K., Reed, J., Hankins, C., Smiley, G., Laube, C., and Njeuhmeli, E., Impact and Cost of Scaling Up Voluntary Medical Male Circumcision for HIV Prevention in the Context of the New 90-90-90 HIV Treatment Targets. *PLoS One*, 2016. **11**(10): p. e0155734.
58. Hallett, T.B., Alsallaq, R.A., Baeten, J.M., Weiss, H., Celum, C., Gray, R., and Abu-Raddad, L., Will circumcision provide even more protection from HIV to women and men? New estimates of the population impact of circumcision interventions. *Sex Transm Infect*, 2011. **87**(2): p. 88-93.
59. Gray, R.H., Li, X., Kigozi, G., Serwadda, D., Nalugoda, F., Watya, S., Reynolds, S.J., and Wawer, M., The impact of male circumcision on HIV incidence and cost per infection prevented: a stochastic simulation model from Rakai, Uganda. *AIDS*, 2007. **21**(7): p. 845-50.
60. World Health Organization, WHO Progress Brief. Voluntary Medical Male Circumcsiion for HIV prevention in 14 priority Countries in East and Southern Africa. 2016.
61. Baguma, A., Circumcision not a greenlight for unsafe sex, in *New Vision*. 2007, *Vision Group*: Kampala.
62. Nabusoba, I., Circumcision: Are you safe?, in *New Vision*. 2006, *Vision Group*: Kampala.
63. Johns Hopkins Bloomberg School of Public Health Center for Communication Programs, The Health Communication Partnership Uganda: 2007-2012 Final Report. 2012: Kampala, Uganda.
64. Kagumire, R., Ugandan effort to constrain HIV spread hampered by systemic and cultural obstacles to male circumcision. *CMAJ*, 2008. **179**(11): p. 1119-20.
65. Wakabi, W., Uganda steps up efforts to boost male circumcision. *Lancet*, 2010. **376**(9743): p. 757-8.
66. Katisi, M. and Daniel, M., Safe male circumcision in Botswana: Tension between traditional practices and biomedical marketing. *Glob Public Health*, 2015: p. 1-18.

67. Kong, X., Kigozi, G., Ssekasanvu, J., Nalugoda, F., Nakigozi, G., Chang, L.W., Latkin, C., Serwadda, D., Wawer, M.J., and Gray, R.H., Medical male circumcision coverage in Rakai, Uganda. *AIDS*, 2017. **31**(5): p. 735-737.
68. Ruhangariyo, D., Men who circumcise are heroes, in *New Vision*. 2016: Kampala.
69. Uganda AIDS Commission, HIV and AIDS Uganda Country Progress Report 2013. 2014, *UAC*: Kampala, Uganda.
70. World Health Organization, Global update on the health sector response to HIV, 2014. 2014, *WHO*: Geneva, Switzerland
71. The Republic of Uganda. Ministry of Health, Annual Health Sector Performance Report for Financial Year 2015/16. 2016, *Ministry of Health*: Kampala.
72. The Republic of Uganda. Ministry of Health, Health Facilities Inventory July 2012: Master Health Facilities Inventory. 2012, *Ministry of Health*: Kampala, Uganda.
73. U.S. President's Emergency Plan for AIDS Relief, Uganda 2015 Country Operational Plan Strategic Direction Summary 2015, *U.S. Department of State*.
74. Nanteza, B., Galukande, M., Aceng, J., Musinguzi, J., Opio, A., Mbonye, A.K., Mukooyo, E., Behumize, P., and Makumbi, F., The burden of tetanus in Uganda. *Springerplus*, 2016. **5**(1): p. 705.
75. World Health Organisation, WHO informal consultation on tetanus and voluntary medical male circumcision: report of meeting convened in Geneva, Switzerland, 9-10 March 2015. 2015, *WHO*: Geneva.
76. World Health Organisation, WHO informal consultation on tetanus and voluntary medical male circumcision: Technical consultation update to the WHO March 2015 meeting report. 2016, *WHO*: Geneva.
77. AVAC, Interview with an Advocate: Fearless Leader of Uganda's Voluntary Medical Male Circumcision Programme Speaks of Momentum, Motivation, and Maintaining Success. 2015.
78. Nevin, P.E., Pfeiffer, J., Kibira, S.P., Lubinga, S.J., Mukose, A., and Babigumira, J.B., Perceptions of HIV and Safe Male Circumcision in High HIV Prevalence Fishing Communities on Lake Victoria, Uganda. *PLoS One*, 2015. **10**(12): p. e0145543.
79. Haberland, N.A., Kelly, C.A., Mulenga, D.M., Mensch, B.S., and Hewett, P.C., Women's Perceptions and Misperceptions of Male Circumcision: A Mixed Methods Study in Zambia. *PLoS One*, 2016. **11**(3): p. e0149517.
80. Albert, L.M., Akol, A., L'Engle, K., Tolley, E.E., Ramirez, C.B., Opio, A., Tumwesigye, N.M., Thomsen, S., Neema, S., and Baine, S.O., Acceptability of male circumcision for prevention of HIV infection among men and women in Uganda. *AIDS Care*, 2011. **23**(12): p. 1578-85.
81. Osaki, H., Mshana, G., Wambura, M., Grund, J., Neke, N., Kuringe, E., Plotkin, M., Mahler, H., Terris-Prestholt, F., Weiss, H., and Changalucha, J., "If You Are Not Circumcised, I Cannot Say Yes": The Role of Women in Promoting the Uptake of Voluntary Medical Male Circumcision in Tanzania. *PLoS One*, 2015. **10**(9): p. e0139009.
82. Westercamp, M., Agot, K.E., Ndinya-Achola, J., and Bailey, R.C., Circumcision preference among women and uncircumcised men prior to scale-up of male circumcision for HIV prevention in Kisumu, Kenya. *AIDS Care*, 2012. **24**(2): p. 157-66.
83. Kelly, A., Kupul, M., Aeno, H., Shih, P., Naketrumb, R., Neo, J., Fitzgerald, L., Kaldor, J.M., Siba, P.M., and Vallely, A., Why women object to male circumcision

to prevent HIV in a moderate-prevalence setting. *Qual Health Res*, 2013. **23**(2): p. 180-93.
84. UNAIDS, National AIDS Programmes: A Guide to Monitoring and Evaluation. 2000, *Joint United Nations Programme on HIV/AIDS*: Geneva, Switzerland.
85. UBOS and ICF International, Uganda Demographic and Health Survey 2011. 2012, *Uganda Bureau of Statistics (UBOS) and ICF International Inc.*: Kampala, Uganda and Calverton, Maryland.
86. UNAIDS, UNAIDS Terminology Guidelines. 2015, *Joint United Nations Programme on HIV/AIDS* Geneva, Switzerland.
87. Parazzini, F., Cavalieri D'oro, L., Naldi, L., Bianchi, C., Graefembergh, S., Mezzanotte, C., Pansera, B., Schena, D., La Vecchia, C., and Franceschi, S., Number of sexual partners, condom use and risk of human immunodeficiency virus infection. *Int J Epidemiol*, 1995. **24**(6): p. 1197-203.
88. Weller, S. and Davis, K., Condom effectiveness in reducing heterosexual HIV transmission. *Cochrane Database Syst Rev*, 2001(3): p. CD003255.
89. Wamoyi, J., Stobeanau, K., Bobrova, N., Abramsky, T., and Watts, C., Transactional sex and risk for HIV infection in sub-Saharan Africa: a systematic review and meta-analysis. *J Int AIDS Soc*, 2016. **19**(1): p. 20992.
90. Stoebenau, K., Heise, L., Wamoyi, J., and Bobrova, N., Revisiting the understanding of "transactional sex" in sub-Saharan Africa: A review and synthesis of the literature. *Soc Sci Med*, 2016. **168**: p. 186-197.
91. Steffenson, A.E., Pettifor, A.E., Seage, G.R., 3rd, Rees, H.V., and Cleary, P.D., Concurrent sexual partnerships and human immunodeficiency virus risk among South African youth. *Sex Transm Dis*, 2011. **38**(6): p. 459-66.
92. Muldoon, K.A., A systematic review of the clinical and social epidemiological research among sex workers in Uganda. *BMC Public Health*, 2015. **15**: p. 1226.
93. Opio, A., Mishra, V., Hong, R., Musinguzi, J., Kirungi, W., Cross, A., Mermin, J., and Bunnell, R., Trends in HIV-related behaviors and knowledge in Uganda, 1989-2005: evidence of a shift toward more risk-taking behaviors. *J Acquir Immune Defic Syndr*, 2008. **49**(3): p. 320-6.
94. Kembabazi, A., Bajunirwe, F., Hunt, P.W., Martin, J.N., Muzoora, C., Haberer, J.E., Bangsberg, D.R., and Siedner, M.J., Disinhibition in risky sexual behavior in men, but not women, during four years of antiretroviral therapy in rural, southwestern Uganda. *PLoS One*, 2013. **8**(7): p. e69634.
95. Andersson, K.M., Vardas, E., Niccolai, L.M., Van Niekerk, R.M., Mogale, M.M., Holdsworth, I.M., Bogoshi, M., McIntyre, J.A., and Gray, G.E., Anticipated changes in sexual risk behaviour following vaccination with a low-efficacy HIV vaccine: survey results from a South African township. *Int J STD AIDS*, 2012. **23**(10): p. 736-41.
96. Newman, P.A., Lee, S.J., Duan, N., Rudy, E., Nakazono, T.K., Boscardin, J., Kakinami, L., Shoptaw, S., Diamant, A., and Cunningham, W.E., Preventive HIV vaccine acceptability and behavioral risk compensation among a random sample of high-risk adults in Los Angeles (LA VOICES). *Health Serv Res*, 2009. **44**(6): p. 2167-79.
97. Newman, P.A., Roungprakhon, S., Tepjan, S., and Yim, S., Preventive HIV vaccine acceptability and behavioral risk compensation among high-risk men who have sex with men and transgenders in Thailand. *Vaccine*, 2010. **28**(4): p. 958-64.
98. World Health Organisation, UNAIDS, and UNICEF, Global HIV/AIDS Response: Epidemic update and health sector progress towards Universal Access. Progress report. 2011, *WHO*: Geneva.

99. Hallett, T.B., Singh, K., Smith, J.A., White, R.G., Abu-Raddad, L.J., and Garnett, G.P., Understanding the impact of male circumcision interventions on the spread of HIV in southern Africa. *PLoS One*, 2008. **3**(5): p. e2212.
100. Adams, J. and Hillman, M., The risk compensation theory and bicycle helmets. Injury Prevention. *Injury Prevention*, 2001. **7**(4): p. 343.
101. Riess, H.T., Achieng, M.M., Otieno, S., Ndinya-Achola, J.O., and Bailey, C.R., "When I Was Circumcised I Was Taught Certain Things": Risk Compensation and Protective Sexual Behavior among Circumcised Men in Kisumu, Kenya. *PLoS One*, 2010. **5**(8): p. 1-9.
102. Hedlund, J., Risky business: safety regulations, risk compensation, and individual behavior. *Injury Prevention*, 2000. **6**: p. 82-90.
103. Hogben, M. and Liddon, N., Disinhibition and risk compensation: scope, definitions, and perspective. *Sex Transm Dis*, 2008. **35**(12): p. 1009-10.
104. Andersson, N. and Cockcroft, A., Male circumcision, attitudes to HIV prevention and HIV status: a cross-sectional study in Botswana, Namibia and Swaziland. *AIDS Care*, 2012. **24**(3): p. 301-9.
105. Cassell, M.M., Halperin, D.T., Shelton, J.D., and Stanton, D., Risk compensation: the Achilles' heel of innovations in HIV prevention? *BMJ*, 2006. **332**(7541): p. 605-7.
106. Abbott, S.A., Haberland, N.A., Mulenga, D.M., and Hewett, P.C., Female sex workers, male circumcision and HIV: a qualitative study of their understanding, experience, and HIV risk in Zambia. *PLoS One*, 2013. **8**(1): p. e53809.
107. Eaton, L. and Kalichman, S.C., Behavioral aspects of male circumcision for the prevention of HIV infection. *Curr HIV/AIDS Rep*, 2009. **6**(4): p. 187-93.
108. Maughan-Brown, B. and Venkataramani, A.S., Learning that circumcision is protective against HIV: risk compensation among men and women in Cape Town, South Africa. *PLoS One*, 2012. **7**(7): p. e40753.
109. Gray, R., Kigozi, G., Kong, X., Ssempiija, V., Makumbi, F., Wattya, S., Serwadda, D., Nalugoda, F., Sewenkambo, N.K., and Wawer, M.J., The effectiveness of male circumcision for HIV prevention and effects on risk behaviors in a posttrial follow-up study. *AIDS*, 2012. **26**(5): p. 609-15.
110. Kong, X., Kigozi, G., Nalugoda, F., Musoke, R., Kagaayi, J., Latkin, C., Ssekubugu, R., Lutalo, T., Nantume, B., Boaz, I., Wawer, M., Serwadda, D., and Gray, R., 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. *Am J Epidemiol*, 2012. **176**(10): p. 875-85.
111. Matovu, J.K., Ssempijja, V., Makumbi, F.E., Gray, R.H., Kigozi, G., Nalugoda, F., Serwadda, D., and Wawer, M.J., Sexually transmitted infection management, safer sex promotion and voluntary HIV counselling and testing in the male circumcision trial, Rakai, Uganda. *Reprod Health Matters*, 2007. **15**(29): p. 68-74.
112. Agot, K.E., Kiarie, J.N., Nguyen, H.Q., Odhiambo, J.O., Onyango, T.M., and Weiss, N.S., Male circumcision in Siaya and Bondo Districts, Kenya: prospective cohort study to assess behavioral disinhibition following circumcision. *J Acquir Immune Defic Syndr*, 2007. **44**(1): p. 66-70.
113. Westercamp, N., Agot, K., Jaoko, W., and Bailey, R.C., Risk compensation following male circumcision: results from a two-year prospective cohort study of recently circumcised and uncircumcised men in Nyanza province, Kenya. *AIDS Behav*, 2014. **18**(9): p. 1764-75.

114. Ayiga, N. and Letamo, G., Impact of male circumcision on HIV risk compensation through the impediment of condom use in Botswana. *Afr Health Sci*, 2011. **11**(4): p. 550-9.
115. Kibira, S.P., Nansubuga, E., Tumwesigye, N.M., Atuyambe, L.M., and Makumbi, F., Differences in risky sexual behaviors and HIV prevalence of circumcised and uncircumcised men in Uganda: evidence from a 2011 cross-sectional national survey. *Reprod Health*, 2014. **11**(1): p. 25.
116. Brito, M.O., Khosla, S., Pananookooln, S., Fleming, P.J., Lerebours, L., Donastorg, Y., and Bailey, R.C., Sexual Pleasure and Function, Coital Trauma, and Sex Behaviors After Voluntary Medical Male Circumcision Among Men in the Dominican Republic. *J Sex Med*, 2017. **14**(4): p. 526-534.
117. Westercamp, M., Jaoko, W., Mehta, S., Abuor, P., Siambe, P., and Bailey, R.C., Changes in Male Circumcision Prevalence and Risk Compensation in the Kisumu, Kenya Population, 2008-2013. *J Acquir Immune Defic Syndr*, 2017. **74**(2): p. e30-e37.
118. Shi, C.F., Li, M., and Dushoff, J., Evidence that promotion of male circumcision did not lead to sexual risk compensation in prioritized Sub-Saharan countries. *PLoS One*, 2017. **12**(4): p. e0175928.
119. Grund, J.M. and Hennink, M.M., A qualitative study of sexual behavior change and risk compensation following adult male circumcision in urban Swaziland. *AIDS Care*, 2012. **24**(2): p. 245-51.
120. Toefy, Y., Skinner, D., and Thomsen, S.C., "What do You Mean I've Got to Wait for Six Weeks?!" Understanding the Sexual Behaviour of Men and Their Female Partners after Voluntary Medical Male Circumcision in the Western Cape. *PLoS One*, 2015. **10**(7): p. e0133156.
121. Mbonye, M., Kuteesa, M., Seeley, J., Levin, J., Weiss, H., and Kamali, A., Voluntary medical male circumcision for HIV prevention in fishing communities in Uganda: the influence of local beliefs and practice. *Afr J AIDS Res*, 2016. **15**(3): p. 211-8.
122. Peltzer, K., Kekana, Q., Banyini, M., Jooste, S., and Simbayi, L., Adaptation of an HIV behavioural disinhibition risk reduction intervention for recently circumcised South African men. *Gender & Behaviour*, 2011. **9**(1): p. 3479–3494.
123. Wilber, K., Introduction to integral theory and practice: IOS basic and the AQAL map. *Journal of integral theory and practice*, 2005. **1**(1).
124. Lundy, T., A paradigm to guide health promotion into the 21st century: the integral idea whose time has come. *Glob Health Promot*, 2010. **17**(3): p. 44-53.
125. Schlitz, M.M., The integral model: answering the call for whole systems health care. *Perm J*, 2008. **12**(2): p. 61-8.
126. Rogers, E.M., Diffusion of Innovations. Third ed. 1983, New York: *The Free Press*.
127. Chikutsa, A., Ncube, C.A., and Mutsau, S., Association between wanting circumcision and risky sexual behaviour in Zimbabwe: evidence from the 2010–11 Zimbabwe demographic and health survey. *Reproductive Health*, 2015. **12**(15).
128. Keetile, M. and Rakgoasi, S.D., Male Circumcision; willingness to undergo safe male circumcision and HIV risk behaviors among men in Botswana. *African Population Studies*, 2014. **28**(3): p. 1345–61.
129. Herman-Roloff, A., Otieno, N., Agot, K., Ndinya-Achola, J., and Bailey, R.C., Acceptability of medical male circumcision among uncircumcised men in Kenya one year after the launch of the national male circumcision program. *PLoS One*, 2011. **6**(5): p. e19814.
130. Jones, D., Cook, R., Arheart, K., Redding, C.A., Zulu, R., Castro, J., and Weiss, S.M., Acceptability, knowledge, beliefs, and partners as determinants of Zambian

men's readiness to undergo medical male circumcision. *AIDS Behav*, 2014. **18**(2): p. 278-84.
131. Plotkin, M., Castor, D., Mziray, H., Kuver, J., Mpuya, E., Luvanda, P.J., Hellar, A., Curran, K., Lukobo-Durell, M., Ashengo, T.A., and Mahler, H., "Man, what took you so long?" Social and individual factors affecting adult attendance at voluntary medical male circumcision services in Tanzania. *Glob Health Sci Pract*, 2013. **1**(1): p. 108-16.
132. Cook, R., Jones, D., Redding, C.A., Zulu, R., Chitalu, N., and Weiss, S.M., Female Partner Acceptance as a Predictor of Men's Readiness to Undergo Voluntary Medical Male Circumcision in Zambia: The Spear and Shield Project. *AIDS Behav*, 2015.
133. Mukama, T., Ndejjo, R., Musinguzi, G., and Musoke, D., Perceptions about medical male circumcision and sexual behaviours of adults in rural Uganda: a cross sectional study. *Pan Afr Med J*, 2015. **22**: p. 354.
134. Hilton, H., Heidi, v.R., Lucia, K., Ruanne, B., and Connie, C., '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*, 2015. **17**(7): p. 920-931.
135. Wirth, K.E., Semo, B.W., Ntsuape, C., Ramabu, N.M., Otlhomile, B., Plank, R.M., Barnhart, S., and Ledikwe, J.H., Triggering the decision to undergo medical male circumcision: a qualitative study of adult men in Botswana. *AIDS Care*, 2016: p. 1-6.
136. George, G., Strauss, M., Chirawu, P., Rhodes, B., Frohlich, J., Montague, C., and Govender, K., Barriers and facilitators to the uptake of voluntary medical male circumcision (VMMC) among adolescent boys in KwaZulu-Natal, South Africa. *Afr J AIDS Res*, 2014. **13**(2): p. 179-87.
137. Uganda Bureau of Statistics, 2002 Uganda Population and Housing Census, Analytical Report. 2006, *UBOS*: Kampala.
138. Uganda AIDS Commission, HIV and AIDS Uganda Country Progress Report 2014. 2015, *UAC*: Kampala, Uganda.
139. Johnson, R.B. and Onwuegbuzie, A.J., Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Eductaional Researcher*, 2004. **33**(7): p. 14-26.
140. Sandelowski, M., Whatever happened to qualitative description? *Res Nurs Health*, 2000. **23**(4): p. 334-40.
141. Lambert, V.A. and Lambert, C.E., Qualitative Descriptive Research: An Acceptable Design. *Pacific Rim Int J Nurs Res*, 2012. **16**(4): p. 255-256.
142. Creswell, J., W., Qualitative inquiry and research design: Choosing among five approaches. 2nd ed. 2007, Thousand Oaks, California: *Sage Publications, Inc.*
143. Cameron, R., A sequential mixed model research design: design, analytical and display issues. *International Journal of Multiple Research Approach*, 2009. **3**(2): p. 140-152.
144. Creswell, J., W., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 4th ed. 2014, Thousand Oaks, California: *SAGE Publications, Inc*. 304.
145. Subedi, D., Explanatory Sequential Mixed Method Design as the Third Research Community of Knowledge Claim. *American Journal of Educational Research*, 2016. **4**(7): p. 570-577.
146. Guba, E.G. and Lincoln, Y.S., Competing paradigms in qualitative research, in *Handbook of qualitative research*, N.K. Denzin and Y.S. Lincoln, Editors. 1994, *Sage*: Thousand Oaks, CA. p. 105-117.
147. Mays, N. and Pope, C., Rigour and qualitative research. *BMJ*, 1995(311): p. 109-12.

148. Mays, N. and Pope, C., Qualitative research in health care. Assessing quality in qualitative research. *BMJ*, 2000. **320**(7226): p. 50-2.
149. Guest, G., Bunce, A., and Johnson, L., How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 2006. **18**(1): p. 59-82.
150. Dew, K., A health researcher's guide to qualitative methodologies. *Aust N Z J Public Health*, 2007. **31**(5): p. 433-7.
151. Zocchetti, C., Consonni, D., and Bertazzi, P.A., Relationship between prevalence rate ratios and odds ratios in cross-sectional studies. *Int J Epidemiol*, 1997. **26**(1): p. 220-3.
152. Traissac, P., Martin-Prevel, Y., Delpeuch, F., and Maire, B., [Logistic regression vs other generalized linear models to estimate prevalence rate ratios]. *Rev Epidemiol Sante Publique*, 1999. **47**(6): p. 593-604.
153. Barros, A.J. and Hirakata, V.N., Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Med Res Methodol*, 2003. **3**: p. 21.
154. Attride-Stirling, J., Thematic networks: an analytic tool for qualitative research. *Qualitative Research*, 2001. **1**(3): p. 385-405.
155. Bryman, A., Barriers to Integrating Quantitative and Qualitative Research. *J Mix Methods Res*, 2007. **1**(1): p. 8-22.
156. Tariq, S. and Woodman, J., Using mixed methods in health research. *JRSM Short Rep*, 2013. **4**(6): p. 2042533313479197.
157. Van den Broeck, J. and Brestoff, J.R., Epidemiology: Principles and Practical Guidelines. 2013, Dordrecht: *Springer Science & Business Media*. 621.
158. International Epidemiological Association, A Dictionary of Epidemiology. Sixth ed, ed. M. Porta. 2014, New York: *Oxford University Press*. 343.
159. Noble, H. and Smith, J., Issues of validity and reliability in qualitative research. *Evid Based Nurs*, 2015. **18**(2): p. 34-5.
160. Uganda Bureau of Statistics and Macro International Inc., Uganda Demographic and Health Survey 2006. 2007, *UBOS and Macro International Inc.*: Calverton, Maryland, USA.
161. Kelly, C.A., Soler-Hampejsek, E., Mensch, B.S., and Hewett, P.C., Social desirability bias in sexual behavior reporting: evidence from an interview mode experiment in rural Malawi. *Int Perspect Sex Reprod Health*, 2013. **39**(1): p. 14-21.
162. Weiss, H.A., Plummer, M.L., Changalucha, J., Mshana, G., Shigongo, Z.S., Todd, J., Wight, D., Hayes, R.J., and Ross, D.A., Circumcision among adolescent boys in rural northwestern Tanzania. *Trop Med Int Health*, 2008. **13**(8): p. 1054-61.
163. Risser, J.M., Risser, W.L., Eissa, M.A., Cromwell, P.F., Barratt, M.S., and Bortot, A., Self-assessment of circumcision status by adolescents. *Am J Epidemiol*, 2004. **159**(11): p. 1095-7.
164. Hewett, P.C., Haberland, N., Apicella, L., and Mensch, B.S., The (mis)reporting of male circumcision status among men and women in Zambia and Swaziland: a randomized evaluation of interview methods. *PLoS One*, 2012. **7**(5): p. e36251.
165. Thomas, A.G., Tran, B.R., Cranston, M., Brown, M.C., Kumar, R., and Tlelai, M., Voluntary medical male circumcision: a cross-sectional study comparing circumcision self-report and physical examination findings in Lesotho. *PLoS One*, 2011. **6**(11): p. e27561.
166. Fenton, K.A., Johnson, A.M., McManus, S., and Erens, B., Measuring sexual behaviour: methodological challenges in survey research. *Sex Transm Infect*, 2001. **77**(2): p. 84-92.

167. Jaccard, J., McDonald, R., Wan, K.C., Dittus, J.P., and Quinlan, S., The Accuracy of Self-Reports of Condom Use and Sexual Behavior. *Journal of Applied Social Psychology*, 2002. **32**(9): p. 1863-1905.
168. Brawley, E.M., The Relationship Between Gender Norms and Expectations and the Sexual Practices of Ugandan Men, in *Health Services*. 2006, *University of Washington*: Washington.
169. Schroder, K.E.E., Carey, M.P., and Vanable, P.A., Methodological Challenges in Research on Sexual Risk Behavior: II. Accuracy of Self-Reports. *Annals of Behavioral Medicine : A Publication of the Society of Behavioral Medicine*, 2003. **26**(2): p. 104–123.
170. Kelly, C.A., Hewett, P.C., Mensch, B.S., Rankin, J.C., Nsobya, S.L., Kalibala, S., and Kakande, P.N., Using biomarkers to assess the validity of sexual behavior reporting across interview modes among young women in Kampala, Uganda. *Stud Fam Plann*, 2014. **45**(1): p. 43-58.
171. Wears, R.L., Advanced statistics: statistical methods for analyzing cluster and cluster-randomized data. *Acad Emerg Med*, 2002. **9**(4): p. 330-41.
172. Green, J. and Thorogood, N., Qualitative methods for health research. 3rd ed. Introducing Qualitative Methods, ed. D. Silverman. 2014, London: *SAGE publications Ltd*. 342.
173. Morse, J.M., Critical Analysis of Strategies for Determining Rigor in Qualitative Inquiry. *Qual Health Res*, 2015. **25**(9): p. 1212-22.
174. Chilisa, B., Indegenous research methodologies. 2012, Los Angeles: *Sage publications*. 343.
175. Chenail, R.J., Presenting qualitative data. *The Qualitative Report*, 1995. **2**(3): p. 1-9.
176. Beck, T.C., Keddy, A.B., and Cohen, Z.M., Reliability and Validity Issues in Phenomenological Research. *West J Nurs Res*, 1994. **16**(3): p. 254-267.
177. Shenton, A.K., Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, 2004. **22**: p. 63-77.
178. Hesse-Biber, S. and Johnson, R.B., The Oxford Handbook of Multimethod and Mixed Methods Research Inquiry. 2015, New York: *Oxford University Press*.
179. Draper, A. and Swift, J.A., Qualitative research in nutrition and dietetics: data collection issues. *J Hum Nutr Diet*, 2011. **24**(1): p. 3-12.
180. Bradbury-Jones, C., Enhancing rigour in qualitative health research: exploring subjectivity through Peshkin's I's. *J Adv Nurs*, 2007. **59**(3): p. 290-8.
181. Kagaayi, J., Kong, X., Kigozi, G., Ssekubugu, R., Kigozi, G., Nalugoda, F., Serwadda, D., Wawer, M.J., and Gray, R.H., Self-selection of male circumcision clients and behaviors following circumcision in a service program in rakai, Uganda. *AIDS*, 2016.
182. Pinkerton, S.D. and Abramson, P.R., Effectiveness of condoms in preventing HIV transmission. *Soc Sci Med*, 1997. **44**(9): p. 1303-12.
183. Gray, R.H., Reducing HIV transmission: Lessons from Rakai and other African studies. International AIDS Society. Rio de Janeiro, Brazil. *Reported in UNAIDS and WHO (2007) Male circumcision: global trends and determinants of prevalence, safety and acceptability. WHO/UNAIDS*. 2005.
184. Ediau, M., Matovu, J.K., Byaruhanga, R., Tumwesigye, N.M., and Wanyenze, R.K., Risk factors for HIV infection among circumcised men in Uganda: a case-control study. *J Int AIDS Soc*, 2015. **18**(1): p. 19312.

185. Morris, M., Epstein, H., and Wawer, M., Timing is everything: international variations in historical sexual partnership concurrency and HIV prevalence. *PLoS One*, 2010. **5**(11): p. e14092.
186. Mishra, V. and Simona, B.-V.A., Concurrent Sexual Partnerships and HIV Infection: Evidence from National Population-Based Surveys. DHS Working Papers No. 62. 2009, *Macro International Inc*: Calverton, Maryland.
187. Eaton, J.W., Hallett, T.B., and Garnett, G.P., Concurrent sexual partnerships and primary HIV infection: a critical interaction. *AIDS Behav*, 2011. **15**(4): p. 687-92.
188. Pilcher, C.D., Tien, H.C., Eron, J.J., Jr., Vernazza, P.L., Leu, S.Y., Stewart, P.W., Goh, L.E., Cohen, M.S., Quest, S., and Duke, U.N.C.E.A.H.I.V.C., Brief but efficient: acute HIV infection and the sexual transmission of HIV. *J Infect Dis*, 2004. **189**(10): p. 1785-92.
189. Riess, T.H., Achieng, M.M., and Bailey, R.C., Women's beliefs about male circumcision, HIV prevention, and sexual behaviors in Kisumu, Kenya. *PLoS One*, 2014. **9**(5): p. e97748.
190. Lunsford, S.S., Byabagambi, J., Falconer-Stout, Z., and Karamagi, E., Improving voluntary medical male circumcision standards adherence and post-procedure follow-up in Uganda: A mixed methods study. *Afr J AIDS Res*, 2017. **16**(1): p. 39-46.
191. USAID ASSIST. Integrating Gender in Voluntary Medical Male Circumcision Programs to Improve Outcomes. 2014; *Available from:* https://www.usaidassist.org/sites/assist/files/assist_integrating_gender_in_vmmc_techbrief_june2014.pdf.
192. Layer, E.H., Beckham, S.W., Mgeni, L., Shembilu, C., Momburi, R.B., and Kennedy, C.E., "After my husband's circumcision, I know that I am safe from diseases": women's attitudes and risk perceptions towards male circumcision in Iringa, Tanzania. *PLoS One*, 2013. **8**(8): p. e74391.
193. Kigozi, G., Lukabwe, I., Kagaayi, J., Wawer, M.J., Nantume, B., Kigozi, G., Nalugoda, F., Kiwanuka, N., Wabwire-Mangen, F., Serwadda, D., Ridzon, R., Buwembo, D., Nabukenya, D., Watya, S., Lutalo, T., Nkale, J., and Gray, R.H., Sexual satisfaction of women partners of circumcised men in a randomized trial of male circumcision in Rakai, Uganda. *BJU Int*, 2009. **104**(11): p. 1698-701.
194. Rakai Health Sciences Program and Johns Hopkins Bloomberg School of Public Health, A Guide for Community Games and Competitions Under the Stylish Man Campaign. 2012, *RHSP and JHSPH Center for Communication Programs*.
195. The Republic of Uganda. Ministry of Health, Understanding Safe Male Circumcision for HIV Prevention [brochure], Ministry of Health, Editor. 2012: Kampala, Uganda.
196. Kong, X., Ssekasanvu, J., Kigozi, G., Lutalo, T., Nalugoda, F., Serwadda, D., Wawer, M., and Gray, R., Male circumcision coverage, knowledge, and attitudes after 4-years of program scale-up in Rakai, Uganda. *AIDS Behav*, 2014. **18**(5): p. 880-4.
197. L'Engle, K., Lanham, M., Loolpapit, M., and Oguma, I., Understanding partial protection and HIV risk and behavior following voluntary medical male circumcision rollout in Kenya. *Health Educ Res*, 2014. **29**(1): p. 122-30.
198. Odong, J. Does Uganda need to realign its male circumcision campaign? 2016 [cited 2016 April 5]; *Available from:* https://www.avert.org/news/does-uganda-need-realign-its-male-circumcision-campaign.
199. Uganda AIDS Commission, District HIV/AIDS support supervision and follow up of HIV/AIDS activities implemented in Local Governments. 2014, *UAC*: Kampala, Uganda.

200. Byabagambi, J., Kigonya, A., Lawino, A., Ssensamba, J., Twinomugisha, A., Karamagi-Nkolo, E., Megere, H., Marks, P., Nanteza, B., and Opio, A., A Guide to Improving the Quality of Safe Male Circumcision in Uganda. 2015, *USAID Applying Science to Strengthen and Improve Systems (ASSIST) Project, University Research Co., LLC*: Bethesda, MD.
201. Byabagambi, J., Marks, P., Megere, H., Karamagi, E., Byakika, S., Opio, A., Calnan, J., and Njeuhmeli, E., Improving the Quality of Voluntary Medical Male Circumcision through Use of the Continuous Quality Improvement Approach: A Pilot in 30 PEPFAR-Supported Sites in Uganda. *PLoS One*, 2015. **10**(7): p. e0133369.
202. Odoyo-June, E., Rogers, J.H., Jaoko, W., and Bailey, R.C., Factors associated with resumption of sex before complete wound healing in circumcised HIV-positive and HIV-negative men in Kisumu, Kenya. *J Acquir Immune Defic Syndr*, 2013. **62**(4): p. 465-70.
203. Herman-Roloff, A., Bailey, R.C., and Agot, K., Factors associated with the early resumption of sexual activity following medical male circumcision in Nyanza province, Kenya. *AIDS Behav*, 2012. **16**(5): p. 1173-81.
204. Kigozi, G., Musoke, R., Kighoma, N., Watya, S., Serwadda, D., Nalugoda, F., Kiwanuka, N., Nkale, J., Wabwire-Mangen, F., Makumbi, F., Sewankambo, N.K., Gray, R.H., and Wawer, M.J., Male circumcision wound healing in human immunodeficiency virus (HIV)-negative and HIV-positive men in Rakai, Uganda. *BJU Int*, 2014. **113**(1): p. 127-32.

Appendices

Appendix I: Informed consent form

Study Purpose: This research project is a collaboration between the University of Bergen in Norway and Makerere University School of Public Health. We are conducting a study to learn about opinions and experiences of men who come for Safe male circumcision in health facilities in Wakiso district. We would like to discuss with you about your decision to come for Safe male circumcision and your opinions about its role in HIV prevention. This information may help to improve the intervention for people who benefit from this program and the general population.

Participation in the study: Your participation in this study is strictly voluntary. This means that you do not have to participate if you do not want to. When you agree to participate, you can refuse to answer any questions that you do not feel comfortable answering. When you participate, you will be interviewed today and again after 3 months. Your mobile telephone contacts will be noted to be able to reach you for a second interview. If you agree, the interviews will be audio-recorded in order to accurately capture what we discuss. You may request the recording to be paused at any time. You can withdraw from this study at any time and you will not be denied any health services if you refuse to participate or decide to withdraw. The interview will last about 40 minutes.

The information that you provide will be anonymously used for research purposes only, together with that of other participants. Your telephone contacts will be kept safely, separate from the audio recordings of the interviews.

Potential study benefits and risks: There is no direct benefit to participation in this study. But, you will be compensated for your time. The answers you provide may help to improve the male circumcision services in this area. Also, while I cannot directly answer questions you have about health, I can provide you with information about where to get health-related assistance. There are no direct risks of participating

in this study and as I mentioned, you can refuse to answer any question or withdraw from the study at any time without any penalties. The health workers in the district are not involved in this study. The services that you receive at the health facilities will not be affected in any way by your participation. You may ask any questions during the interview.

Rights: If you have any further questions about this study or about your rights as a study participant, you can contact Simon Peter Kibira, University of Bergen, on telephone: 0757-070644. Should you have questions about your rights as a study participant, please contact Dr. Suzanne Kiwanuka, Chairperson of Makerere University School of Public Health, Higher Degrees Research and Ethics Committee. P. O. Box 7072, Kampala, Tel: 0312-291397/0701-888163, email: skiwanuka@musph.ac.ug

If you agree to participate in this study, please sign below to indicate that you have understood what the study is about and what your role is. You will be given a copy of this signed consent form.

Consent sheet

I have been informed of the study purpose and of my rights as a study participant. The investigator has offered to answer my questions concerning this study. I hereby consent to participate in the study.

Study Participant PRINTED NAME:_____

Study Participant SIGNATURE: _____

Date: _____

Interviewer SIGNATURE: _____

Appendix II: In-depth interview guides

IDI guide for clients at baseline

1. How do people in your community perceive male circumcision? What influences men in your community to go for circumcision?

2. Now, let's talk about your own decision. How did you decide that you wanted to come for circumcision? *(Probe: Who influenced you? What was the role of your partner(s) in the decision? Why did you decide to come? Why now?)*

3. What are your expectations after circumcision? *(Probe: any anticipated changes in behaviour; do(es) your partner (s) expect you to behave differently?)*

4. Now, let us talk about the details around circumcision and HIV. Please tell me about your opinions on male circumcision and its role in HIV prevention. *(Probe: how does it reduce HIV transmission? Who does it protect? What does partial protection mean to you? What does it mean to you that male circumcision reduces a man's risk of getting HIV from an infected woman by 60%? How would you describe it to someone else? How about other men you know of, how do they understand partial risk reduction?*)

5. How did you obtain the above information before coming to this health facility for circumcision? *(probe: from which sources[-social marketing(on radio, TV, newspapers, posters, billboards)], peers, health workers, sexual partners)*

6. Have you received any individual or group counselling from the health workers at this facility today about circumcision? Would you please describe what they have told you? *(Probe: What key messages did you take from the counselling? How did they talk about the chances of reducing HIV when circumcised?)*

7. Let us talk about use of condoms among men in your community. How would you describe the typical condom use among men that you know of? *(Probe: Do you think they use condoms consistently, with whom?)*

8. How about you. How would you describe your use of condoms? *(Probe: Do you use condoms, with whom, consistently? why? How many sexual partners do you have? What is your planned use of condoms after circumcision?)*

9. What beliefs and perceptions relating to sex are you aware of in your culture and community?

10. How have the values, beliefs and perceptions relating to sex in your culture and community influenced men's sexual behaviour? *(Probe: How about you, how have they influenced you? Are the values beliefs and perceptions different for women and men? Are there perceptions that relate to both male circumcision and sexual behaviour? Are the beliefs from other cultures impacting on you? Is the influence positive/ negative? Are your partner's values influencing your behaviour)*

Thank you for your time. We wish you quick healing and we will meet again in 6 months to discuss how you have progressed.

IDI guide for clients at six months follow-up

1. Let us talk about events since we last met [6 months ago] at the time you were circumcised. How was the healing period? How long did it take you to heal? *(Probe: Month by month narration of how the they went through the healing period. Did you do anything to heal faster? What did you do? Did the sexual partner(s) help in anyway?)*

2. How has your sex life changed since circumcision? *(Probe: when did you resume? any sex other than with [main] partner? [In case of multiple partners]did you use condoms? Sexual satisfaction perceptions, more partners than before or less or same, do you feel more protected?)*

3. How is your sexual partner'(s) perception towards you since you got circumcised? *(Probes: has it changed, how? Why do you think she (they) perceive you this way now? How did they go through the period when you were healing?)*

4. Think about your life, living in this community and the culture around you. How has your culture and the beliefs around sex in your society affected your behaviour since the time you were circumcised?

5. Please tell me about your perception of HIV risk now. How do you perceive your risk now compared to the time before circumcision? *(Probe: is the risk perceived to be less or the same? Why? What makes you think so? How do other men you know of that are circumcised perceive the risk after circumcision?)*

6. Think back to the time when you were circumcised. What messages did you receive from the health workers that you still remember? *(Probe: How has that helped you through the process until now? Could it have been given differently?)*

7. Other than what you were told at the health facility and given the experience that you have gone through, what extra messages should health workers tell men at circumcision?
8. What kind of messages would you want to have to remind you about consistently maintaining safer sexual behaviour after circumcision?

9. What would you advise other men regarding circumcision now based on your experience? *(Probe: Why would you give such kind of advice? Have you advised anyone so far? What have you told them?)*

10. Are there any other things you would like us to discuss about your circumcision?

Thank you so much for your participation in this study

Appendix III: Ethical approvals

REK
REGIONALE KOMITEER FOR MEDISINSK OG HELSEFAGLIG FORSKNINGSETIKK

Region:	Phone number:	Our date:	Our reference:
REC South-East	+47 22845512	07.04.2015	2015/477

To whom it may concern

With regards to the study Male circumcision, sexual risk behaviour and HIV infection in Uganda
Chief Investigator: Ingvild Fossgard Sandøy, Institution responsible for the research: University of Bergen

With reference to your email of the 25th of March 2015, we hereby confirm that the Committee`s chair Knut Engedal reviewed the Remit Assessment, for the project "**Male circumcision, sexual risk behaviour and HIV infection in Uganda**", (Norwegian title "2015/477 A Mannlig omskjæring, seksuell risikoadferd og HIV-infeksjon i Uganda") on the 25th of March 2015.

The project was assessed in accordance with the Norwegian Research Ethics Act of 30th June 2006 and Act on Medical and Health Research (the Health Research Act) 20th of June 2008 for The Regional Committees for Medical and Health Research Ethics.

The abovementioned study is exempt from review in Norway, cf. § 4 of The Act. The project can be implemented without the approval by the Regional Committee for Medical Research Ethics.

Please do not hesitate to contact the Regional Committee for Medical and Health Research Ethics, section South-East A (REK Sør-Øst A) if further information is required.

Yours sincerely

Knut Engedal (PP)
professor dr. med.
Chair of Committee

Anne Schiøtz Kavli
Senior Executive Officer

MAKERERE UNIVERSITY

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COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
HIGHER DEGREES, RESEARCH AND ETHICS COMMITTEE

08th April, 2015

Simon Peter Sebina Kibira
Principal Investigator, Protocol (288)
Makerere University, School of Public Health

Expedited review,

Re: Approval of Proposal titled: Male Circumcision, sexual risk behaviour and HIV infection in Uganda

This is to inform you that, the Higher Degrees, Research and Ethics Committee (HDREC) has granted approval to the above referenced study, the HDREC reviewed the proposal and made some suggestions and comments which you have adequately incorporated:

	Document Name	Version Date
1	Research Protocol	August 08th, 2015
2	ALL Informed Consent Documents	August 08th 2015
3	Data collection tools	August 08th 2015

Note that the initial approval date for your proposal by HDREC is 08th/04/2015, and therefore approval expires at every annual anniversary of this approval date. The current approval is therefore valid until: **07th//04/2016**.

Continued approval is conditional upon your compliance with the following requirements:

1) No other consent form(s), questionnaire and/or advertisement documents should be used. The consent form(s) must be signed by each subject prior to initiation of any protocol procedures. In addition, each subject must be given a copy of the signed consent form.

2) All protocol amendments and changes to other approved documents must be submitted to HDREC and not be implemented until approved by HDREC except where necessary to eliminate apparent immediate hazards to the study subjects.

3) Significant changes to the study site and significant deviations from the research protocol and all unanticipated problems that may involve risks or affect the safety or welfare of subjects or others, or that may affect the integrity of the research must be promptly reported to HDREC.
4) All deaths, life threatening problems or serious or unexpected adverse events, *whether related to the study or not,* must be reported to HDREC in a timely manner as specified in the National Guidelines for Research Involving Humans as Research Participants.

- Please complete and submit reports to HDREC as follows:

a) For renewal of the study approval – complete and return the continuing Review Report – Renewal Request (Form 404A) at least 60 days prior to the expiration of the approval period. The study cannot continue until re-approved by HDREC.

b) Completion, termination, or if not renewing the project – send a final report within 90 days upon completion of the study.

- Finally, the legal requirement in Uganda is that all research activities must be registered with the National Council of Science and Technology. The forms for this registration can be obtained from their website www.uncst.go.ug. Please contact Mr. Tusiime Wilson, Administrative Assistant of the Higher Degrees, Research and Ethics Committee at wtusiime@musph.ac.ug or telephone number (256)-41-543872 or +256772496136 if you encounter any problems.

Yours sincerely

Mbarara University School of Public Health
Valid Thru:
07 APR 2016
Higher Degrees, Research and Ethics Committee

Assoc. Prof. Lynn Atuyambe
Vice Chairman: Higher Degrees, Research and Ethics Committee

Enclosures:

a) A stamped, approved study documents (informed consent documents):

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

UNCST

Our Ref: SS 3764 **6th May 2015**

Mr. Simon Peter Sebina Kibira
Makerere University
Kampala

Re: Research Approval: **Male circumcision, sexual risk behavior and HIV infection in Uganda**

I am pleased to inform you that on **20/04/2015**, the Uganda National Council for Science and Technology (UNCST) approved the above referenced research project. The Approval of the research project is for the period of **20/04/2015** to **20/04/2016.**

Your research registration number with the UNCST is **SS 3764**. Please, cite this number in all your future correspondences with UNCST in respect of the above research project.

As Principal Investigator of the research project, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the research protocol or the consent form (where applicable) must be submitted to the designated Research Ethics Committee (REC) or Lead Agency for re-review and approval **prior** to the activation of the changes. UNCST must be notified of the approved changes within five working days.
3. For clinical trials, all serious adverse events must be reported promptly to the designated local REC for review with copies to the National Drug Authority.
4. Unanticipated problems involving risks to research subjects/participants or other must be reported promptly to the UNCST. New information that becomes available which could change the risk/benefit ratio must be submitted promptly for UNCST review.
5. Only approved study procedures are to be implemented. The UNCST may conduct impromptu audits of all study records.
6. A progress report must be submitted electronically to UNCST within four weeks after every 12 months. Failure to do so may result in termination of the research project.

Below is a list of documents approved with this application:

	Document Title	Language	Version	Version Date
1	Research proposal	English	N/A	08/04/2015
2	Informed consent	English, Luganda	N/A	08/04/2015
3	In-depth interview guides	English, Luganda	N/A	08/04/2015

Yours sincerely,

Helle N Opolot
for: Executive Secretary
UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

cc Chair, School of Public Health, Makerere University, Kampala

Papers

I

Kibira et al. BMC Public Health (2016) 16:7
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BMC Public Health

RESEARCH ARTICLE Open Access

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

Simon Peter Sebina Kibira[1,2*], Ingvild Fossgard Sandøy[1], Marguerite Daniel[3], Lynn Muhimbuura Atuyambe[2] and Fredrick Edward Makumbi[4]

Abstract

Background: Although male circumcision reduces the heterosexual HIV transmission risk, its effect may be attenuated if circumcised men increase sexual risk behaviours (SRB) due to perceived low risk. In Uganda information about the protective effects of circumcision has been publicly disseminated since 2007. If increased awareness of the protection increases SRB among circumcised men, it is likely that differences in prevalence of SRB among circumcised versus uncircumcised men will change over time. This study aimed at comparing SRBs and HIV sero-status of circumcised and uncircumcised men before and after the launch of the safe male circumcision programme.

Methods: Data from the 2004 and 2011 Uganda AIDS Indicator Surveys (UAIS) were used. The analyses were based on generalized linear models, obtaining prevalence ratios (PR) as measures of association between circumcision status and multiple sexual partners, transactional sex, sex with non-marital partners, condom use at last non-marital sex, and HIV infection. In addition we conducted multivariate analyses adjusted for sociodemographic characteristics, and the multivariate models for HIV status were also adjusted for SRB.

Results: Twenty six percent of men were circumcised in 2004 and 28 % in 2011. Prevalence of SRB was higher among circumcised men in both surveys. In the unadjusted analysis, circumcision was associated with having multiple sexual partners and non-marital partners. Condom use was not associated with circumcision in 2004, but in 2011 circumcised men were less likely to report condom use with the last non-marital partner. The associations between the other sexual risk behaviours and circumcision status were stable across the two surveys." In both surveys, circumcised men were less likely to be HIV positive (Adj PR 0.55; CI: 0.41–0.73 in 2004 and Adj PR 0.64; CI: 0.49–0.83 in 2011).

(Continued on next page)

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Full list of author information is available at the end of the article

(Continued from previous page)

Conclusions: There was higher prevalence of SRBs among circumcised men in both surveys, but the only significant change from 2004 to 2011 was a lower prevalence of condom use among the circumcised. Nevertheless, HIV prevalence was lower among circumcised men. Targeted messages for circumcised men and their sexual partners to continue using condoms even after circumcision should be enhanced to avoid risk compensation.

Keywords: Circumcision, Condom use, Survey, Sexual risk behaviours, HIV, Multiple partners, Non-marital sex, Uganda

Background

Heterosexual transmission of HIV is still the biggest contributor to the HIV epidemic in sub Saharan Africa where over 70 % of the estimated global 35 million HIV positive people live [1, 2]. Male circumcision reduces HIV heterosexual transmission risk from infected women to men [3–8], prevalence of high risk human papilloma virus and incidence of Herpes simplex virus two in men and, genital ulcers in female partners of circumcised HIV negative men [9–12]. In 2007, male circumcision was recommended in 14 sub Saharan African countries with high HIV prevalence but low levels of male circumcision [13, 14].

The Ministry of Health and partners in Uganda have scaled up circumcision through the national safe male circumcision (SMC) programme since 2007. Health workers were provided with accurate information using flip charts and question-answer booklets to assist clients, while media training sessions equipped journalists with information about SMC and its link to HIV prevention. The general public was educated through radio and television talk shows, newspaper columns and educational materials such as brochures for men [15]. A national policy guiding the programme was launched in 2010 [16] together with a national communication strategy [17]. In 2011, there were further social marketing efforts to increase demand, such as the "stand proud, get circumcised" campaign using a provocative approach that spoke to men through women. This was designed to convince men who had intentions of circumcision to get SMC services while encouraging women to support their partners to get circumcised and encouraging adherence to post circumcision practices that promote healing. The SMC intervention is implemented as an additional approach to the existing HIV prevention programmes such promoting condom use and being faithful to one sexual partner, and its demand and service provision increased. Between 2009 and September 2013, over 1.4 million adult men were circumcised [18, 19].

Male circumcision has the potential to reduce the HIV epidemic at population level with large scale benefits projected [20, 21]. There are concerns however that promoting such large scale population level interventions may also come with potential for behavioural risk compensation [22–25]. Circumcised men may as a result of reduced self-perceived risk to HIV and sexually transmitted infections increase sexual risk behaviours, including frequency of unprotected sex with multiple high risk partners [26–28], in part due to misperceptions from social marketing about the 'partial' protective effect of male circumcision [29]. Increases in sexual risk behaviours have been documented in Uganda among people living with HIV on antiretroviral therapy [30], partly due to reduced risk perception [31]. HIV vaccine trials have documented similar concerns with increases in sexual risk behaviours after vaccination among some groups [32–34].

Information from the three randomised controlled trials on which the WHO recommendation of the male circumcision intervention was mainly based, indicated both adjustments and non-adjustments in the sexual behaviour of participants. In South Africa [8] circumcised men reported more sexual partners in the 4–21 month recall periods post circumcision while in Kenya [7], inconsistent condom use declined in the control but not in intervention group after a 24 month period of repeated emphasis on comprehensive behaviour related counselling. In contrast, in the Ugandan trial [6, 35], there was no evidence of behavioural risk compensation reported even in follow up studies. However, the authors indicate in the study limitations that all the participants in these studies had received intensive health education and counselling during the trial period, and therefore such results may not be generalizable to the general male population who receive male circumcision through routine services.

There are few studies [23, 28, 36–38] outside of the three trials that have examined the association between male circumcision and sexual risk behaviour. Our earlier analysis of differences in sexual risk behaviours in the 2011 Uganda AIDS indicator survey (UAIS) alone, showed higher odds of engaging in sexual risk behaviours among circumcised men than the uncircumcised [39]. However, no comparison with the period before the implementation of the national SMC programme (2004 UAIS) has been done. The objectives of this paper were to estimate whether there are differences in the associations between sexual risk behaviours and circumcision status, and HIV sero-status and circumcision status between the 2004 and 2011; the periods before and after

implementing the SMC programme. We hypothesised a higher prevalence of sexual risk behaviours among circumcised men after information was made public that male circumcision offers partial protection from HIV.

Methods

Study design and sampling procedures

This study was based on data from two national surveys; the Uganda HIV/AIDS Sero-Behavioural Survey 2004 (which we refer to as UAIS in this paper) and the UAIS 2011. The 2004 UAIS was conducted before the implementation of the SMC programme while the 2011 UAIS was conducted after the SMC programme implementation was underway in the country. The two surveys have nationally representative samples obtained from stratified two-stage cluster sampling designs [40, 41]. In both surveys, clusters were selected from strata defined by urban/rural residence and geographical regions at the first stage, while the second stage involved selecting households for interview to obtain eligible respondents. Clusters were from a list of enumeration areas obtained from the 2002 Uganda population census (for the 2004 UAIS) and from the 2010 Uganda National Household Survey update of the 2002 Uganda population census (for the 2011 UAIS). At the first stage, 417 clusters in 2004 and 470 in 2011 were selected. The second stage in both surveys involved systematically sampling 25 households for interview in each cluster. Out of 9,842 eligible households, 9,529 were interviewed in 2004 (response rate, 96.1 %) and in these households 8,830 men completed individual interviews out of 9,905 eligible men (response rate, 89.1 %). In the 2011 survey, out of 11,434 occupied households, 11,340 were interviewed, giving a response rate of 99.2 %. In these households 9,588 men were interviewed out of the 9,983 eligible (response rate, 96 %). In both surveys, eligible respondents were permanent residents of the households or visitors who had spent the survey night in the household. All men 15–59 years were requested to voluntarily provide a blood sample for HIV testing. The response rate for HIV testing was 83.4 % in 2004, and 94.2 % in 2011. This paper is based on information from 14,875 men (6,906 in 2004 and 7,969 in 2011 UAIS) who reported to ever have had sex and had information on HIV status.

Data collection and variables

Data were collected between August 2004 and January 2005 for the 2004 UAIS and between February and September 2011 for the 2011 UAIS. Both surveys were led by the Uganda Ministry of Health working with ICF international, USA and Uganda Bureau of Statistics. Individual male interviews obtained data on respondents' self-reported circumcision status, their reported sexual behaviours, personal perceived risk of HIV infection, and knowledge of the protection offered by male circumcision against HIV infection (for 2011 alone), and socio-demographic characteristics (age, marital status, highest education level, survey region, ethnicity, residence, religion). Information on wealth status was also obtained from the household interviews and thus reflects the state of the household in which individual men were interviewed. All male interviews were conducted by trained male research assistants.

Laboratory technicians collected blood samples (venous blood or dried blood spots for those who refused venous blood draw) for HIV testing. Tests for the both surveys were conducted at a central laboratory of the Uganda Virus Research Institute using Murex HIV 1.2.0 (Abbott) assay. Samples that were HIV-reactive with Murex were re-tested with Vironostika HIV Uni-Form II Plus-O to confirm their sero-status, while ANILAB Systems HIV enzyme immunoassay was used to resolve discordant results. All the positive specimens and 5 % of the negative specimens were re-tested at the Centers for Disease Control laboratory in Uganda using the same testing algorithm, for quality control purposes. Further details on the tests and quality control are available in the main survey reports [40, 41].

The dependent variables were HIV sero-status obtained from blood sample tests in both surveys, and the following sexual risk behaviours [42] among sexually active circumcised and uncircumcised men: (a) having multiple sexual partners, (b) having had sex with non-marital partners, (c) non-use of condoms at the last non-marital sex, and (d) transactional sex (payment or receipt of money/gifts in exchange for sex). All these questions referred to behaviours that took place in the 12 months preceding each of the surveys. Condom use at last non-marital sex only included men who reported having such sex. The main independent variable was self-reported circumcision status, while other explanatory variables were socio-demographic characteristics, personal HIV risk perception as well as knowledge of the protection offered by male circumcision against HIV infection (for the 2011 UAIS).

Statistical analyses

Analyses were conducted using Stata version 13 (StataCorp 2013). Men's individual data files were sorted by unique identifiers to link them to the HIV sero-status data for each survey. Data from the two national surveys were then appended to get one dataset with 14,875 observations. A "survey" variable was generated to identify each of the surveys' datasets.

The measure of association used for these analyses were prevalence ratios (PR) and their corresponding 95 % confidence intervals [43–45] obtained via modified Poisson regression models using generalized linear models with

family (Poisson) and link (log). First we estimated the associations between male circumcision and sexual risk behaviours, or male circumcision and HIV sero-status for each of the surveys. In the adjusted analyses of sexual risk behaviour, socio-demographic characteristics were controlled for. When there was 10 % difference in the survey specific PRs, an interaction term between male circumcision and year of the survey was introduced in combined regression models for each of the sexual risk behaviours to further test if the survey period was important. Sample weights were used in the analyses. We also adjusted for clustering of observations within the same cluster by use of the cluster command in Stata.

Ethical considerations

Informed consent was obtained before conducting interviews, and separate consent was obtained for taking blood samples. For confidentiality purposes, all personal information that could potentially identify an individual (such as name and address) was destroyed before linking that HIV data to the socio-demographic and behavioural data collected in the individual questionnaires. In the 2004 survey, HIV test results were not provided from the survey but the respondents who wanted to know their HIV status were given a voucher for a free voluntary counselling and testing visit at a nearby health facility or an outreach point established by the survey project [41]. In 2011, home based rapid HIV testing was done and test results were provided on the same day for respondents who wanted to receive them, in addition to the central laboratory tests. Those who tested positive were told to obtain CD4 results six weeks after the interview at a nearby health facility. Counselling was also provided before and after testing by trained counsellors for those who opted to receive results [40].

Each survey protocol was reviewed and approved by the Science and Ethics Committee of the Uganda Virus Research Institute, ICF International's Institutional Review Board, and a review committee at the Centers for Disease Control and Prevention in Atlanta, USA. They were also cleared by the Ethics Committee of the Uganda National Council for Science and Technology. Permission to use both surveys' data was obtained from ICF international, USA, and the Ministry of Health, Uganda.

Results

Characteristics of respondents

A total of 14,875 men were analysed in the two surveys. We excluded 531 men from the analysis for this study; sixteen men in 2004 and one in the 2011 survey had indeterminate HIV test results, a further 458 men in 2004 and 51 in 2011 had missing HIV results, and five men in 2004 had missing circumcision status data.

In total 1,792 (26 %) and 2,228 (28 %) men reported that they were circumcised in 2004 and 2011, respectively. In 2004, two thirds (67 %) of men were married and 86 % lived in rural areas, while in 2011, 72 % were married and 81 % lived in rural areas. The majority (61 % in 2004 and 57 % in 2011) of the men had completed primary education but a higher proportion in 2011 (36 %) had completed secondary or higher education than in 2004 (29 %). In both surveys, 44 % were from households in the top two wealth quintiles, and the largest ethnic groups were Baganda, Banyankore and Langi/Acholi. Two thirds (65 %) in 2011 perceived themselves as being at high risk for HIV and 50 % knew that male circumcision reduced the risk of HIV infection to a man.

In 2004, over half of circumcised men (53 %) were from households in the top two wealth quintiles compared to only 44 % of the uncircumcised. Circumcised men were also more educated and more likely to be from urban areas than their uncircumcised counterparts in both surveys. Among the uncircumcised men, 6.8 % in 2004 and 7.8 % in 2011 tested positive for HIV while among the circumcised, 4.3 and 4.8 % in 2004 and 2011, respectively, tested positive.

In 2011, a larger proportion of circumcised than uncircumcised men knew that circumcision was protective (62 % against 46 %), but the personal perception of HIV risk was similar across both groups (64 % among circumcised, 66 % among the uncircumcised) (Table 1).

Prevalence of sexual risk behaviours

The prevalence of multiple and non-marital sexual partnerships was stable over the two survey periods. In the 2004 survey, 25 % of men reported sex with multiple partners while in 2011, 22 % reported this behaviour. Thirty five percent of men reported sex with a non-marital partner in 2004 compared to 33 % in 2011. However, the percentage of men who reported non-use of condoms at the last such sexual intercourse was higher in the 2011 survey (55 % compared to 48 % in 2004). There was an increase in the proportion of men who reported transactional sex from 1.2 % in 2004 to 2.7 % in 2011 (Table 2).

Sexual risk behaviour differences between circumcised and uncircumcised men in 2004 and 2011

The prevalence of all sexual risk behaviour was higher among the circumcised than the uncircumcised men in both survey periods (Table 2). When we adjusted for socio-demographic variables, circumcision status was significantly associated with having multiple sexual partners both in 2004 and 2011 (2004: adjusted PR 1.38; 95 % CI 1.26–1.51]; 2011: adjusted PR 1.23; 95 % CI 1.11–1.36), and having had sex with non-marital sexual partners in 2004 (adjusted PR 1.12; 95 % CI 1.06–1.20)

Table 1 Characteristics of circumcised and uncircumcised men 15–59 years, Uganda 2004 and 2011

Variables	2004 UAIS, n (%)			2011 UAIS, n (%)		
	Circumcised	Uncircumcised	All men	Circumcised	Uncircumcised	All men
Age						
15–24	492 (27.4)	1,318 (25.8)	1,809 (26.2)	610 (27.4)	1,331 (23.2)	1,941 (24.4)
25–34	549 (30.6)	1,664 (32.6)	2,213 (32.1)	708 (31.8)	1,751 (30.5)	2,460 (30.9)
35–44	434 (24.2)	1,162 (22.7)	1,596 (23.1)	508 (22.8)	1,492 (26.0)	2,000 (25.1)
45–59	317 (17.7)	970 (19.0)	1,288 (18.6)	402 (18.0)	1,166 (20.3)	1,568 (19.7)
Marital status						
Never married	418 (23.3)	1,170 (22.9)	1,589 (23.0)	523 (23.5)	1,127 (19.6)	1,649 (20.7)
Married	1,183 (66.0)	3,438 (67.2)	4,621 (66.9)	1,534 (68.9)	4,176 (72.7)	5,710 (71.7)
Divorced/Widowed	191 (10.6)	506 (9.9)	696 (10.1)	171 (7.7)	438 (7.6)	609 (7.7)
Residence						
Urban	352 (19.6)	605 (11.8)	957 (13.9)	604 (27.1)	916 (16.0)	1,520 (19.1)
Rural	1,440 (80.4)	4,509 (88.2)	5,949 (86.2)	1,624 (72.9)	4,825 (84.1)	6,449 (80.9)
Region						
Central	468 (26.1)	1,213 (23.7)	1,681 (24.4)	491 (22.0)	1,293 (22.5)	1,784 (22.4)
Kampala	332 (18.6)	645 (12.6)	978 (14.2)	215 (9.7)	353 (6.2)	568 (7.1)
Eastern	465 (25.9)	817 (16.0)	1,282 (18.6)	882 (39.6)	819 (14.3)	1,701 (21.4)
Northern	458 (25.6)	1,712 (33.5)	2,171 (31.4)	201 (9.0)	1,798 (31.3)	1,999 (25.1)
Western	69 (3.8)	725 (14.2)	794 (11.5)	439 (19.7)	1,477 (25.7)	1,916 (24.1)
Highest Education Level						
No Education	164 (9.1)	529 (10.4)	693 (10.1)	143 (6.4)	427 (7.4)	570 (7.2)
Primary	1,058 (59.1)	3,167 (62.0)	4,225 (61.3)	1,166 (52.3)	3,360 (58.5)	4,526 (56.8)
Secondary	442 (24.7)	1,066 (20.9)	1,509 (21.9)	697 (31.3)	1,458 (25.4)	2,155 (27.0)
Tertiary	125 (7.0)	342 (6.7)	468 (6.8)	222 (10.0)	496 (8.6)	718 (9.0)
Wealth level						
Low	496 (27.7)	1,999 (39.1)	2,495 (36.1)	654 (29.4)	2,297 (40.0)	2,952 (37.0)
Middle	347 (19.4)	1,012 (19.8)	1,359 (19.7)	428 (19.2)	1,103 (19.2)	1,531 (19.2)
High	949 (52.9)	2,103 (41.1)	3,052 (44.2)	1,146 (51.4)	2,341 (40.8)	3,486 (43.8)
Ethnicity						
Baganda	357 (19.9)	785 (15.4)	1,142 (16.6)	400 (18.0)	921 (16.1)	1,321 (16.6)
Banyakore	68 (3.8)	606 (11.9)	674 (9.8)	109 (4.9)	685 (11.9)	793 (10.0)
Iteso/Karimojong	47 (2.6)	621 (12.2)	668 (9.7)	64 (2.9)	667 (11.6)	730 (9.2)
Lugbara/Madi	184 (10.3)	292 (5.7)	477 (6.9)	113 (5.1)	282 (4.9)	396 (5.0)
Basoga	217 (12.1)	416 (8.1)	632 (9.2)	314 (14.1)	401 (7.0)	716 (9.0)
Langi/Acholi	21 (1.2)	765 (15.0)	786 (11.4)	19 (0.9)	877 (15.3)	896 (11.2)
Bakiga/Bafumbira	45 (2.5)	434 (8.5)	479 (7.0)	66 (2.9)	526 (9.2)	592 (7.4)
Bagisu/Sabiny/Bakonzo	395 (22.0)	54 (1.1)	449 (6.5)	646 (29.0)	34 (0.6)	680 (8.5)
Alur/Japadhola	76 (4.2)	321 (6.3)	397 (5.8)	73 (3.3)	315 (5.5)	387 (4.9)
Banyoro/Batooro	81 (4.5)	323 (6.3)	404 (5.9)	164 (7.4)	516 (9.0)	680 (8.5)
Others	300 (16.8)	488 (9.6)	788 (11.4)	261 (11.7)	516 (9.0)	777 (9.8)
Religion						
Non Moslem	931 (52.0)	5,085 (99.8)	6,016 (87.4)	1,202 (54.0)	5,729 (99.8)	6,931 (87.0)
Moslem	858 (48.0)	12 (0.2)	870 (12.6)	1,026 (46.1)	12 (0.2)	1,038 (13.0)

Table 1 Characteristics of circumcised and uncircumcised men 15–59 years, Uganda 2004 and 2011 *(Continued)*

Perceived HIV risk						
Low risk				743 (33.4)	1,721 (30.0)	2465 (30.9)
High risk/not sure				1,431 (64.2)	3,772 (65.7)	5202 (65.3)
Missing				54 (2.4)	248 (4.3)	302 (3.8)
Knows circumcision Reduces HIV risk						
No				826 (37.1)	3,029 (52.8)	3855 (48.4)
Yes				1,389 (62.4)	2,634 (45.9)	4023 (50.5)
Missing				13 (0.6)	78 (1.4)	91 (1.1)
HIV sero-status						
Negative	1,716 (95.7)	4,767 (93.2)	6,482 (93.9)	2,120 (95.2)	5,296 (92.3)	7,416 (93.1)
Positive	76 (4.3)	347 (6.8)	424 (6.1)	108 (4.8)	445 (7.8)	553 (6.9)
Total	1,792 (100)	5,114 (100)	6,906 (100)	2,228 (100)	5,741 (100)	7,969 (100)

in the 12 months preceding each survey. There was no difference in 2004 between the two groups regarding condom use at last non-marital sex. However, in 2011, circumcised men were less likely to report use of condoms at the last sex with a non-marital partner than uncircumcised men (adjusted PR 0.85; CI 0.76–0.96). Male circumcision status was not significantly associated with transactional sex in any of the two surveys. Other factors independently associated with sexual risk behaviours were age, marital status, education level, region of residence and wealth quintile of the man's household (Table 3).

There was interaction between the effect of circumcision and age on transactional sex. There was also interaction between the effect circumcision and age on non-marital sex. Circumcision was more strongly associated with these transactional sex among the older (25–59 years) than the younger men (15–24 years). This was also similar for men reporting non-marital sex. Interaction between the effect of circumcision and urban/rural residence on transactional sex was also observed. A slightly higher proportion of circumcised men in the rural areas reported engaging in transactional sex in 2011 than in the 2004 survey. A similar trend was observed among uncircumcised men in urban areas. These stratified results are however based on very few men reporting transactional sex.

The models with combined data from the two surveys with an interaction term for "circumcision status and

Table 2 Prevalence of Sexual risk behaviours among circumcised and uncircumcised men, Uganda 2004 and 2011

Variables	2004 UAIS, n (%)			2011 UAIS, n (%)		
	Circumcised	Uncircumcised	All men	Circumcised	Uncircumcised	All men
Had multiple sexual partners						
No	1,201 (67.0)	3,996 (78.1)	5,196 (75.2)	1,615 (72.5)	4,572 (79.7)	6,187 (77.6)
Yes	592 (33.0)	1,118 (21.9)	1,710 (24.8)	613 (27.5)	1,168 (20.4)	1,781 (22.4)
Total	1,792 (100)	5,114 (100)	6,906 (100)	2,228 (100)	5,741 (100)	7,969 (100)
Had transactional sex						
No	1,761 (98.2)	5,063 (99.0)	6,824 (98.8)	2,154 (96.7)	5,601 (97.6)	7,755 (97.3)
Yes	31 (1.8)	51 (1.0)	82 (1.2)	74 (3.3)	139 (2.4)	214 (2.7)
Total	1,792 (100)	5,114 (100)	6,906 (100)	2,228 (100)	5,741 (100)	7,969 (100)
Sex with a non-marital partner						
No	926 (59.3)	2,951 (67.8)	3,878 (65.5)	1,229 (61.6)	3,569 (69.8)	4,798 (67.5)
Yes	636 (40.7)	1,404 (32.2)	2,040 (34.5)	768 (38.5)	1,547 (30.2)	2,315 (32.6)
Total	1,562 (100)	4,355 (100)	5,918 (100)	1,997 (100)	5,116 (100)	7,114 (100)
Used a condom at last non marital sex						
No	290 (45.6)	692 (49.3)	983 (48.2)	448 (58.4)	819 (52.9)	1,267 (54.7)
Yes	346 (54.4)	711 (50.7)	1,057 (51.8)	320 (41.6)	728 (47.1)	1,048 (45.3)
Total	636 (100)	1,404 (100)	2,040 (100)	768 (100)	1,547 (100)	2,315 (100)

Table 3 Generalised linear models showing unadjusted and adjusted associations between sexual risk behaviours and circumcision status among men age 15–59 years, Uganda 2004 and 2011

	Had multiple sexual partners in last 12 months, PR [95 % CI]		Had sex with non-marital partner in last 12 months, PR [95 % CI]		Used a condom at last non marital sex, PR [95 % CI]		Transactional sex in last 12 months, PR [95 % CI]	
	2004	2011	2004	2011	2004	2011	2004	2011
Unadjusted: Circumcised								
No	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Yes	1.51* [1.38,1.65]	1.35* [1.23,1.49]	1.26* [1.17,1.37]	1.27* [1.17,1.38]	1.07 [0.98,1.18]	0.88* [0.79,0.99]	1.72 [1.06,2.81]	1.36 [0.99,1.88]
Adjusted[a]: Circumcised								
No	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Yes	1.38* [1.26,1.51]	1.23* [1.11,1.36]	1.12* [1.06,1.20]	1.05 [0.99,1.13]	1.00 [0.92,1.10]	0.85* [0.76,0.96]	1.56 [0.92,2.62]	1.23 [0.85,1.76]
Number of men	6886	7857	5919	6996	1945	2233	6886	7857

[a]Adjusted for highest education level, Age, Marital status, Survey region, Residence, and Wealth status
*$p < 0.05$

survey period" indicate that non-use of condoms at the last non-marital sex among circumcised men significantly varied by survey. There was a reduction in condom use in 2011, with circumcised men significantly less likely to report use. The association between circumcision and multiple sexual partners did not significantly vary between 2004 and 2011 (Table 4).

Male circumcision and HIV sero-status

Male circumcision was significantly associated with lower HIV prevalence across both surveys. After adjusting for background characteristics, circumcised men were 43 % less likely to test HIV positive in 2004 (adjusted PR 0.57; CI 0.44–0.75) and 34 % less likely in the 2011 UAIS (adjusted PR 0.66; CI 0.51–0.84) compared to the uncircumcised. The PRs did not change substantially after including sexual risk behaviours in the models (Table 5).

Discussion

Circumcised men reported higher prevalence of all sexual risk behaviours examined, except for transactional sex, than uncircumcised men. Use of condoms with the last non-marital sexual partner among circumcised men reporting non-marital sex was lower in 2011 compared with 2004. However, there was no significant change in the prevalence of other sexual risk behaviours between the two survey periods. Thus we conclude that there is limited evidence to support our hypothesis from the two UAISs. Even with higher reported prevalence of sexual risk behaviours, circumcised men were less likely to test HIV positive than the uncircumcised in both surveys.

It is plausible that the reduction in condom use among circumcised men could be linked to risk compensation due to higher awareness in 2011 that circumcision was protective since a similar reduction in reported condom

Table 4 Models of the associations between sexual risk behaviours and circumcision status with combined data from the 2004 and 2011 UAIS

	Had multiple sexual partners in last 12 months		Used a condom at last non marital sex	
	Unadjusted, PR [95 % CI]	Adjusted, PR [95 % CI]	Unadjusted, PR [95 % CI]	Adjusted, PR [95 % CI]
Circumcised[a]				
No	1.0	1.0	1.0	1.0
Yes	1.51* [1.37,1.66]	1.42* [1.29,1.56]	1.07 [0.96,1.20]	1.02 [0.93,1.12]
Survey				
2004 UAIS	1.0	1.0	1.0	1.0
2011 UAIS	0.93 [0.84,1.03]	0.92 [0.83,1.02]	0.93 [0.84,1.03]	0.99 [0.91,1.07]
Interaction term (circumcision and survey)	0.90 [0.77,1.04]	0.89 [0.77,1.03]	0.82* [0.70,0.97]	0.81* [0.71,0.93]
Number of men	14757	14743	4181	4178

[a]Adjusted for highest education level, Age, Marital status, Survey region, Residence, and Wealth status
*$p < 0.05$

Table 5 Generalised linear models showing unadjusted and adjusted associations between circumcision status and HIV test results among circumcised and uncircumcised men age 15–59 years, Uganda 2004 and 2011

	(1)	(2)	(3)	(4)	(5)	(6)
	Unadjusted: Tested HIV positive, 2004 PR (95 % CI)	Unadjusted: Tested HIV positive, 2011 PR (95 % CI)	Adjusted for background characteristics[a]: Tested HIV positive, 2004 PR (95 % CI)	Adjusted for background characteristics[a]: Tested HIV positive, 2011 PR (95 % CI)	Adjusted for background characteristics and sexual risk behaviours[b]: Tested HIV positive, 2004 PR (95 % CI)	Adjusted for background characteristics and sexual risk behaviours[b]: Tested HIV positive, 2011 PR (95 % CI)
Circumcised						
No	1.0	1.0	1.0	1.0	1.0	1.0
Yes	0.63* [0.48,0.82]	0.62* [0.49,0.80]	0.57* [0.44,0.75]	0.66* [0.51,0.84]	0.55* [0.41,0.73]	0.64* [0.49,0.83]
Number of men	6900	7857	6886	7857	5919	6996

[a]Adjusted for highest education level, Age, Marital status, Survey region, Residence, and Wealth status
[b]Adjusted for highest education level, Age, Marital status, Survey region, Residence, and Wealth status, Multiple sexual partners, Sex with a non-marital partner, Transactional sex
*$p < 0.05$

use at the last non-marital sex was not found among uncircumcised men. Since condoms are even more effective against heterosexual HIV infection than circumcision [46, 47], a reduction in their use because of male circumcision [48] would be a dangerous 'trade off'. Inconsistent condom use after circumcision has been associated with increased risk of HIV infection among young men in eastern Uganda [49]. This could significantly reduce the beneficial effect of circumcision against HIV infection, even with its reported high efficacy levels [21, 50].

Circumcised men reported higher prevalence of multiple sexual partners in both 2004 and 2011 than the uncircumcised. Although there were no significant differences in the association over time, i.e. indicating that any risk compensation due to the SMC campaign was limited at this early stage of the campaign, multiple sexual partnerships coupled with higher prevalence of non-use of condoms in 2011 is a potentially dangerous situation if it continues uncontrolled. If persons who have multiple sexual relationships also have concurrent partners, non-use of condoms is particularly risky because HIV infection can easily spread to several persons in the sexual network if one of the concurrent partners are newly infected (and thus more infectious) [51, 52]. Concurrency has been one of the main drivers of heterosexual HIV infections in sub Saharan Africa in the past decades [1, 53, 54].

Further, because of the early stages of the SMC campaign, it is possible that some previously circumcised men may not have fully understood partial risk reduction as opposed to eliminating the entire risk of HIV infection, leading to a misguided sense of sexual freedom [48]. These two concepts may still be hard for the population to understand fully even in the current stage of the campaign, a challenge that could further be complicated by appropriate translation into all local dialects for diverse populations ([55], p.26). It may be hard to convince all circumcised men as well as their sexual partners to continue using condoms after circumcision, even when engaging in high risk behaviours such as multiple sexual partnerships. However, if such behaviour continues unabated in the current 'mature' period of the SMC programme, this should have implications for circumcision-related social marketing messages that mainly focus on those intending to circumcise, and less on behaviours of men already circumcised.

Although a higher occurrence of sexual risk behaviours was reported among circumcised men, the HIV prevalence was significantly lower among this group than the uncircumcised in both 2004 and 2011 survey. The associations remained significant even after adjusting for sexual risk behaviours in the final model. Higher sexual risk behaviours among circumcised men did not seem to affect their HIV risk. This further supports the evidence for protection that male circumcision offers against HIV infection [3, 6–8]. However, caution needs to be consistently publicly re-echoed to ensure circumcised men embrace safer sexual behaviours even with knowledge that the intervention is protective.

The study has several limitations. First, the cross sectional nature of both surveys means inability to ascertain temporality and causation between circumcision, sexual behaviour and HIV status. Second, both circumcision status and the sexual risk behaviours were obtained using individual men's self-reports in face-to-face interviews which can be liable to social desirability [56] as well as recall biases when reporting for a 12 months periods. However, all the individual interviews were conducted by well-trained male interviewers using standardised questionnaires. The results from this study are from nationally representative samples of men with a high response rate and can be generalised to the general adult male

population in Uganda. The surveys are also drawn using the same standard sampling methodology from a similar target population 5 years apart. Even though they are not panel surveys, they can be comparable across the time points.

Conclusions

This study indicates higher prevalence of sexual risk behaviours among circumcised men in each survey and lower prevalence in use of condoms with non-marital sexual partners among circumcised men in 2011, suggesting possible risk compensation among some circumcised men. However, even with higher prevalence of sexual risk behaviours, circumcised men still had significantly lower HIV prevalence than their uncircumcised counterparts. Considering the high levels of sexual risk behaviours among men who are already circumcised observed in this study, the Ministry of Health and partners need to continue sensitising the sexually active population to use condoms especially when having multiple sexual partners, even when a man is circumcised. These messages should target both circumcised men and their sexual partners. Educating men undergoing circumcision also needs to be strengthened to avoid sexual risk taking post circumcision.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

SPSK conceived the study, led the data analysis and drafting of the manuscript. IFS and FM significantly contributed to the data analysis and writing of the manuscript. MD and LMA significantly contributed to writing and revising the manuscript. All authors read and approved the final manuscript.

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References

1. Wanyama OJ, Kaweesa KD, Kirungi W, Odiit M, Wabwire-Mangen F. Uganda HIV prevention response and modes of transmission analysis. Kampala: Uganda national AIDS commission, UNAIDS. 2009.
2. UNAIDS. The GAP report. Geneva: Joint United Nations Programme on HIV/AIDS; 2014.
3. Siegfried N, Muller M, Volmink J, Deeks J, Egger M, Low N, et al. Male circumcision for prevention of heterosexual acquisition of HIV in men. Cochrane Database Syst Rev. 2003;3:CD003362. doi:10.1002/14651858.CD003362.
4. Auvert B, Buve A, Ferry B, Carael M, Morison L, Lagarde E, et al. Ecological and individual level analysis of risk factors for HIV infection in four urban populations in sub-Saharan Africa with different levels of HIV infection. AIDS (London, England). 2001;15(4):S15–30.
5. Weiss HA, Quigley MA, Hayes RJ. Male circumcision and risk of HIV infection in sub-Saharan Africa: a systematic review and meta-analysis. AIDS (London, England). 2000;4(15):2361–70.
6. Gray RH, Kigozi G, Serwadda D, Makumbi F, Watya S, Nalugoda F, et al. Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. Lancet. 2007;369(9562):657–66. doi:10.1016/S0140-6736(07)60313-4. S0140-6736(07)60313-4 [pii].
7. Bailey RC, Moses S, Parker CB, Agot K, Maclean I, Krieger JN, et al. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomized controlled trial. Lancet. 2007;369(9562):643–56.
8. Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, Puren A. Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. PLoS Med. 2005;2(11):e298. doi:10.1371/journal.pmed.0020298.
9. Auvert B, Sobngwi-Tambekou J, Cutler E, Nieuwoudt M, Lissouba P, Puren A, et al. Effect of male circumcision on the prevalence of high-risk human papillomavirus in young men: results of a randomized controlled trial conducted in Orange Farm, South Africa. Am J Infect Dis. 2009;199(1):14–9. doi:10.1086/595566.
10. Tobian AA, Serwadda D, Quinn TC, Kigozi G, Gravitt PE, Laeyendecker O, et al. Male circumcision for the prevention of HSV-2 and HPV infections and syphilis. N Engl J Med. 2009;360(13):1298–309. doi:10.1056/NEJMoa0802556.
11. Wawer MJ, Tobian AA, Kigozi G, Kong X, Gravitt PE, Serwadda D, et al. Effect of circumcision of HIV-negative men on transmission of human papillomavirus to HIV-negative women: a randomised trial in Rakai. Uganda Lancet. 2011;377(9761):209–18. doi:10.1016/S0140-6736(10)61967-8.
12. Nurminen M. On the epidemiologic notion of confounding and confounder identification. Scand J Work Environ Health. 1997;23(1):64–8.
13. WHO/UNAIDS. New data on male circumcision and HIV prevention: policy and programme implications. Geneva: World Health Organisation and Joint United Nations Programme on HIV/AIDS; 2007.
14. WHO/UNAIDS. Joint strategic action framework to accelerate the scale-Up of voluntary medical male circumcision for HIV prevention in eastern and southern africa 2012–2016: world health organisation and joint united nations programme on HIV/AIDS. 2011.
15. Center for Communication Programs. The health communication partnership Uganda, final report. Kampala: Johns Hopkins Bloomberg School of Public Health CCP; 2012.
16. MOH. Safe male circumcision policy. Kampala: Uganda: Ministry of Health; 2010.
17. MOH. Safe male circumcision for HIV prevention. National communication strategy. Kampala: Uganda: Ministry of Health; 2010.
18. Uganda AIDS Commission. HIV and AIDS Uganda country progress report. Kampala: Uganda: UAC; 2013.
19. WHO. Global update on the health sector response to HIV. Geneva: Switzerland World Health Organization; 2014.
20. WHO UNAIDS and UNICEF. Global HIV/AIDS Response: Epidemic update and health sector progress towards Universal Access. Progress report2011
21. Hallett TB, Singh K, Smith JA, White RG, Abu-Raddad LJ, Garnett GP. Understanding the impact of male circumcision interventions on the spread of HIV in southern Africa. PLoS One. 2008;3(5):e2212. doi:10.1371/journal.pone.0002212.
22. Adams J, Hillman M. The risk compensation theory and bicycle helmets. Inj Prev. 2001;7(4):343.

23. Riess HT, Achieng MM, Otieno S, Ndinya-Achola JO, Bailey CR. "When I was circumcised I was taught certain things": risk compensation and protective sexual behavior among circumcised Men in kisumu, Kenya. PLoS One. 2010;5(8):1–9. doi:10.1371/journal.pone.0012366.
24. Hedlund J. Risky business: safety regulations, risk compensation, and individual behavior. Inj Prev. 2000;6:82–90.
25. Hogben M, Liddon N. Disinhibition and risk compensation: scope, definitions, and perspective. Sex Transm Dis. 2008;35(12):1009–10. doi:10.1097/OLQ.0b013e31818eb752.
26. Cassell MM, Halperin DT, Shelton JD, Stanton D. Risk compensation: the Achilles' heel of innovations in HIV prevention? Bmj. 2006;332(7541):605–7. doi:332/7541/605 [pii] 10.1136/bmj.332.7541.605.
27. Eaton L, Kalichman SC. Behavioral aspects of male circumcision for the prevention of HIV infection. Curr HIV/AIDS Rep. 2009;6(4):187–93.
28. Abbott SA, Haberland NA, Mulenga DM, Hewett PC. Female sex workers, male circumcision and HIV: a qualitative study of their understanding, experience, and HIV risk in Zambia. PLoS One. 2013;8(1):e53809. doi:10.1371/journal.pone.0053809.
29. Layer EH, Beckham SW, Momburi RB, Kennedy CE. Understanding the partial protection of male circumcision for HIV prevention among women in Iringa Region, Tanzania: an ethnomedical model. AIDS care. 2013;25(8):1045–50. doi:10.1080/09540121.2012.748874.
30. Kembabazi A, Bajunirwe F, Hunt PW, Martin JN, Muzoora C, Haberer JE, et al. Disinhibition in risky sexual behavior in men, but not women, during 4 years of antiretroviral therapy in rural, southwestern Uganda. PLoS One. 2013;8(7):e69634. doi:10.1371/journal.pone.0069634.
31. Sensalire S. Cross sectional cohort study to assess behavioral disinhibition following Antiretroviral Therapy (ART). 6th IAS conference on HIV pathogenesis, prevention and treatment; 17–20 July. Rome, Italy: International AIDS Society; 2011.
32. Andersson KM, Vardas E, Niccolai LM, Van Niekerk RM, Mogale MM, Holdsworth IM, et al. Anticipated changes in sexual risk behaviour following vaccination with a low-efficacy HIV vaccine: survey results from a South African township. Int J STD AIDS. 2012;23(10):736–41. doi:10.1258/ijsa.2009.009378.
33. Newman PA, Lee SJ, Duan N, Rudy E, Nakazono TK, Boscardin J, et al. Preventive HIV vaccine acceptability and behavioral risk compensation among a random sample of high-risk adults in Los Angeles (LA VOICES). Health Serv Res. 2009;44(6):2167–79. doi:10.1111/j.1475-6773.2009.01039.x.
34. Newman PA, Roungprakhon S, Tepjan S, Yim S. Preventive HIV vaccine acceptability and behavioral risk compensation among high-risk men who have sex with men and transgenders in Thailand. Vaccine. 2010;28(4):958–64. doi:10.1016/j.vaccine.2009.10.142.
35. Kong X, Kigozi G, Nalugoda F, Musoke R, Kagaayi J, Latkin C, et al. 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. Am J Epidemiol. 2012;176(10):875–85. doi:10.1093/aje/kws179.
36. Agot KE, Kiarie JN, Nguyen HQ, Odhiambo JO, Onyango TM, Weiss NS. Male circumcision in Siaya and Bondo Districts, Kenya: prospective cohort study to assess behavioral disinhibition following circumcision. Journal of acquired immune deficiency syndromes (1999). 2007;44(1):66–70. doi:10.1097/01.qai.0000242455.05274.20.
37. Ayiga N, Letamo G. Impact of male circumcision on HIV risk compensation through the impediment of condom use in Botswana. Afr Health Sci. 2011;11(4):550–9.
38. Westercamp N, Agot K, Jaoko W, Bailey RC. Risk compensation following male circumcision: results from a 2 year prospective cohort study of recently circumcised and uncircumcised men in Nyanza province. Kenya AIDS and behavior. 2014;18(9):1764–75. doi:10.1007/s10461-014-0846-4.
39. Kibira SP, Nansubuga E, Tumwesigye NM, Atuyambe LM, Makumbi F. Differences in risky sexual behaviors and HIV prevalence of circumcised and uncircumcised men in Uganda: evidence from a 2011 cross-sectional national survey. Reprod Health. 2014;11(1):25. doi:10.1186/1742-4755-11-25.
40. MOH and ICF International. Uganda AIDS indicator survey. Kampala: Uganda and Calverton Maryland, USA: Ministry of Health and ICF International2012; 2011.
41. MOH and ORC Macro. Uganda HIV/AIDS sero-behavioural survey 2004–2005. Calverton: Maryland, USA: Ministry of Health and ORC Macro; 2006.
42. UNAIDS. National AIDS Programmes: A Guide to Monitoring and Evaluation. Geneva, Switzerland: Joint United Nations Programme on HIV/AIDS2000 June. Report No.: UNAIDS/00.17E
43. Zocchetti C, Consonni D, Bertazzi PA. Relationship between prevalence rate ratios and odds ratios in cross-sectional studies. Int J Epidemiol. 1997;26(1):220–3.
44. Traissac P, Martin-Prevel Y, Delpeuch F, Maire B. Logistic regression vs other generalized linear models to estimate prevalence rate ratios. Rev Epidemiol Sante Publique. 1999;47(6):593–604.
45. Barros AJ, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. BMC Med Res Methodol. 2003;3:21. doi:10.1186/1471-2288-3-21.
46. Pinkerton SD, Abramson PR. Effectiveness of condoms in preventing HIV transmission. Soc Sci Med. 1997;44(9):1303–12.
47. Weller S, Davis K. Condom effectiveness in reducing heterosexual HIV transmission. Cochrane Database Syst Rev. 2001;3:CD003255. doi:10.1002/14651858.CD003255.
48. Grund JM, Hennink MM. A qualitative study of sexual behavior change and risk compensation following adult male circumcision in urban Swaziland. AIDS care. 2012;24(2):245–51. doi:10.1080/09540121.2011.596516.
49. Ediau M, Matovu JK, Byaruhanga R, Tumwesigye NM, Wanyenze RK. Risk factors for HIV infection among circumcised men in Uganda: a case–control study. J Int AIDS Soc. 2015;18(1):19312. doi:10.7448/IAS.18.1.19312.
50. Gray RH. Reducing HIV transmission: lessons from rakai and other African studies. International AIDS society. Rio de Janeiro, Brazil: Reported in UNAIDS and WHO (2007) Male circumcision: global trends and determinants of prevalence, safety and acceptability. WHO/UNAIDS; 2005.
51. Eaton JW, Hallett TB, Garnett GP. Concurrent sexual partnerships and primary HIV infection: a critical interaction. AIDS Behav. 2011;15(4):687–92. doi:10.1007/s10461-010-9787-8.
52. Pilcher CD, Tien HC, Eron Jr JJ, Vernazza PL, Leu SY, Stewart PW, et al. Brief but efficient: acute HIV infection and the sexual transmission of HIV. Asian J Infect Dis. 2004;189(10):1785–92. doi:10.1086/386333.
53. Morris M, Epstein H, Wawer M. Timing is everything: international variations in historical sexual partnership concurrency and HIV prevalence. PLoS One. 2010;5(11):e14092. doi:10.1371/journal.pone.0014092.
54. Mishra V, Simona B-VA. Concurrent sexual partnerships and HIV infection: evidence from national population-based surveys. DHS working papers No. 62. Calverton, Maryland: Macro International Inc; 2009.
55. WHO and UNAIDS. Male circumcision: global trends and determinants of prevalence, safety and acceptability. Geneva: World Health Organization, United Nations Joint Programme on HIV/AIDS and London School of Hygiene and Tropical Medicine; 2007.
56. Kelly CA, Soler-Hampejsek E, Mensch BS, Hewett PC. Social desirability bias in sexual behavior reporting: evidence from an interview mode experiment in rural Malawi. Int Perspect Sex Reprod Health. 2013;39(1):14–21. doi:10.1363/3901413.

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RESEARCH ARTICLE

Sexual Risk Behaviours and Willingness to Be Circumcised among Uncircumcised Adult Men in Uganda

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Abstract

Background

There has been substantial demand for safe male circumcision (SMC) in Uganda in the early programme scale-up phase. Research indicates that early adopters of new interventions often differ from later adopters in relation to a range of behaviours. However, there is limited knowledge about the risk profile of men who were willing to be circumcised at the time of launching the SMC programme, i.e., potential early adopters, compared to those who were reluctant. The aim of this study was to address this gap to provide indications on whether it is likely that potential early adopters of male circumcision were more in need of this new prevention measure than others.

Methods

Data were from the 2011 Uganda AIDS Indictor Survey (UAIS), with a nationally representative sample of men 15 to 59 years. The analysis was based on generalized linear models, obtaining prevalence risk ratios (PRR) with 95% confidence intervals (CI) as measures of association between willingness to be circumcised and multiple sexual partners, transactional sex, non-marital sex and non-use of condoms at last non-marital sex.

Results

Of the 5,776 men in the survey, 44% expressed willingness to be circumcised. Willingness to be circumcised was higher among the younger, urban and educated men. In the unadjusted analyses, all the sexual risk behaviours were associated with willingness to be circumcised, while in the adjusted analysis, non-marital sex (Adj PRR 1.27; CI: 1.16–1.40) and non-use of condoms at last such sex (Adj PRR 1.18; CI: 1.07–1.29) were associated with higher willingness to be circumcised.

Conclusion

Willingness to be circumcised was relatively high at the launch of the SMC programme and was more common among uncircumcised men reporting sexual risk behaviours. This indicates that the early adopters of SMC were likely to be in particular need of such additional HIV protective measures.

Introduction

There are several biomedical and behavioural interventions available to reduce the impact of the HIV epidemics in sub Saharan Africa, and partly as a result of this, incidence is declining in most of the region [1]. Voluntary medical male circumcision, also known as safe male circumcision, is one of the most recent such interventions. The foreskin is one of the prime sites for HIV entry [2] and male circumcision reduces heterosexual HIV transmission risk from infected women to men as indicated in several observational studies [3–5] and randomised controlled trials in Uganda [6], Kenya [7], and South Africa [8]. It also reduces the prevalence of high risk human papilloma virus that is most associated with cervical cancer [9] and incidence of herpes simplex virus infection among men [10], and genital ulcers in female partners of circumcised HIV negative men [11]. As a result of the overwhelming beneficial evidence, WHO and UNAIDS in 2007 recommended adoption of safe male circumcision (SMC) in fourteen priority countries with high HIV prevalence and low male circumcision levels, including Uganda [12, 13].

Following the WHO recommendation, the Uganda Ministry of Health has since 2007 implemented the safe male circumcision programme through activities aimed at educating leaders, health workers and the general public about SMC [14–16]. In the first years these efforts included public debates, radio and television talk shows, educational materials for health workers and their clients (flip charts, question and answer booklets for health workers, and brochures for men), and education and counselling through a national health hotline with counsellors [16, 17]. Between 2008 and 2009, over 350 health workers were also trained as trainers for their colleagues [18].

In 2011, the prevalence of male circumcision in Uganda among adult men 15–49 years was 27% [19] and until the WHO recommendation it was mainly practised for cultural and religious reasons among a few ethnic groups. As a result of the implementation of the safe male circumcision intervention, demand and service provision have increased. By September 2013, 1,117 health facilities offered SMC services, and from 2008 to 2013, one million four hundred thousand adult men were circumcised; 800,000 between October 2012 and September 2013 alone [15, 20, 21].

It is likely that those who have expressed willingness to be circumcised after the implementation of the safe male circumcision programme represent 'early adopters' [22] of the intervention in the Uganda. According to the diffusion of innovation theory, early adopters tend to have high social status, above-average education and are not particularly focused on traditions [22]. A study in Kenya found that early adopters of male circumcision perceived themselves to be at higher risk than later adopters [23]. Thus it is possible that potential early adopters may have a different sexual risk profile than the later adopters and those that do not get circumcised. However, there are few published studies elsewhere [23–25] and none in Uganda that have assessed the associations between sexual risk behaviours and willingness to be circumcised in the general population. In a country with a severe generalised HIV epidemic [19] and fears

of increased rate of new infections [1], examining willingness to be circumcised among uncircumcised men with varied sexual behaviours is important to assess whether the National safe male circumcision programme seems to be reaching those that have the highest need of increased protection. In conceptualising this study, we hypothesised that uncircumcised men who had higher sexual risk behaviours were more likely to be willing to be circumcised than their counterparts. We therefore set out to compare the sexual risk profile of men who were willing to be circumcised to those who were reluctant in the 2011 UAIS.

Methods

This study is based on data from the 2011 UAIS, which among other objectives obtained information about HIV/AIDS programme coverage indicators, such as sexual behaviour related to HIV. The survey sample was designed to produce representative estimates for the entire country, urban and rural areas separately, and for each region. The sample size considerations included an adult HIV prevalence of 6.4 obtained from the preceding national survey, a 10% relative error, a design effect of 1.69 and a response rate of 92% of adults for HIV testing [19]. A stratified two-stage cluster sampling design was used. Clusters were selected from each stratum at the first stage, while the second stage involved selecting households for interview to obtain eligible respondents. The strata were defined by urban/rural residence and geographical region. The clusters were from a list of enumeration areas obtained in the 2010 Uganda National Household Survey update of the 2002 Uganda Population Census. A total of 470 clusters were selected from the strata at the first stage, while the second stage involved systematically sampling 25 households for interview in each cluster to obtain a self-weighting sample. A total of 11,340 occupied households were interviewed, and in these households 9,588 men completed individual interviews. Eligible respondents were permanent residents of the households or visitors who had spent a night in the household before the survey. This paper is based on 5,776 cases of men age 15–59 years who were uncircumcised and reported to ever have had sex at the time of the survey.

Data collection and variables

The data were collected between February and September 2011 and the survey was led by the Ministry of Health working with ICF international, USA and Uganda Bureau of Statistics. Individual male interviews obtained data on respondents' self-reported circumcision status, willingness to be circumcised, their reported sexual behaviours, personal perceived risk of HIV infection, knowledge of the protection offered by male circumcision against HIV infection, and socio-demographic characteristics (age, marital status, highest education level, survey region, ethnicity, residence, religion). Information on wealth status was obtained from the household questionnaire and reflects the state of the household in which a man was interviewed, and not necessarily the wealth level of the individual men.

The primary outcome was willingness to be circumcised among all uncircumcised men in the sample. Men who had not decided whether they would like to be circumcised (3.9%) were recoded as unwilling. Our main independent variables were the following sexual risk behaviours [26]: (i) having multiple sexual partners in the 12 months preceding the survey, (ii) transactional sex (payment or receipt of money/gifts in exchange for sex) in the 12 months preceding the survey (iii) having had sex with a non-marital partner in the 12 months preceding the survey, and (iv) non-use of condoms at the last non-marital sex. 'Multiple sexual partners' was defined as reporting two or more sexual partners. Non-marital sex and condom use at last non-marital sex were collapsed into one variable with three levels; did not have non-marital sex in the previous 12 months, did not use a condom at last non-marital sex, used a

condom at last non marital sex. This was done to ensure that we had a complete sample of all uncircumcised men for the multivariable model, not only the sub sample that reported non-marital sex. Other explanatory variables were socio-demographic characteristics. In order to have more power to detect difference in willingness between different subgroups, we merged some of the original categories for some of the variables: All men who reported living with a woman as if married were coded as "currently married", and ethnic groups were categorised into those that are geographically close to each other or who share the tradition of male circumcision although their areas of origin are distant geographically. For example, the Bagisu, Sabiny and the Bakonjo were categorised into one group because they are traditionally circumcising ethnic groups in Uganda even though the Bakonjo are from a different region.

Statistical analyses

The analyses were conducted using STATA version 13 (StataCorp 2013). We explored variables of interest at univariate level, including examining their distribution and missing data. To estimate the associations between the sexual risk behaviours and willingness to be circumcised, we used a 'modified' Poisson regression model via a generalized linear model with family (Poisson) and link (log), obtaining prevalence risk ratios (PRR) with their 95% confidence intervals (CI) as a measure of association. PRRs were used because the outcome variable had prevalence above 10% [27–29]. We checked for correlation between the independent variables. In the multivariable analysis with all the sexual risk behaviours, we also adjusted for potential confounding from socio-demographic variables. Marital status was excluded in the multivariable analysis because it was highly correlated with non-marital sex and condom use at last such sex. Sample weights were used in order to account for differential non-response in the survey and we adjusted for clustering.

Ethical considerations

The UAIS 2011 was reviewed and approved by the Science and Ethics Committee of the Uganda Virus Research Institute, ICF International's Institutional Review Board, and a review committee at the Centers for Disease Control and Prevention in Atlanta. It was also cleared by the Ethics Committee of the Uganda National Council of Science and Technology. We obtained permission to use the UAIS data from ICF international, USA and the Uganda Ministry of Health.

Results

Description of uncircumcised men

Table 1 presents the characteristics of 5,776 uncircumcised men. Forty four percent (2,516) of uncircumcised men were willing to be circumcised. There was a higher prevalence of willingness to be circumcised among younger men aged 15 to 24 (59.3%) and 25 to 34 years (48.9%), men from urban areas (49.7%) those with secondary (50.6%) or higher education (47.1%) as well as among those from households in the top two wealth quintiles. Forty seven percent of uncircumcised men who perceived themselves to be at high risk of contracting HIV were willing to be circumcised compared to 42.6% of those who had low self-perceived risk (chi square p value = 0.006). Among uncircumcised men who knew that circumcision was protective against HIV, 58.8% were willing to be circumcised while only 31% of those who did not have this knowledge were willing.

Nearly seven in ten men who had transactional sex in the 12 months preceding the survey were willing to be circumcised compared to only 42% of those who did not report such sex.

Table 1. Characteristics of uncircumcised men willing to be circumcised and those who were not willing, Uganda 2011.

Variables	Willingness to be circumcised		
	Not willing (%)	Willing (%)	Total
Age			
15–24	546 (40.7)	795 (59.3)	1341 (100)
25–34	903 (51.1)	864 (48.9)	1767 (100)
35–44	925 (61.7)	574 (38.3)	1498 (100)
45–59	886 (75.8)	283 (24.2)	1169 (100)
Residence			
Urban	470 (50.3)	465 (49.7)	935 (100)
Rural	2790 (57.6)	2051 (42.4)	4841 (100)
Highest education level			
No Education	305 (70.0)	131 (30.0)	436 (100)
Primary	1965 (58.3)	1406 (41.7)	3371 (100)
Secondary	722 (49.4)	740 (50.6)	1462 (100)
Higher	268 (52.9)	239 (47.1)	507 (100)
Survey region			
Central	648 (49.9)	651 (50.1)	1299 (100)
Kampala	167 (46.4)	192 (53.6)	359 (100)
Eastern	394 (47.9)	429 (52.2)	823 (100)
Northern	1256 (69.5)	551 (30.5)	1807 (100)
Western	795 (53.5)	692 (46.5)	1488 (100)
Wealth quintile			
Lowest	777 (67.3)	377 (32.7)	1154 (100)
Second	699 (61.0)	447 (39.0)	1146 (100)
Middle	604 (55.0)	494 (45.0)	1098 (100)
Fourth	590 (51.8)	550 (48.2)	1140 (100)
Highest	590 (47.7)	647 (52.3)	1237 (100)
Marital status			
Never married	475 (41.6)	668 (58.5)	1142 (100)
Married	2540 (60.5)	1657 (39.5)	4197 (100)
Divorced/Separated	246 (56.3)	191 (43.7)	437 (100)
Ethnicity			
Baganda	480 (51.6)	451 (48.5)	931 (100)
Banyankore	362 (52.5)	328 (47.5)	689 (100)
Iteso/ Karimajong	433 (64.5)	238 (35.5)	671 (100)
Lugbara/Madi/ Alur/Jopadhola	352 (57.9)	255 (42.1)	607 (100)
Basoga	180 (44.9)	221 (55.1)	400 (100)
Langi/Acholi	641 (72.7)	240 (27.3)	881 (100)
Bakiga/Bafumbira	319 (60.2)	211 (39.8)	530 (100)
Bagisu/Sabiny/ Bakonzo	5 (14.3)	30 (85.7)	35 (100)
Banyoro/Batooro	240 (46.2)	280 (53.8)	520 (100)
Others	250 (48.8)	262 (51.2)	512 (100)
Religion			
Catholic	1711 (59.0)	1188 (41.0)	2899 (100)
Anglican	1178 (52.9)	1049 (47.1)	2227 (100)
Pentecostal	227 (63.2)	132 (36.8)	359 (100)
Others	145 (49.5)	147 (50.5)	292 (100)

(*Continued*)

Table 1. (*Continued*)

Variables	Willingness to be circumcised		
	Not willing (%)	Willing (%)	Total
Perceived HIV risk			
Low risk	2189 (57.5)	1621 (42.6)	3810 (100)
High risk/not sure	904 (52.6)	814 (47.4)	1718 (100)
Missing	167 (67.3)	81 (32.7)	248 (100)
Knows SMC reduces HIV risk			
No	2103 (69.0)	945 (31.0)	3048 (100)
Yes	1091 (41.2)	1556 (58.8)	2647 (100)
Missing	66 (81.1)	15 (18.9)	81 (100)
Used a condom at last non-marital sex			
Did not have non marital sex	2628 (62.4)	1586 (37.6)	4214 (100)
Did not use a condom	371 (44.8)	456 (55.2)	827 (100)
Used a condom	262 (35.6)	473 (64.4)	735 (100)
Had multiple sexual partners			
No	2678 (58.1)	1933 (41.9)	4611 (100)
Yes	582 (49.96)	583 (50.04)	1165 (100)
Transactional sex			
No	3217 (57.1)	2420 (42.9)	5637 (100)
Yes	43 (30.9)	96 (69.1)	140 (100)
Total	**3260 (56.4)**	**2516 (43.6)**	**5776 (100)**

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Among men who reported sex with a non-marital partner and used a condom at the last such sex, 64.4% were willing to be circumcised, while among those who did not use condoms at last non-marital sex, 55.2% were willing. Only 37.2% among those who did not report sex with a non-marital partner were willing to be circumcised (Table 1).

Association between sexual risk behaviours and willingness to be circumcised

In Table 2, all the sexual risk behaviours were significantly associated with willingness to be circumcised in the unadjusted analyses. Uncircumcised men who reported having multiple sexual partners in the 12 months preceding the survey were more likely to be willing to be circumcised (PRR 1.19; 95% CI: 1.11–1.29) than those who did not report multiple sexual partners. We explored if there were differences among men who reported only two sexual partners and those that had three or more, but this was not significant (results not shown). Men who reported to have engaged in transactional sex in the 12 months period were also significantly more likely to be willing to be circumcised than their counterparts (PRR 1.61; 95% CI: 1.39–1.87). However, the adjusted associations were not significant for these two sexual risk behaviours.

Uncircumcised men who reported use of condoms at the last sex with a non-marital partner in the 12 months period were 1.71 times more likely to be willing to be circumcised than those who did not have non-marital sex, while those who had sex with a non-marital partner without condoms were also 1.47 times more likely to be willing to be circumcised that those who did not report non-marital sex. In the multivariable model the associations were still significant, and those who did used a condom during the last non-marital sexual intercourse appeared to be even more willing than those who did not use a condom (but there was a minor overlap in the confidence intervals for the PRR for the two categories) (Table 2).

Table 2. Generalised linear models showing unadjusted and adjusted associations between willingness to be circumcised and sexual risk behaviours and socio-demographic variables among uncircumcised men age 15–59 years, Uganda 2011.

	Willing to be circumcised. PRR [95% CI]	
	Unadjusted	**Multivariable model**
Used a condom at last non-marital sex		
Did not have non marital sex	1.00	1.00
Did not use a condom	1.47* [1.35,1.59]	1.18* [1.07,1.29]
Used a condom	1.71* [1.59,1.85]	1.27* [1.16,1.40]
Had multiple sexual partners		
No	1.00	1.00
Yes	1.19* [1.11,1.29]	1.05 [0.97,1.14]
Transactional sex		
No	1.00	1.00
Yes	1.61* [1.39,1.87]	1.14 [0.97,1.33]
Age		
15–24	2.45* [2.17,2.77]	2.13* [1.87,2.42]
25–34	2.02* [1.78,2.29]	1.92* [1.69,2.17]
35–44	1.58* [1.38,1.81]	1.53* [1.34,1.75]
45–59	1.00	1.00
Survey region		
Northern	1.0	1.00
Central	1.64* [1.49,1.82]	1.48* [1.33,1.65]
Kampala	1.76* [1.55,1.99]	1.45* [1.22,1.72]
Eastern	1.71* [1.55,1.89]	1.61* [1.46,1.79]
Western	1.53* [1.38,1.69]	1.37* [1.23,1.52]
Residence		
Rural	1.00	1.00
Urban	1.17* [1.08,1.28]	0.89[0.78,1.01]
Wealth quintile		
Lowest	1.00	1.00
Second	1.19* [1.06,1.34]	1.07 [0.96,1.20]
Middle	1.38* [1.23,1.54]	1.14* [1.02,1.28]
Fourth	1.48* [1.32,1.65]	1.18* [1.05,1.32]
Highest	1.60* [1.44,1.79]	1.22* [1.07,1.40]
Highest Education level		
No education	1.00	1.00
Primary	1.39* [1.17,1.65]	1.20* [1.02,1.41]
Secondary	1.69* [1.42,2.01]	1.29* [1.09,1.53]
Higher	1.57* [1.28,1.92]	1.27* [1.04,1.55]
Religion		
Catholic	1.00	1.00
Anglican	1.15* [1.07,1.23]	1.07 [1.00,1.14]
Pentecostal	0.90 [0.76,1.06]	0.87 [0.75,1.01]
Others	1.23* [1.08,1.41]	1.15* [1.02,1.30]
Number of men	***5682***	***5682***

*$p<0.05$

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Other factors in the adjusted model that were independently associated with willingness to be circumcised were: age, region of residence, wealth quintile of the man's household, education and religion. Willingness to be circumcised increased with decreasing age. Uncircumcised educated men were more likely to be willing to be circumcised than their uneducated colleagues, while men from households in the middle to highest wealth quintiles were more likely to be willing to be circumcised than those from the lowest wealth quintile. Men from the northern region were the least likely to be willing to be circumcised compared to all other survey regions (Table 2).

Discussion

This study found high levels of willingness to be circumcised among uncircumcised men who reported sexual risk behaviours than those who did not report such behaviours in the 2011 UAIS. Forty four percent of men were willing to be circumcised. Our results indicate a higher likelihood of willingness to be circumcised among men who reported sex with multiple partners and transactional sex, as well as among those reporting sex with a non-marital partner. In the multivariable model those who did not use a condom during the last non-marital sex in preceding 12 months were most likely to report willingness to be circumcised. These results support the a priori hypothesis. Other factors associated with willingness to be circumcised were; young age, urban residence, higher wealth quintile of the man's household, having an education, and not being from northern region.

The findings in this study indicate that the willingness to be circumcised was higher among those that had engaged in more risky behaviours. In other recent cross sectional studies conducted in 2010/ 2011 in Zimbabwe [24] and 2008 in Botswana [25], willingness to be circumcised was also associated with more risky sexual behaviours such as having multiple sexual partners [24, 25], non-marital partners, and having engaged in transactional sex [24]. Even those who had used a condom at last non-marital sex were more willing than those who had not had non-marital sex in the preceding year, which could indicate that they did not think condoms gave full protection or that they had not used condoms consistently at all higher risk sexual encounters. Men who engage in sexual risk behaviours may see circumcision as protection from the risk of HIV or other sexually transmitted infections. This could explain their willingness to be circumcised. It could also further indicate that those in most need of further HIV protection are actually the easiest to reach for circumcision. However, such men may need tailored interventions after circumcision to reduce their sexual risk behaviours, and in particular to reduce the probability of sexual risk compensation [30]. Interventions that target continuation or enhancement of consistent use of condoms and reduction in number of sexual partners would probably positively affect behaviour among men who undergo circumcision.

There was a consistently inverse relationship between increasing age group and willingness to be circumcised. Younger uncircumcised men were more likely to be willing to be circumcised, and this was consistent across both the bivariate and multivariable analyses. Circumcision is probably more appealing to younger men compared to older ones because relatively younger men may have a higher personal perception of HIV risk, for which circumcision is protective. Younger men are also more likely to be innovators and early adopters of new interventions [22] such as circumcision. Similar associations between young age and interest in circumcision were found in a Zimbabwe study [24].

Men from the northern region were least likely to be willing to circumcise than all other regions. This region also had the lowest prevalence in the country at the time of the survey in 2011 [19, 31]. It is difficult to find a plausible explanation for the low willingness to be circumcised, although cultural traditions could have played a role [32].

Education was positively associated with willingness to be circumcised. Education plays a positive role in acceptance of health interventions and more educated men may easily seek more information than the uneducated counterparts. Other studies have also found associations between education and willingness to be circumcised or circumcision preference [24, 25, 33]. In exploring the relationship between variables in the data, we found educated men to have a higher knowledge about the protective effect of circumcision (data not presented). Such exposure to knowledge among the educated men could also explain the higher willingness to accept the intervention [33, 34].

The strengths of this study are that it is based on data from a nationally representative sample of uncircumcised men with high response rates. The socio-demographic characteristics of the weighted sample of men are similar to the national demographic profile and the results can thus probably be generalised to the adult male population in Uganda. This study uses PRRs in measuring associations, which are more conservative than the commonly used prevalence odds ratios in many studies of this kind [35, 36]. Although the observed risk ratios are not very high, they are more credible. However, there are some limitations. This is based on cross-sectional survey data and causal inferences cannot be drawn. It is also worth noting that expressed willingness may not necessarily lead to actual circumcision although behaviours often begin with intention. The study findings could also be limited by social desirability bias in men's self-reporting of sexual risk behaviours in face to face interviews and recall bias when reporting on a 12 months period [27]. However, social desirability bias in underreporting sexual risk behaviours is more likely to affect women than men [29, 37] in the typical Ugandan context given that women are socially expected to have less adventurous sexual lifestyles [38]. The interviews were conducted by well-trained male interviewers, further reducing the risk of such bias. If the biases exist, they are likely to be non-differential because reporting of sexual behaviour was not likely in any way to be linked with reporting willingness to circumcise. The findings are also consistent with other studies in the sub Saharan African region [24, 25], further indicating their validity.

In conclusion, the findings from this study indicate higher likelihood of willingness to be circumcised among men with more sexual risk taking behaviours in Uganda. This indicates that the potential early adopters of male circumcision may be those in the greatest need of such an added protective measure. However, this does not imply that further promotion of SMC to reach the late adopters is not needed. Considering the high level of risk behaviour among potential early adopters, sustained efforts by the Ministry of Health and partners to sensitise and educate men undergoing circumcision on the importance of continued use of condoms are necessary to avoid risk compensation after the circumcision procedure.

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Author Contributions

Conceived and designed the experiments: SPSK IFS FM. Analyzed the data: SPSK. Wrote the paper: SPSK FM MD LMA IFS. Contributed significantly to data analysis: FM IFS.

References

1. UNAIDS, The Gap Report. 2014, Joint United Nations Programme on HIV/AIDS: Geneva.

2. Wabwire-Mangen F., Odiit M., Kirungi W., Kaweesa K., D., and Wanyama O., J., Uganda HIV Prevention Response and Modes of Transmission Analysis. 2009, Uganda National AIDS Commission, UNAIDS: Kampala.
3. Siegfried N., Muller M., Volmink J., Deeks J., Egger M., Low N., et al., Male circumcision for prevention of heterosexual acquisition of HIV in men. Cochrane Database Syst Rev, 2003(3:): p. CD003362. PMID: 12917962
4. Auvert B., Buve A., Ferry B., Carael M., Morison L., Lagarde E., et al., Ecological and individual level analysis of risk factors for HIV infection in four urban populations in sub-Saharan Africa with different levels of HIV infection. AIDS, 2001. 15 Suppl 4: p. S15–30. PMID: 11686462
5. Weiss H.A., Quigley M.A., and Hayes R.J., Male circumcision and risk of HIV infection in sub-Saharan Africa: a systematic review and meta-analysis. AIDS, 2000. 14(15): p. 2361–70. PMID: 11089625
6. Gray R.H., Kigozi G., Serwadda D., Makumbi F., Watya S., Nalugoda F., et al., Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. Lancet, 2007. 369(9562): p. 657–66. PMID: 17321311
7. Bailey R.C., Moses S., Parker C.B., Agot K., Maclean I., Krieger J.N., et al., Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomized controlled trial. Lancet, 2007. 369(9562): p. 643–656. PMID: 17321310
8. Auvert B., Taljaard D., Lagarde E., Sobngwi-Tambekou J., Sitta R., and Puren A., Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. PLoS Med, 2005. 2(11): p. e298. PMID: 16231970
9. Auvert B., Sobngwi-Tambekou J., Cutler E., Nieuwoudt M., Lissouba P., Puren A., et al., Effect of male circumcision on the prevalence of high-risk human papillomavirus in young men: results of a randomized controlled trial conducted in Orange Farm, South Africa. J Infect Dis, 2009. 199(1): p. 14–9. doi: 10.1086/595566 PMID: 19086814
10. Tobian A.A., Serwadda D., Quinn T.C., Kigozi G., Gravitt P.E., Laeyendecker O., et al., Male circumcision for the prevention of HSV-2 and HPV infections and syphilis. N Engl J Med, 2009. 360(13): p. 1298–309. doi: 10.1056/NEJMoa0802556 PMID: 19321868
11. Wawer M.J., Tobian A.A., Kigozi G., Kong X., Gravitt P.E., Serwadda D., et al., Effect of circumcision of HIV-negative men on transmission of human papillomavirus to HIV-negative women: a randomised trial in Rakai, Uganda. Lancet, 2011. 377(9761): p. 209–18. doi: 10.1016/S0140-6736(10)61967-8 PMID: 21216000
12. WHO/UNAIDS, New Data on Male Circumcision and HIV Prevention: Policy and Programme Implications. 2007, World Health Organisation and Joint United Nations Programme on HIV/AIDS,: Geneva.
13. WHO/UNAIDS, Joint Strategic Action Framework to Accelerate the Scale-Up of Voluntary Medical Male Circumcision for HIV Prevention in Eastern and Southern Africa 2012–2016. 2011, World Health Organisation and Joint United Nations Programme on HIV/AIDS,.
14. MOH, Safe male circumcision for HIV prevention. National communication strategy. 2010, Ministry of Health: Kampala, Uganda.
15. Uganda AIDS Commission, HIV and AIDS Uganda Country Progress Report 2013. 2014, UAC: Kampala, Uganda.
16. Center for Communication Programs, The Health Communication Partnership Uganda, Final Report. 2012, Johns Hopkins Bloomberg School of Public Health, CCP: Kampala.
17. Health Communication Partnerships, *HCP* 2010 Survey Highlights: Safe male circumcision for HIV prevention 2010, HCP: Kampala.
18. MUSPH, School of Public Health, Makerere University College of Health Sciences. Annual Report Aug 2009—July 2010. 2010, Makerere University: Kampala.
19. MOH and ICF International, Uganda AIDS Indicator Survey 2011. 2012, Ministry of Health and ICF International: Kampala, Uganda and Calverton Maryland, USA.
20. WHO UNAIDS and UNICEF, *Global HIV/AIDS Response: Epidemic update and health sector progress towards Universal Access*. *Progress report*. 2011.
21. WHO, Global update on the health sector response to HIV, 2014. 2014, World Health Organization: Geneva, Switzerland
22. Rogers E.M., Diffusion of Innovations. Third ed. 1983, New York: The Free Press.
23. Westercamp N., Agot K., Jaoko W., and Bailey R.C., Risk compensation following male circumcision: results from a two-year prospective cohort study of recently circumcised and uncircumcised men in Nyanza province, Kenya. AIDS Behav, 2014. 18(9): p. 1764–75. doi: 10.1007/s10461-014-0846-4 PMID: 25047688

24. Chikutsa A., Ncube C.A., and Mutsau S., Association between wanting circumcision and risky sexual behaviour in Zimbabwe: evidence from the 2010–11 Zimbabwe demographic and health survey. Reproductive Health, 2015. 12(15).

25. Keetile M. and Rakgoasi S.D., Male Circumcision; willingness to undergo safe male circumcision and HIV risk behaviors among men in Botswana. African Population Studies, 2014. 28(3): p. 1345–61.

26. UNAIDS, National AIDS Programmes: A Guide to Monitoring and Evaluation. 2000, Joint United Nations Programme on HIV/AIDS: Geneva, Switzerland.

27. Kelly C.A., Soler-Hampejsek E., Mensch B.S., and Hewett P.C., Social desirability bias in sexual behavior reporting: evidence from an interview mode experiment in rural Malawi. Int Perspect Sex Reprod Health, 2013. 39(1): p. 14–21. doi: 10.1363/3901413 PMID: 23584464

28. Mnyika K.S., Klepp K.I., Kvale G., and Ole-Kingori N., Determinants of high-risk sexual behaviour and condom use among adults in the Arusha region, Tanzania. Int J STD AIDS, 1997. 8(3): p. 176–83. PMID: 9089028

29. Schroder K.E.E., Carey M.P., and Vanable P.A., Methodological Challenges in Research on Sexual Risk Behavior: II. Accuracy of Self-Reports. Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine, 2003. 26(2): p. 104–123.

30. Cassell M.M., Halperin D.T., Shelton J.D., and Stanton D., Risk compensation: the Achilles' heel of innovations in HIV prevention? BMJ, 2006. 332(7541): p. 605–7. PMID: 16528088

31. UBOS and ICF International, Uganda Demographic and Health Survey 2011. 2012, Uganda Bureau of Statistics (UBOS) and ICF International Inc.: Kampala, Uganda and Calverton, Maryland.

32. Kitara D., Lagoro, Ocero A., Lanyero J., and Ocom F., Roll-out of Medical Male circumcision (MMC) for HIV prevention in non-circumcising communities of Northern Uganda. The Pan African Medical Journal, 2013. 15(100).

33. Westercamp M., Agot K.E., Ndinya-Achola J., and Bailey R.C., Circumcision preference among women and uncircumcised men prior to scale-up of male circumcision for HIV prevention in Kisumu, Kenya. AIDS Care, 2012. 24(2): p. 157–66. doi: 10.1080/09540121.2011.597944 PMID: 21854351

34. Muhangi D., Factors that Influence Decisions to Seek Medical Male Circumcision Services: A Report of Qualitative Research in Kampala, Kayunga, Pallisa, Kasese and Mbale Districts—Uganda. 2010, USAID/JHU: Kampala, Uganda.

35. Barros A.J. and Hirakata V.N., Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. BMC Med Res Methodol, 2003. 3: p. 21. PMID: 14567763

36. Axelson O., Fredriksson M., and Ekberg K., Use of the prevalence ratio v the prevalence odds ratio as a measure of risk in cross sectional studies. Occup Environ Med, 1994. 51(8): p. 574. PMID: 7951785

37. Kelly C.A., Hewett P.C., Mensch B.S., Rankin J.C., Nsobya S.L., Kalibala S., et al., Using biomarkers to assess the validity of sexual behavior reporting across interview modes among young women in Kampala, Uganda. Stud Fam Plann, 2014. 45(1): p. 43–58. doi: 10.1111/j.1728-4465.2014.00375.x PMID: 24615574

38. Brawley E.M., The Relationship Between Gender Norms and Expectations and the Sexual Practices of Ugandan Men, in Health Services. 2006, University of Washington: Washington.

III

PLOS ONE

RESEARCH ARTICLE

Exploring drivers for safe male circumcision: Experiences with health education and understanding of partial HIV protection among newly circumcised men in Wakiso, Uganda

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Abstract

Introduction

About 2.5 million men have voluntarily been circumcised since Uganda started implementing the WHO recommendation to scale up safe male circumcision to reduce HIV transmission. This study sought to understand what influences men's circumcision decisions, their experiences with health education at health facilities and their knowledge of partial HIV risk reduction in Wakiso district.

Methods

Data were collected in May and June 2015 at five public health facilities in Wakiso District. Twenty-five in-depth interviews were held with adult safe male circumcision clients. Data were analysed using thematic network analysis.

Findings

Safe male circumcision decisions were mainly influenced by sexual partners, a perceived need to reduce the risk of HIV/STIs, community pressure and other benefits like hygiene. Sexual partners directly requested men to circumcise or indirectly influenced them in varied ways. Health education at facilities mainly focused on the surgical procedure, circumcision benefits especially HIV risk reduction, wound care and time to resumption of sex, with less focus on post-circumcision sexual behaviour. Five men reported no health education. All men reported that circumcision only reduces and does not eliminate HIV risk, and could mention ways it protects, although some extended the benefit to direct protection for women

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and prevention of other STIs. Five men thought social marketing messages were 'misleading' and feared risk compensation within the community.

Conclusions

Participants reported positive community perception about safe male circumcision campaigns, influencing men to seek services and enabling female partners to impact this decision-making process. However, there seemed to be gaps in safe male circumcision health education, although all participants correctly understood that circumcision offers only partial protection from HIV. Standard health education procedures, if followed at health facilities offering safe male circumcision, would ensure all clients are well informed, especially about post-circumcision sexual behaviour that is key to prevention of risk compensation.

Introduction

Safe male circumcision (SMC) is a one off long-term efficacious intervention for both individual and population HIV prevention [1–4] recommended in countries where its prevalence is low and the HIV epidemic is generalised [5, 6]. Studies published after the 2007 World Health Organization (WHO) recommendation to scale up SMC, have shown further benefits of SMC beyond HIV prevention; a reduction in the prevalence and incidence of high risk Human Papilloma virus [7, 8], incidence of Herpes Simplex [9], and genital ulcers in female partners of circumcised HIV negative men [10]. It also reduces the risk of penile cancer, prevents inflammation of the glans and the foreskin, makes it easier to keep the penis clean, and prevents potential development of scar tissue on the foreskin [11].

International agencies globally make use of targets to achieve health and development goals that motivate country governments to accelerate progress. Target five of the UNAIDS 2016–2021 strategy aims to have 27 million additional medical circumcisions conducted by 2020 in high HIV prevalence settings like Uganda, as part of integrated sexual and reproductive health services for men [12]. This is in line with sustainable development goal 3.3 that aims in part, to end the AIDS epidemic [13]. The Copenhagen consensus identified scaling up SMC to 90% of HIV negative men by 2030 as one of the best investments to realise the post-2015 development agenda. The estimated benefit is 28 US$ for every dollar invested [14] in HIV hyper endemic countries (with adult prevalence >15%). The benefit of investing in SMC is also high for countries with epidemic HIV [15, 16] such as Uganda.

Circumcision prevalence among men 15 to 49 years in Uganda was 27% in 2011 [17], but with high levels of willingness to be circumcised among uncircumcised men [18]. Those who expressed willingness at the time also seemed to be the ones with the largest need for protective measures [18]. SMC has since been promoted using mass media, posters, billboards, and automobiles with loudspeakers that drive through communities, especially when outreach services are planned. These methods help to mobilise men to come for the services. The public health facilities offering SMC have displayed logos indicating the availability of this free service while some private facilities also provide the services at a cost. In 2014, over 3.2 million males were circumcised in the 14 WHO-priority countries, bringing the cumulative total to 9.1 million men since the recommendation was first made, and Uganda was one of the better performers with 878,109 men circumcised. The circumcision prevalence among adult men in Uganda has been reported to be as high as 40% in 2014, with 2,114,461 men circumcised under the SMC program between 2010 and 2014 [19]. Only Kenya, Ethiopia and Tanzania achieved higher coverage [20].

WHO/UNAIDS recommends that provision of circumcision at health facilities should include health education and counselling for all men. There should be group education sessions for clients to have basic information on sexual and reproductive health, including HIV, before additional individual counselling is conducted. Circumcision-specific education should include information about the health benefits of SMC, how the procedure is conducted and potential complications as well as when to resume sex; it should also inquire about and correct myths among clients [11].

It is vital for SMC clients to appreciate that circumcision provides only partial protection against HIV. Such an understanding may motivate them to take other precautions beyond circumcision, such as using condoms and being faithful to one partner, to further reduce their chances of HIV infection. Since comprehensive information about partial HIV risk reduction is ideally provided as part of the health education [11] at health facilities, it is important to explore if and what messages, men remember after receiving SMC services. Men's post circumcision behaviours may also be affected by the factors that influenced them to seek SMC. Previous studies have shown that among the most important reasons for deciding to circumcise are the expected benefits in terms of HIV risk reduction, and the influence of women[21–23]. However, these studies have been largely based on community views and male informants who have not yet been circumcised [21, 22, 24–27, 23]. Only a few included self-reports of circumcised men [28–30]. This study explored the drivers of adult men's circumcision decisions from the perspective of SMC clients, their experiences with health education at health facilities and personal understanding of partial HIV protection that SMC offers.

Methods

Study location and participants

This qualitative study was conducted in Wakiso district, central Uganda. Wakiso district has a cosmopolitan population due to its proximity to the country's capital city. It is the largest district in Uganda with 5.8% (1,997,418) of the national population recorded in the 2014 census [31]. Men comprised 48.2% (962,121) while the urban population was 59.2% (1,182,901) [31]. The district has 103 health facilities including four hospitals, five Health Centres (HC) IV, 37 HC III and 57 HC II offering varied services summarised in Table 1 [32]. SMC services are provided free of charge at public health facilities with operational theatres such as HC IV level, and through mobile outreach clinics in areas without surgical theatres.

We purposively selected adult men who came for SMC at public health facilities offering this service in the district from May to June 2015. The men were selected from five level III and IV health facilities. The eligibility criteria for the men included being an adult aged 18 to 59 years, able to give written informed consent, married or having a stable partner at the time of the initial interview, and seeking SMC voluntarily. Eligible participants were recruited at the health facilities through health workers who informed them when they came for SMC about

Table 1. Summary of services offered at different facility levels

Facility level	Coverage	Services offered
HCII	Parish level	Preventative, promotive & outpatient curative services
HCIII	Sub-County	HCII services plus maternity, in-patient care, laboratory services
HCIV	County level	HCIII services plus blood transfusion and emergency surgery services
General/district hospital	District level	HCIV services plus in-service training, consultation and research to community based healthcare programmes

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the possibility to participate in the study. After indicating a willingness to participate, they were approached by the researchers who explained further study details and provided them with a written informed consent form.

Twenty-five men were recruited and all were married or had stable sexual partners at the time of the interview. Six men reported two or more partners/wives. Fifteen men were aged above 24 years and participants' ages ranged from 18 to 46 years. Due to the cosmopolitan nature of the district, participants were from seven ethnic backgrounds found in Central (Baganda, Baluri), Eastern (Basoga, Bateso) and Western (Banyankore, Bakiga, Banyarwanda) parts of Uganda. Fourteen lived in rural areas and twelve men were circumcised at HC IV level centres while the rest were circumcised at HCIII facilities and outreach points. Twelve men had primary education, nine had secondary, while four had tertiary/university education as the highest level attended.

Data collection and analysis

We conducted 25 in-depth interviews with men in Luganda (district main language), Runyankore/Rukiga (spoken in south western Uganda) and Lusoga (spoken in parts of eastern Uganda) languages. All interviews were held either on the same day after receiving the SMC service at the health facility premises, or one day later at their respective homes if the informant preferred. An interview guide was designed to discuss informants' motives for SMC, what influenced uptake, experiences with health education received (if any), and understanding of partial risk reduction among other issues. In-depth interviews were used owing to the sensitivity of the research questions and the need to explore personal experiences.

All interviews were recorded using digital voice recorders, transcribed and translated into English. Complete transcripts were imported into atlas.ti7.5 qualitative data management software (Scientific Software Development GmbH) for analysis. Data were analysed using a thematic approach. We utilised thematic networks [33] to systematise the extraction of basic themes, organising themes and global themes. The basic themes are the lowest order premises that are derived from the data while organising themes are more abstract middle-order themes that categorise basic themes into clusters of similar issues. Global themes in the case of this study are the overarching themes that show the components of the study aim [33].

The coding procedure involved three people who generated a coding framework that was applied to the rest of the transcripts while allowing for new codes to emerge. Codes were discussed until consensus was reached. Basic themes were then identified from the coded segments of data and refined. The basic themes were then rearranged into organising themes, and three global themes that reflected the research questions for this paper were deduced. Each global theme reflected similar organising themes about a specific issue. The thematic networks are presented describing contents under each basic theme with support from text segments of data where necessary. (Table 2).

Ethical considerations

The study protocol was assessed in accordance with the Norwegian Research Ethics Act and the Health Research Act. It was thereafter exempted from review by the Regional Ethical Committee of Western Norway (reference 2015/477) in March 2015 because it did not involve experiments on human subjects. It was reviewed and approved by the Higher Degrees, Research and Ethics Committee at Makerere University School of Public Health (registration 288) in April 2015. The study was then approved and registered by the Uganda National Council for Science and Technology (SS 3764) in May 2015. Permission to collect data was obtained from the Wakiso District health office and the health facilities where men were recruited.

Table 2. An example of the basic, organising and global themes emerging from the coding.

Global themes	Organising themes	Basic Themes
Drivers for SMC decisions	Personal need to reduce HIV/STI risk	• Reduce the chances of HIV infection. • Reduce risk of STIs.
	Influence of sexual partners in circumcision decision	• Partner directly wanted it. • Partner talked about this often indirectly • Perceived enhanced sexual performance. • Women prefer circumcised men. • Mistrusting partner's sexual behaviour. • Protect the partner from infection risk. • Perceived better penis appearance.
	Personal hygiene	• Easy to clean sexual organs • Tired of dirt under foreskin
	Positive community perceptions	• Fashionable/trendy • Influence of friends and family. • Influence by other circumcised men
	Timing of circumcision	• Waited until my partner was away. • Waited until I had leave • Waited until a period with less work.
Experience with health education at the health facilities	Health education about surgical procedure and healing.	• Wound healing. • Waiting period. • SMC procedure. • Demonstrated how the procedure is done.
	HIV/STI risk reduction and other benefits of SMC.	• SMC reduces HIV risk • SMC reduces STIs risk. • Reduces cancer risk to women. • Other benefits
	Post healing sexual behaviour and HIV Testing	• Sexual behaviour after healing • Received free condoms. • HIV testing before SMC.
	Poor quality or absent health education	• Too anxious to listen to all messages. • The time was not enough. • They told us nothing
Personal understanding of partial protection for HIV after SMC	Knowledge on how HIV risk is only reduced but not eliminated	• It only reduces HIV risk. • It reduces the risk of STIs. • Reduce HIV re-infection (other strains). • Removes foreskin that harbours HIV. • Limits bruising in intercourse. • It protects the man more than a woman.
	Misunderstanding HIV risk reduction	• Reduces HIV risk from man to woman. • Absolute protection from "minor" STIs.
	Unconvinced about risk reduction messages	• Fear that some men will compensate for perceived reduced risk. • The focus should be put on other benefits. • Not convinced of HIV risk reduction. • SMC messages not well understood.

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Further, the purpose of the study, the extent of their involvement and rights were explained to all study participants before obtaining their written informed consent. Consent included to anonymously use their interview data in the study reports. All audio recordings of the interviews were erased after transcription was completed. Study participants were compensated 20,000 Uganda shillings (about US$ 7) for their time.

Findings

Findings are presented using three global themes (Table 2): (1) Drivers for men's circumcision decisions; (2) experiences with health education at the health facilities; and (3) men's understanding

of partial HIV risk reduction. Under each global theme, the organising and basic themes are presented with typical and deviant quotations used to illustrate some of the participants' accounts.

Drivers for men's circumcision decisions

This global theme comprises five organising themes: personal need to reduce the risk of HIV/STIs, the influence of sexual partners, personal hygiene, positive community perception of male circumcision and timing of circumcision.

A strong desire to reduce the personal risk of infection with HIV and STIs such as gonorrhoea and syphilis was an important factor in decisions to seek SMC. Nearly all the men reported that they knew that circumcision reduced their risk and recognised a fear for such infections.

> *I fear contracting HIV and they say circumcision reduces the chances of infection. So why don't I circumcise with this big benefit? I also talked to my "women"* [he has two partners] *and we agreed with them. (P17, age 41, secondary education).*

The men had received information about risk reduction for HIV/STIs from community mobilisation using community radio in the trading centres nearby and motor vehicles from the health facilities with loudspeakers and SMC mobilisation messages. Many men had also heard and read messages from the print and electronic media such as radio, television, and newspapers. Only those with secondary and tertiary education reported reading newspapers. They had also received information from friends in the communities, circumcised colleagues, as well as directly from health workers.

> I heard on the radio several times that circumcision helps to prevent some of the STIs. I used to have recurrent blisters on the penis and I decided to come. That was my biggest challenge. I thought maybe this problem will go. I also hear that it prevents gonorrhoea. (P9, age 30, primary education).

Men's motivation to seek circumcision was strongly related to their sexual partners. Women influenced decisions even when the men had prior knowledge regarding risk reduction for HIV. Most men reported that their partners directly expressed a desire to see them circumcised, while some men mentioned that their partner had expressed her wishes by referring to circumcised men as clean, less prone to infections, less likely to infect women with cervical cancer, and having better penis appearance (in one case). Men believed that women obtained this information from within the community or from health workers while receiving other services like antenatal care.

> *We had talked about it for some time. She used to ask me "why don't you go for circumcision?" and I would ask her back, why do you always ask me to go for it? Then she told me "you go for it and you will see my reasons." Now I have just called to tell her* [lives upcountry] *and she is very excited about it. (P1, age 25, secondary education).*
>
> *Nalongo* [one of his wives] *one time told me that if I ever knew of cervical cancer screening programmes going on at the health facility, I should let her know. She said they told them at the facility that an uncircumcised man has high chances of infecting their partner with a cervical, cancer-causing virus. She jokingly asked me "when will you ever be courageous to go for circumcision since you were able to take your sons?" That is why I am here. I think they all*

[his other wives] *wanted it but they would not come out directly like she did. (P10, age 46, primary education).*

Half of the men, irrespective of age, perceived circumcision to enhance sexual performance and expected to better satisfy their partners. They reported that it was common knowledge that women in the community and elsewhere preferred circumcised sexual partners. This widespread perception played a role in many decisions to seek circumcision to increase sexual appeal.

Sometime back, I read from New Vision or Bukedde [local daily newspapers] *about sexual performance. That the glans is very sensitive and when the foreskin retracts, it makes it much too sensitive for a man to last long during intercourse. Of course, any man would like to enhance sexual performance. That if you get circumcised, that skin will be hardened and it will be less sensitive during intercourse. (P8, age 40, tertiary education).*

I heard from my friend. He told me that sexual pleasure will be different once you are circumcised. That is what I know. He said that 'your partner will be more satisfied and even if she cheated on you with an uncircumcised man, she will still come back to you because you are certainly better.' (P13, age 21, primary education).

Men who had informed their partners about the decision to circumcise in advance said their partners were excited about it, giving them the courage to turn up. Interestingly, some men did not inform their partners beforehand because they wanted to surprise them on their return. These men reported that their partners doubted they would adhere to their wishes or doubted their courage to bear the perceived surgical pain.

It has taken about three months now [to comply with her wishes]. *But today I decided to give her a surprise because she is visiting her parents in the village. I want her to come back when "everything is new". She is not expecting this at all because I have not done it for all the months we discussed it. It will be a complete surprise. I don't want to tell her yet. I want her to find when things are well as she has always wanted. (P6, age 24, primary education).*

Three men sought circumcision to protect their sexual partners from the risk of infection with cervical cancer and HIV; this was in addition to other reasons already reported above.

For me, the very first reason was to reduce the chances of getting infected with HIV. The second reason was to reduce the dirt that builds up under the foreskin and also to reduce the chances of my partner getting infected with those cancers I have told you [cervical cancer]. *(P1, age 25, secondary education).*

Four men mistrusted their partners' sexual behaviour and partly sought circumcision to have more protection in case of any infection from partners' extra marital sex.

Another driver was personal hygiene. Many men reported that this was a reason mentioned by their partners or wives in order to persuade them, and they also cited this reason as something that contributed to their decision to seek circumcision.

I have been personally challenged about this even before my wife influenced me. If you do not bathe in the morning and you wait until the evening, you will be surprised how dirty underneath your foreskin will be. In today's slang language one would say "you also fear

yourself." You have to shower twice a day, yet circumcised men can shower once a day if they want without much trouble. I was tired of this. (P22, age 41, secondary education).

There was a strong wave of community positivity about circumcised men in general, which influenced men's desire for circumcision. In relation to this, circumcised friends of the participants within the wider community also used their experience to influence them, allaying fears about perceived surgical pain. In men's social gathering places like bars and pool halls, and places of work like construction sites, circumcision was reportedly discussed. One quarter of men also noted that many people they knew thought that circumcision was fashionable.

I will give you several reasons why we come. But I think mainly because it is fashionable to be circumcised nowadays. It is the trend that many women want men to take. I would say it is like a woman telling you 'please wear shorter socks, they are trendy, or you should not wear hemmed trousers.' It is the way to go now. (P8, age 40, tertiary education).

After taking the decision to circumcise, the timing of when to have the surgery was an important factor. It was crucial for seven men to go for SMC at a time when either they or their sexual partners were away from home for some days or weeks. This was to ensure healing free from "sexual temptations." The presence of their partners was perceived as an undesirable disturbance that would cause unwanted erections with sutured sexual organs and delay healing. Three men also ensured that they waited until they had a period of limited or no work. They were casual labourers in the construction industry who had postponed their decision, fearing to lose productive time.

I decided to wait until she went to the village; away from me because now it will be easier for me to heal without any temptations. I will not be thinking so much about her when she is away. I have heard from circumcised men that when you think about a woman during the healing period, you get a lot of pain. This will delay your healing. So I had to take this chance too. (P6, age 24, primary education).

Experiences with health education at the health facilities

We explored the experiences of men when they sought SMC services at health facilities regarding the kind of messages that they received. Results here are presented using four organising themes: Health education about surgical procedure and healing; HIV/STI risk reduction and other benefits of SMC; post-healing sexual behaviour and HIV Testing; poor quality or absent health education.

Twenty men reported that they received some kind of health education comprising how the circumcision surgical procedure was going to be done, the length of the healing period, care for the wound and a clear warning not to resume sex before the communicated healing period was over. The procedure messages included allaying fears of the perceived pain that men expected to have, reassurance about the use of anaesthesia and in some instances showing pictures of the different forms of circumcision procedures that can be performed. Men were also cautioned to follow the guidelines for proper healing in varied ways. While some were told to only take oral pain killers provided, keep the wound dry and not to apply any other substances, others were told to use "lukewarm salty water to carefully clean the wound." Only a few were told to return to the facilities for review. They were also cautioned to do less manual work and avoid long travel in the first few days.

> They told us that we are not supposed to have a full body shower for a whole week; we can only bathe partially, carefully wiping the body and the groin area near the wound. Then after a week, if you want to shower, you get a clean clear polythene bag, wrap the private parts and bathe. (P3, age 30, primary education).

The six weeks waiting period had been emphasised and caution was given not to have sex even when they visibly appeared healed before the prescribed period. In a few instances, men shared that they were also provided with phone contacts of health workers in case they had any challenges during this phase.

> The main message was caution not to resume sexual intercourse before the healing period of six weeks. I think no man will complain when they have problems because the health workers were very clear on this message to all of us. Other clients were young boys. But anyone who had a girlfriend was cautioned on this. The other message was about keeping proper hygiene throughout the healing period and after. (P19, age 33, primary education).

Five men among the 20 who received pre-SMC health education, said they remembered only a few messages due to anxiety because *"as they explain to you, your mind is focused on the possible pain from the surgical blade and how the procedure will go." (P10, age 46, primary education)*. Only nine said they were cautioned on the importance of safe sexual behaviour after healing. They were encouraged to use condoms and/or avoid multiple sexual partnerships because circumcision does not offer full protection. Ten were offered an HIV test prior to being circumcised, and one received condoms.

> They told us about how to behave after circumcision. They told us that circumcision alone will not prevent HIV completely or other STIs, but it reduces the risk by 60%. So we were encouraged to behave well. They told us about how to behave during the healing so that we have no complications. (P20, age 28, tertiary education).

Health education also emphasised the role of circumcision in HIV/STI risk reduction. Men were told that SMC reduced their risk of HIV infection and other STIs with some health workers reportedly emphasising the 60% risk reduction while others did not mention percentages but emphasised that it was only partial. Other benefits of SMC discussed included a reduction in cervical cancer risk to women and hygiene related benefits.

> He told me about all the advantages, the diseases that it prevents, like penile cancer and cancer of the cervix for women, syphilis. He also talked about HIV. (P8, age 40, tertiary education).

It is worth noting that five men said they did not receive any kind of health education at the health facilities prior to circumcision, although some of them received HIV testing services. One man said the session was rushed and that he had no opportunity to ask questions. This excerpt gives an example of a young man who received no health education:

> They did not tell us anything. . .
>
> *We came here* [with two colleagues] *and told them we have come for circumcision. They told us to buy books* [for records], *and then showed us the health worker responsible, who wrote something in the books and sent us to the lab for HIV testing. We were tested and received results. We were then told to come back to the theatre and that was it. We were*

circumcised.

I: Why do you think they did not explain anything about what was happening?

P: Maybe the counsellors are not around. I do not know. You know what happens with our public health centres. Anyway, we wanted circumcision and got it. (P11, age 21, primary education).

Personal understanding of partial risk reduction for HIV after SMC

We also explored how men understood the concept of partial risk reduction for HIV after receiving SMC services. This was important because such knowledge may influence sexual behaviour post circumcision. Men's accounts were organised into: those that understood how HIV risk is only reduced but not eliminated, misunderstanding of HIV risk reduction, and being unconvinced about risk reduction messages.

Twenty-two of the men were able to explain that circumcision only reduced the risk of HIV infection. They acknowledged the possibility that one could be infected and thus needed to continue taking precautions after SMC. Some specifically mentioned the 60% risk reduction conveyed in the ideal health education messaging at facilities but explained it in their own terms.

I heard it reduces [HIV risk] *by 60%. This means that the 40% chances* [to be infected] *are still there. Even in a football game, if one team has 70% ball possession, they may still lose the game when the other team has only 30% of the ball. That is how I relate this risk reduction in normal life. It means you can still get infected in case you do not use condoms if you think you will depend on the 60% chances alone. It means you still have to protect yourself when you know you are HIV negative. We all want life. Especially when you are still a young person and have no child in life yet. (P11, age 21, primary education).*

Most explained that the removal of the foreskin, which could harbour the virus after sexual intercourse, was crucial in reducing the chances of getting HIV infection. The foreskin, they said, provides a conducive, warm environment underneath for the viruses to thrive before entering the body. Such information was received from health education and from other sources in the community and did not differ by educational level or age of the men. Related to the foreskin, half of the men said the removal of the skin exposes the glans and hardens it, limiting chances of bruising during less lubricated intercourse.

Because this foreskin is now removed, the head of your penis becomes hardened. This means you have reduced your chances of the virus entering your skin. When your penis head is hardened, you cannot have bruises on it; you get rid of all these potential damages to the skin that you would get if you were uncircumcised. It is so easy to get bruises on the skin when you engage in sexual intercourse with your partner if uncircumcised. But this is very hard for a circumcised man because you cannot bleed. When you are uncircumcised you bleed because you get bruised and this is a big risk for HIV infection. (P1, age 25, secondary education).

However, there were some important misconceptions from four men. One man reported that he knew circumcision also directly reduced HIV risk to a woman, while another two reported that it provides absolute protection from what they called minor STIs. Both men had secondary education. One man also said that after circumcision, he could just wipe or wash the penis when he had condom-less sex as a measure to further reduce infection risk.

> I have hope that finally my dream of preventing STIs that I feared, most especially gonorrhoea, is now realized. I am taking this [circumcision] as being vaccinated against those STIs, as I always wanted. (P5, age 29, secondary education).

Five men (all with secondary or tertiary education) were unconvinced that circumcision reduces HIV infection risk. Even though they were aware of the messages, in their own view, these were "misleading" and not well understood by some people. They recommended that mobilisation messages focus on other SMC benefits like improved hygiene, with HIV risk reduction as an additional benefit. They also feared that some men indeed do or will *"approach the football field without shoes"* [have condom-less sex], believing they are fully protected. Similarly, four men also felt that they were unable to explain how the HIV infection risk is reduced, although they said knew it was not full protection.

> I do not believe that circumcision will reduce the chances of the virus entering through the urethra because it still remains as open as that of an uncircumcised man. It is very hard to convince me that the 60% works. Even if the glans is hardened, it is not too hard for nothing to enter. But today I did not challenge the doctor because you know you cannot challenge health workers. But no one can confirm that 60%. How do you confirm that the percentage is 60%? So I did not listen to this 60%. I am not convinced. (P8, age 40, tertiary education).

Discussion

This study explored the main influences of adult men's circumcision decisions, experiences with health education at health facilities and their knowledge of HIV risk reduction from circumcision. Female sexual partners played a leading role in influencing respondents' decision to seek SMC, although a reduction of HIV risk was also important. During health education, more emphasis was perceived to be put on wound care and the surgical procedure, as well as benefits of SMC while a few of the men reported a focus on post SMC sexual behaviour. All the men, however, were aware that circumcision only offers partial risk reduction for HIV infection. Nonetheless, there were a few who in addition to this, wrongly thought male circumcision reduces the transmission risk from man to woman and/or entirely eliminates STI transmission risk.

Men reported both direct and indirect ways that their partners influenced them to seek SMC. The direct influence was where the partners explicitly told their husbands or men that they preferred them circumcised. Indirect influence included cases where the partners discussed circumcision to be beneficial in varied ways without directly telling the men to go for it. In patriarchal societies like Uganda, matters concerning men's sexual health may be one of the few areas where women have such strong influence. A study in Zambia found that women's acceptance of circumcision and discussion with partners influenced men's readiness to undergo SMC [25, 22] and in Kenya, a study documented that some women who were 'more knowledgeable' about circumcision educated their partners and encouraged them to go for the service [34]. Studies in Botswana and Tanzania showed both direct and indirect influence as well, with women using "soft" language to convince partners, mindful not to endanger their marriages or relationships, while others even denied partners sex to effect circumcision decisions [28, 29]. However, in contrast to this, in a study in Rakai, Uganda [35], conducted before the national scale up of SMC, female partners were reported as deterring rather than motivating the decision to get circumcised.

Men in this study believed that circumcision enhanced sexual performance and perceived women to prefer circumcised men when making sexual partner choices. Such influence

through beliefs about sexual performance has also been reported in many studies in WHO priority SMC countries [30, 28, 21, 36, 29, 37–39] and elsewhere [40]. Perception of partner preference for circumcised men has also been reported in other places [34, 24, 41, 26, 40, 42]. These widespread perceptions are also most likely influenced by the SMC social marketing campaigns. For example, messages from the "Stand Proud, Get Circumcised" campaign in Uganda [43] aimed to use women as key players in influencing men, and portrayed SMC as one of the attributes of a "modern stylish man" [44]. Preference for circumcised men is also listed as an additional benefit in some brochures stating "women believe a circumcised penis looks better" and "possibly gives greater sexual satisfaction" [45]. This could explain the generally positive community perception towards circumcision reported in this study.

HIV infection risk reduction was the second most mentioned reason to seek SMC, after their partners' influence. It is not surprising because this relates to the central message of SMC social marketing. All men had heard such messages in the media, within the community and/or at health facilities. Other reasons reported such as better penile hygiene, risk reduction to some STIs and cervical cancer prevention to partners, are also portrayed in SMC messages to the public in Uganda [45, 46]. Studies conducted in other sub Saharan countries [47, 48, 27, 29, 26] have also reported that these reasons play a role in influencing men to circumcise.

Although rare, it is worth noting that some men reported that they received no health education from health facilities. Even among those that experienced health education, some said they were not told about post SMC desired sexual behaviours. These reports indicate gaps in how the WHO recommendations regarding pre SMC health education are followed [11]. This could be due to competing services provision in hospitals and HCs with large numbers of patients where health workers have multiple demands and limited time. Men who were circumcised at facilities with health workers dedicated to providing SMC reported more detailed health education and the offer of HIV testing. Given the fears of behavioural risk compensation and the potential dangers this may pose for HIV infection [49], such gaps in health education are a point of concern. Furthermore, the appropriate time to provide health education is also important. Some men experienced anxiety prior to surgery that affected how much they grasped from the health education information they were given. Providing extra sexual behaviour related messages during the post-operative period could probably be helpful.

All participants understood that SMC did not yield 100% protection from HIV infection and identified the need for maintenance or adoption of safer sexual behaviours after the procedure, such as condom use. Such knowledge was also reported after a four-year scale up in Rakai, Uganda [50], and in Kisumu, Kenya [51], although in these clinical trial areas, the health education was probably more comprehensive than in programme settings. Clinical trial settings are study environments that are well organised, with strict adherence to protocols. This may not be the case in programme settings where other competing interests may affect adherence to guidelines. In this study, we expected that men would obtain health education information from staff at the respective health facilities. However, many had instead received health information from other sources such as radio and television social marketing, from peers, as well as circumcised friends. Participants who reported no "formal" health education from health facilities also managed to obtain such information.

A few men reported misconceptions as well, thinking SMC also reduced the risk of HIV transmission from men to women directly and, absolutely protected them from other STIs. Concerns about misunderstanding the level of protection from circumcision have also been reported in southern Africa [52, 53] and among fishing communities in Uganda [27]. Such misconceptions could be due to information from less reliable sources within communities and/or misunderstandings of SMC social marketing messages, as indeed feared by some men in this study.

The strength of this study is that the findings coincide with research conducted on SMC programmes in other countries. There are several limitations however, that should be considered when interpreting the findings in this study. The study was conducted in only one district in central Uganda, although participants came from various cultural backgrounds from other parts of Uganda. Conceptual generalisation may, therefore, be limited. Although men were interviewed on the day of receiving services or one day later, there is a possibility of an inaccurate recall of what transpired during the health education sessions. Some participants acknowledged pre surgical anxiety affecting what they could grasp. Although we explained that there was no direct link between the research team and the health system, some participants occasionally referred to interviewers as "musawo" (meaning health worker). It is, therefore, possible that some could have reported what they thought the 'health worker' would like to hear.

The participants reported positive community perceptions about SMC campaigns, influencing them to seek services and enabling female partners to impact this decision-making process directly or indirectly. Partner involvement can be enhanced to go beyond influencing decision making for SMC. It can include physical presence of the partners at the health facilities for joint health education where agreeable and help in the maintenance of safer sexual behaviour post circumcision. The SMC programme could also provide couples reproductive health services such as couple HIV counselling and testing at SMC points.

There appeared to be gaps in SMC health education at some health facilities based on what the men reported, with the main focus placed on the immediate concerns of the surgery and the healing process, and less focus on the post SMC safer sexual behaviour. However, it is encouraging that all participants correctly understood that SMC offers only partial protection from HIV even though a few stretched the direct protection to women and to STIs.

Standard health education procedures, including counselling post-surgery, if followed at all health facilities offering SMC, would help in informing all the clients, especially about post SMC sexual behaviour that is key to prevention of risk compensation or misinformed risky behaviour. This is important because there are many other, probably less reliable, sources of information in the communities that could mislead some men.

Supporting information

S1 Text. Excerpts from the interviews.
(DOCX)

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References

1. Gray RH, Kigozi G, Serwadda D, Makumbi F, Watya S, Nalugoda F et al. Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. Lancet. 2007; 369(9562):657–66. https://doi.org/10.1016/S0140-6736(07)60313-4 PMID: 17321311
2. Bailey RC, Moses S, Parker CB, Agot K, Maclean I, Krieger JN et al. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomized controlled trial. Lancet. 2007; 369(9562):643–56. https://doi.org/10.1016/S0140-6736(07)60312-2 PMID: 17321310
3. Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, Puren A. Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. PLoS medicine. 2005; 2(11):e298. https://doi.org/10.1371/journal.pmed.0020298 PMID: 16231970
4. Mehta SD, Moses S, Agot K, Odoyo-June E, Li H, Maclean I et al. The long-term efficacy of medical male circumcision against HIV acquisition. AIDS (London, England). 2013; 27(18):2899–907.
5. WHO/UNAIDS. New Data on Male Circumcision and HIV Prevention: Policy and Programme Implications. Geneva, Switzerland: World Health Organisation and Joint United Nations Programme on HIV/AIDS,2007 March 28.
6. WHO/UNAIDS. Joint Strategic Action Framework to Accelerate the Scale-Up of Voluntary Medical Male Circumcision for HIV Prevention in Eastern and Southern Africa 2012–2016: World Health Organisation and Joint United Nations Programme on HIV/AIDS,2011 November.
7. Grabowski MK, Kong X, Gray RH, Serwadda D, Kigozi G, Gravitt PE et al. Partner Human Papillomavirus Viral Load and Incident Human Papillomavirus Detection in Heterosexual Couples. The Journal of infectious diseases. 2016; 213(6):948–56. https://doi.org/10.1093/infdis/jiv541 PMID: 26597261
8. Auvert B, Sobngwi-Tambekou J, Cutler E, Nieuwoudt M, Lissouba P, Puren A et al. Effect of male circumcision on the prevalence of high-risk human papillomavirus in young men: results of a randomized controlled trial conducted in Orange Farm, South Africa. The Journal of infectious diseases. 2009; 199 (1):14–9. https://doi.org/10.1086/595566 PMID: 19086814
9. Tobian AA, Serwadda D, Quinn TC, Kigozi G, Gravitt PE, Laeyendecker O et al. Male circumcision for the prevention of HSV-2 and HPV infections and syphilis. The New England journal of medicine. 2009; 360(13):1298–309. https://doi.org/10.1056/NEJMoa0802556 PMID: 19321868
10. Wawer MJ, Tobian AA, Kigozi G, Kong X, Gravitt PE, Serwadda D et al. Effect of circumcision of HIV-negative men on transmission of human papillomavirus to HIV-negative women: a randomised trial in Rakai, Uganda. Lancet. 2011; 377(9761):209–18. https://doi.org/10.1016/S0140-6736(10)61967-8 PMID: 21216000
11. WHO, UNAIDS. Manual for male circumcision under local anaesthesia. WHO/UNAIDS/JHPIEGO, Version 3.1. 2009. Geneva, Switzerland, Department of Reproductive Health and Research;2009 December.
12. UNAIDS. 2016–2021 Strategy: On the Fast-Track to end AIDS. Geneva, Switzerland: UNAIDS2016.
13. United Nations. Transforming our World: the 2030 Agenda for Sustainable Development. New York, USA: United Nations, Department of Economic and Social Affairs/ Division for Sustainable Development;2015 Contract No.: A/RES/70/1.
14. Geldsetzer P, Bloom DE, Humair S, Bärnighausen T. Benefits and Costs of the HIV/AIDS Targets for the Post-2015 Development Agenda: Copenhagen Consensus Center2015 March 11.
15. WHO UNAIDS and UNICEF. Global HIV/AIDS Response: Epidemic update and health sector progress towards Universal Access. Progress report2011.
16. Hallett TB, Singh K, Smith JA, White RG, Abu-Raddad LJ, Garnett GP. Understanding the impact of male circumcision interventions on the spread of HIV in southern Africa. PloS one. 2008; 3(5):e2212. https://doi.org/10.1371/journal.pone.0002212 PMID: 18493593
17. Ministry of Health and ICF International. Uganda AIDS Indicator Survey 2011. Kampala, Uganda and Calverton Maryland, USA: MOH and ICF International2012.
18. Kibira SP, Makumbi F, Daniel M, Atuyambe LM, Sandoy IF. Sexual Risk Behaviours and Willingness to Be Circumcised among Uncircumcised Adult Men in Uganda. PloS one. 2015; 10(12):e0144843. https://doi.org/10.1371/journal.pone.0144843 PMID: 26658740

19. Uganda AIDS Commission. The HIV and AIDS Uganda progress report 2014. Kampala: UAC2015 June 15.
20. World Health Organization. WHO Progress Brief: Voluntary Medical Male Circumcision for HIV Prevention in 14 Priority Countries in East and Southern Africa. Geneva, Switzerland: WHO; 2015.
21. Herman-Roloff A, Otieno N, Agot K, Ndinya-Achola J, Bailey RC. Acceptability of medical male circumcision among uncircumcised men in Kenya one year after the launch of the national male circumcision program. PloS one. 2011; 6(5):e19814. https://doi.org/10.1371/journal.pone.0019814 PMID: 21603622
22. Jones D, Cook R, Arheart K, Redding CA, Zulu R, Castro J et al. Acceptability, knowledge, beliefs, and partners as determinants of Zambian men's readiness to undergo medical male circumcision. AIDS and behavior. 2014; 18(2):278–84. https://doi.org/10.1007/s10461-013-0530-0 PMID: 23757123
23. Hilton H, Heidi vR, Lucia K, Ruanne B, Connie C. '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. 2015; 17(7):920–31.
24. Plotkin M, Castor D, Mziray H, Kuver J, Mpuya E, Luvanda PJ et al. "Man, what took you so long?" Social and individual factors affecting adult attendance at voluntary medical male circumcision services in Tanzania. Glob Health Sci Pract. 2013; 1(1):108–16. https://doi.org/10.9745/GHSP-D-12-00037 PMID: 25276521
25. Cook R, Jones D, Redding CA, Zulu R, Chitalu N, Weiss SM. Female Partner Acceptance as a Predictor of Men's Readiness to Undergo Voluntary Medical Male Circumcision in Zambia: The Spear and Shield Project. AIDS and behavior. 2015.
26. Mukama T, Ndejjo R, Musinguzi G, Musoke D. Perceptions about medical male circumcision and sexual behaviours of adults in rural Uganda: a cross sectional study. The Pan African medical journal. 2015; 22:354. https://doi.org/10.11604/pamj.2015.22.354.7125 PMID: 26985272
27. Nevin PE, Pfeiffer J, Kibira SP, Lubinga SJ, Mukose A, Babigumira JB. Perceptions of HIV and Safe Male Circumcision in High HIV Prevalence Fishing Communities on Lake Victoria, Uganda. PloS one. 2015; 10(12):e0145543. https://doi.org/10.1371/journal.pone.0145543 PMID: 26689212
28. Osaki H, Mshana G, Wambura M, Grund J, Neke N, Kuringe E et al. "If You Are Not Circumcised, I Cannot Say Yes": The Role of Women in Promoting the Uptake of Voluntary Medical Male Circumcision in Tanzania. PloS one. 2015; 10(9):e0139009. https://doi.org/10.1371/journal.pone.0139009 PMID: 26402231
29. Wirth KE, Semo BW, Ntsuape C, Ramabu NM, Otlhomile B, Plank RM et al. Triggering the decision to undergo medical male circumcision: a qualitative study of adult men in Botswana. AIDS care. 2016:1–6.
30. George G, Strauss M, Chirawu P, Rhodes B, Frohlich J, Montague C et al. Barriers and facilitators to the uptake of voluntary medical male circumcision (VMMC) among adolescent boys in KwaZulu-Natal, South Africa. Afr J AIDS Res. 2014; 13(2):179–87. https://doi.org/10.2989/16085906.2014.943253 PMID: 25174635
31. Uganda Bureau of Statistics. The National Population and Housing Census 2014- Main Report. Kampala, Uganda: UBOS2016.
32. The Republic of Uganda. Ministry of Health. Health Facilities Inventory July 2012: Master Health Facilities Inventory. Kampala, Uganda: Ministry of Health, Department of Clinical Services;2012.
33. Attride-Stirling J. Thematic networks: an analytic tool for qualitative research. Qualitative Research. 2001; 1(3):385–405.
34. Riess TH, Achieng MM, Bailey RC. Women's beliefs about male circumcision, HIV prevention, and sexual behaviors in Kisumu, Kenya. PloS one. 2014; 9(5):e97748. https://doi.org/10.1371/journal.pone.0097748 PMID: 24844845
35. Ssekubugu R, Leontsini E, Wawer MJ, Serwadda D, Kigozi G, Kennedy CE et al. Contextual barriers and motivators to adult male medical circumcision in Rakai, Uganda. Qualitative health research. 2013; 23(6):795–804. https://doi.org/10.1177/1049732313482189 PMID: 23515302
36. Riess HT, Achieng MM, Otieno S, Ndinya-Achola JO, Bailey CR. "When I Was Circumcised I Was Taught Certain Things": Risk Compensation and Protective Sexual Behavior among Circumcised Men in Kisumu, Kenya. PloS one. 2010; 5(8):1–9.
37. Shacham E, Godlonton S, Thornton RL. Perceptions of Male Circumcision among Married Couples in Rural Malawi. J Int Assoc Provid AIDS Care. 2014; 13(5):443–9. https://doi.org/10.1177/2325957413508319 PMID: 24162614
38. Muhamadi L, Ibrahim M, Wabwire-Mangen F, Peterson S, Reynolds SJ. Perceived medical benefit, peer/partner influence and safety and cost to access the service: client motivators for voluntary seeking of medical male circumcision in Iganga district eastern Uganda, a qualitative study. The Pan African medical journal. 2013; 15:117. https://doi.org/10.11604/pamj.2013.15.117.2540 PMID: 24255723

39. Zulu R, Jones D, Chitalu N, Cook R, Weiss S. Sexual Satisfaction, Performance, and Partner Response Following Voluntary Medical Male Circumcision in Zambia: The Spear and Shield Project. Glob Health Sci Pract. 2015; 3(4):606–18. https://doi.org/10.9745/GHSP-D-15-00163 PMID: 26681707

40. Fleming PJ, Barrington C, Pearce LD, Lerebours L, Donastorg Y, Brito MO. "I Feel Like More of a Man": A Mixed Methods Study of Masculinity, Sexual Performance, and Circumcision for HIV Prevention. J Sex Res. 2016:1–13.

41. Layer EH, Beckham SW, Mgeni L, Shembilu C, Momburi RB, Kennedy CE. "After my husband's circumcision, I know that I am safe from diseases": women's attitudes and risk perceptions towards male circumcision in Iringa, Tanzania. PloS one. 2013; 8(8):e74391. https://doi.org/10.1371/journal.pone.0074391 PMID: 24009771

42. Westercamp M, Agot KE, Ndinya-Achola J, Bailey RC. Circumcision preference among women and uncircumcised men prior to scale-up of male circumcision for HIV prevention in Kisumu, Kenya. AIDS care. 2012; 24(2):157–66. https://doi.org/10.1080/09540121.2011.597944 PMID: 21854351

43. Johns Hopkins Bloomberg School of Public Health Center for Communication Programs. The Health Communication Partnership Uganda: 2007–2012 Final Report. Kampala, Uganda2012 May.

44. Rakai Health Sciences Program and Johns Hopkins Bloomberg School of Public Health. A Guide for Community Games and Competitions Under the Stylish Man Campaign. RHSP and JHSPH Center for Communication Programs; 2012.

45. The Republic of Uganda. Ministry of Health. Understanding Safe Male Circumcision for HIV Prevention [brochure]. In: Ministry of Health, editor. Kampala, Uganda2012.

46. The Republic of Uganda. Ministry of Health. Safe male circumcision for HIV prevention. National communication strategy. Kampala, Uganda: Ministry of Health2010.

47. Toefy Y, Skinner D, Thomsen SC. "What do You Mean I've Got to Wait for Six Weeks?!" Understanding the Sexual Behaviour of Men and Their Female Partners after Voluntary Medical Male Circumcision in the Western Cape. PloS one. 2015; 10(7):e0133156. https://doi.org/10.1371/journal.pone.0133156 PMID: 26176946

48. Herman-Roloff A, Bailey RC, Agot K. Factors associated with the early resumption of sexual activity following medical male circumcision in Nyanza province, Kenya. AIDS and behavior. 2012; 16(5):1173–81. https://doi.org/10.1007/s10461-011-0073-1 PMID: 22052231

49. Kalichman S, Eaton L, Pinkerton S. Circumcision for HIV prevention: failure to fully account for behavioral risk compensation. PLoS medicine. 2007; 4(3):e138; author reply e46. https://doi.org/10.1371/journal.pmed.0040138 PMID: 17388676

50. Kong X, Ssekasanvu J, Kigozi G, Lutalo T, Nalugoda F, Serwadda D et al. Male circumcision coverage, knowledge, and attitudes after 4-years of program scale-up in Rakai, Uganda. AIDS and behavior. 2014; 18(5):880–4. https://doi.org/10.1007/s10461-014-0740-0 PMID: 24633740

51. L'Engle K, Lanham M, Loolpapit M, Oguma I. Understanding partial protection and HIV risk and behavior following voluntary medical male circumcision rollout in Kenya. Health education research. 2014; 29 (1):122–30. https://doi.org/10.1093/her/cyt103 PMID: 24293524

52. Friedland BA, Apicella L, Schenk KD, Sheehy M, Hewett PC. How informed are clients who consent? A mixed-method evaluation of comprehension among clients of male circumcision services in Zambia and Swaziland. AIDS and behavior. 2013; 17(6):2269–82. https://doi.org/10.1007/s10461-013-0424-1 PMID: 23392912

53. Maughan-Brown B, Godlonton S, Thornton R, Venkataramani AS. What Do People Actually Learn from Public Health Campaigns? Incorrect Inferences About Male Circumcision and Female HIV Infection Risk Among Men and Women in Malawi. AIDS and behavior. 2015; 19(7):1170–7. https://doi.org/10.1007/s10461-014-0882-0 PMID: 25155700

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Research article

"Now that you are circumcised, you cannot have first sex with your wife": post circumcision sexual behaviours and beliefs among men in Wakiso district, Uganda

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Abstract

Introduction: Safe male circumcision is an important biomedical intervention in the comprehensive HIV prevention programmes implemented in 14 sub-Saharan African countries with high HIV prevalence. To sustain its partial protective benefit, it is important that perceived reduced HIV risk does not lead to behavioural risk compensation among circumcised men and their sexual partners. This study explored beliefs that may influence post circumcision sexual behaviours among circumcised men in a programme setting.

Methods: Forty-eight in-depth interviews were conducted with newly circumcised men in Wakiso district, central Uganda. Twenty-five men seeking circumcision services at public health facilities in the district were recruited from May to June 2015 and, interviewed at baseline and after 6 months. Participants' beliefs and sexual behaviours were compared just after circumcision and at follow up to explore changes. Data were managed using atlas.ti7 and analysed following a thematic network analysis framework.

Results: Four themes following safe male circumcision emerged from this study. Beliefs related to: (1) sexual cleansing, (2) healing, (3) post SMC sexual capabilities and (4) continued HIV transmission risk. Most men maintained or adopted safer sexual behaviour; being faithful to their partner after circumcision or using condoms with extramarital partners following the knowledge that there was continued HIV risk post circumcision. The most prevalent risky belief was regarding sexual cleansing post circumcision, and as a result of this belief, some men had one off condom-less sexual intercourse with a casual partner. Some resumed sex before the recommended period due to misunderstanding of what comprised healing.

Conclusions: Although most men maintained or adopted safer sexual behaviour, there were instances of risky sexual behaviour resulting from beliefs regarding the first sexual intercourse after circumcision or misunderstandings of what comprised wound healing. If not addressed, these may attenuate the safe male circumcision benefits of risk reduction for HIV.

Keywords: Male circumcision; Sexual risk behaviours; HIV; Uganda

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Introduction

Male circumcision is an important biomedical intervention that reduces heterosexual HIV infection risk from infected women to men [1–3]. Modelling studies indicate that the direct reduction of HIV transmission to men will also reduce the long-term infection risk to women [4]. Uganda is one of the 14 WHO priority countries [5,6] with epidemic HIV which are implementing the Safe Male Circumcision (SMC) programme. Over two million men have been circumcised under the national SMC programme between 2010 and 2014 [7].

Mixed findings regarding post SMC sexual behaviour have been reported in the clinical trials [1–3] that informed the WHO recommendation for SMC [5]. More sexual partners [2] were reported in the South African trial among the circumcised than the uncircumcised men. In the Kenyan trial, circumcised men exhibited slightly higher sexual risk behaviours than the uncircumcised after a 24-month period of follow up. Fifty-one per cent of the circumcised men reported condom-less sex versus 46% in the control group [3]. However, there were no significant differences in sexual behaviour in the first two years among intervention and control groups in the Ugandan trial [1]. The Ugandan post-trial follow-up studies also reported no evidence of behavioural risk compensation [8,9]. In a programme setting in Kisumu, Kenya,

Westercamp and colleagues also observed no evidence of risk compensation [10]. They instead found that both circumcised and uncircumcised men exposed to the SMC programme and information messages, respectively, adopted safer sexual behaviours. Such findings are reassuring, but contexts may be different [10].

Research providing in-depth understanding of the behaviours of circumcised men in the general population is important in the efforts to prevent risk compensation. Kong et al. [9] recommended that more studies should focus on the population of men circumcised in programmatic settings. They also suggested focusing on behaviour changes within the short term (about six months) after circumcision [9], where such behaviour adjustments are most likely to occur. There are few qualitative studies that have explored reasons for circumcised men's behaviour choices following circumcision [11–13]. The studies conducted in South Africa [13], Swaziland [12] and Kenya [11] provided mixed findings. The informants in these studies reported both protective and risky behaviours (the studied periods ranged from six weeks and up to 12 months). The study in Western Cape, South Africa showed that some men had intercourse before complete healing as a result of intoxication with alcohol. Others had intended to have non-penetrative sex for coping with the restriction placed on them by the wound but this escalated into intercourse. They expressed a high sexual drive during this period especially because in these densely populated townships, couples lived in cramped houses with limited interpersonal space that made it hard to avoid sexual arousal [13]. In Kisumu, Kenya and in Urban Swaziland, some men reported an increased number of sexual partners shortly after SMC and/or non-use of condoms. They felt circumcision made them sexually more desirable to women or wanted to be adventurous and have sexual experimentation in the short period after SMC [11,12]. Some also described SMC as a "back up" for condoms [12]. The men who reported HIV protective behaviours believed that behaving in a risky way would only negate the partial protection offered by SMC while some reported that it was easier to wear condoms with a circumcised penis [11,12].

There is a dearth of published studies about beliefs among SMC clients in programme settings in Uganda. One recent study in fishing communities on Lake Victoria provides some insights from clients [14]. Cultural beliefs regarding circumcision may vary in different settings and could change over time as information from SMC programmes continues to be widely disseminated. The objective of this study was to explore beliefs that may influence post circumcision sexual behaviours among circumcised adult men in a programme setting in Uganda 5 years after the SMC programme launch in the country.

Methods

Setting

This study was conducted in Wakiso district, central Uganda, which is contiguous to the country's capital city. It is the most populated district in Uganda [15]. The district has 103 health facilities including four hospitals, five Health Centres (HC) IV, 37 HC III and 57 HC II offering varied services [16]. SMC services are provided free of charge at public health facilities with operational theatres such as HC IV level, and through mobile outreach clinics in areas without surgical theatres. The study was conducted among clients from five public level IV and level III HCs or their outreach points that were providing SMC services at the time of data collection for the baseline. These were in both peri-urban and rural Wakiso.

Design and selection of participants

This qualitative description included purposively selected adult men coming for SMC at the five public HCs or outreach points run by these facilities in the district between May and June 2015. The follow-up interviews were conducted between December 2015 and January 2016. A courtesy phone call was also made to all participants in September 2015. The phone contacts of the first author were provided to all the participants, and they were free to call during the six-month period, if they had any further questions about the study. The study inclusion criteria at baseline were: age 18–59 years, ability to give written consent, married or having a stable sexual partner, seeking SMC voluntarily, and willing to be interviewed after a period of six months. Although we did not intend to stratify selection of participants by age, younger (below 25 years of age) and older participants were evenly represented. The drivers of the circumcision decisions of these men are discussed in a related paper [17]. The upper age limit (59 years) is in line with AIDS indicator survey age group while the lower age limit (18 years) is the adult age of consent in Uganda. Married men were purposely selected because they are more likely to be sexually active since exposure to sex in marriage is assumed to be higher. Study participants were recruited at the health facilities or the outreach points through health workers who informed them about the study when they came for SMC services. The research team approached the willing men and explained the details about the study before obtaining written informed consent. Participants provided their contact phone numbers and residential or other preferred addresses for the follow-up interviews. Four extra men were enrolled after the saturation point (when we concluded that no new information about beliefs was emerging [18]) to cater for potential loss to follow up. We used in-depth interviews, the best method for sensitive topics [19]. These were employed in a longitudinal strategy that also offers advantages such as building trust between the informants and the researcher over time to discuss sensitive issues in detail compared to the single snapshot interviews [20].

Data collection and analysis

Four people (two trained male research assistants and two authors) were involved in conducting 48 in-depth interviews. The first interview in May and June 2015 with each of the informants (25 men) was held either soon after receiving the SMC service at the health facility

premises, or a day after at the participant's home, depending on what was desired. The follow-up interviews were held with 23 men at least six months after the time of circumcision, at their homes, workplaces or other private venues as they preferred. These were conducted in December 2015 and January 2016. Two men were lost to follow up; one could not be traced through his provided contacts and address, and the other declined for reasons that he did not disclose. Interviews were conducted in Luganda (district main language), Runyankore/Rukiga (spoken in south western Uganda), Lusoga (spoken in parts of eastern Uganda), and English languages, depending on what the informant preferred.

At baseline, the interview guide included the following topics: current sexual partnerships and practices regarding condom use, and expectations after circumcision. Men were also asked about any beliefs and perceptions relating to circumcision in general that they were aware of in their cultures and community as well as the sources of such beliefs. Further questions regarding the influence of such beliefs on sexual behaviour in the communities and individually were discussed. In the follow-up interviews, topics included the healing process and what was involved, resumption of sex and who they had sex with over the period, if there were any new beliefs since they were circumcised, and how these affected them, as well as perception of HIV risk. Before conducting each follow-up interview, the interviewers read the baseline interview transcript to enable better probing in case of inconsistencies in reports.

All interviews were recorded using digital voice recorders, and simultaneously transcribed and translated to English. The proof-read transcripts were then imported into atlas.ti7 qualitative data management software (ATLAS.ti GmbH, Berlin) for analysis. We used thematic network analysis as the framework for analysis [21]. Initially, inductive coding was done involving three people; two of them independent of the study planning and data collection. Initial codes were compared and discussed before a coding framework was devised and applied to the rest of the transcripts. We allowed for any emerging codes to be included for both baseline and follow-up interviews. Codes were also discussed among the first, second, and last author. Baseline and follow-up transcripts for each participant were compared to identify differences in reported behaviours, as well as beliefs. Basic themes were identified by exploring the links between the codes and clustering them. The basic themes were then arranged into organizing themes, and global themes that reflected the research question for this paper were then deduced.

Ethical considerations

The study was approved by the Higher Degrees, Research and Ethics Committee (HDREC) of Makerere University School of Public Health (registration 288) and the Uganda National Council for Science and Technology (SS 3764). The Wakiso district health office and the health facilities where men sought SMC services granted permission for data collection. For each of the rounds of interview, the participants were compensated for their time with 20,000 Uganda shillings (about 7 US$ at the time).

Results

Characteristics of study participants

All participants' demographic characteristics were collected at baseline. All men were either married or in stable sexual relationships since this was one of the study criteria. The participants' ages ranged from 18 to 46 years, with a median age of 26 years. The majority had primary school-level education. They were from several ethnic backgrounds that are found in the Central, Western and Eastern regions of the country. Participants' demographic details can be seen in Table 1.

The overarching theme – post SMC sexual beliefs – encompassed the following organising themes [1]: Beliefs regarding sexual cleansing [2], beliefs regarding HIV transmission risk [3], beliefs regarding healing, and [4] beliefs regarding sexual capabilities post circumcision (Figure 1). The findings are presented following these themes.

Beliefs regarding continued HIV transmission risk

Men correctly believed that although reduced, there was still a continued risk of HIV transmission after undergoing SMC. As a result of this belief, the majority of the men interviewed at follow up had either maintained or adopted safe sexual behaviour such as being faithful to one partner or use of condoms during extra marital affairs.

At follow up, twelve men reported that they still had only one sexual partner, the same partner they had at baseline. They mentioned that this was to some extent because they knew that SMC only offered partial protection, which meant they needed other measures to continue protecting themselves and their partner:

> I cannot say that I have very minimal chances of getting HIV infection. I think we should not take risks just because we are circumcised. There is still a chance that you can get HIV. If you put it in your mind that you cannot get HIV, you may have trouble. If you decide to go on rampage, you may be infected in the process. Since you do not know when you may be infected, you need to be protective of yourself all the time. So you should be faithful to your one trusted partner or you should use condoms (P22, follow up, age 41).

Two men had reported extramarital affairs at baseline but both stopped casual sexual relations after SMC. Both kept their marital partners, although one had two official wives. These two attributed the behaviour change to the health education they received at the health facilities when seeking SMC services, the fear of HIV, as well as other non-SMC-related reasons as indicated in the excerpt below:

> Since the time we met [referring to baseline interview] I have not had sex with any casual partner; only my wives. . .
>
> I told them I have now concentrated on them and it will be them to bring any infections, not me. I was more worried

Table 1. Participants' characteristics

Characteristics	*Number of men*
Age group	
18–24	10
25–34	11
35+	4
Highest education level	
Primary	12
Secondary	9
Tertiary	4
Residence	
Rural	14
Urban	11
Health facility where circumcised	
HCIV	12
HCIII	8
Outreach	5
Ethnicity	
Baganda	13
Bakiga/Banyankore/Banyarwanda	5
Basoga	5
Bateso/Baluuri	2
Occupation	
Building/Masonry/Brick-laying/Plumbing	12
Security/barbers/taxi driving	4
Casual labour	3
Farming	3
Business/shops	3

about penile cancer and that is why I went for circumcision. The risk of HIV also reduced for sure... He [health worker] said circumcised men have fewer chances. But he cautioned us not to have multiple partners just because we were circumcised. Now combining my behaviour and circumcision, I should say I am better off. But I know that there is still a chance in case I have sex with anyone I am not sure of. I still have to protect myself (P10, follow up, age 46).

Three participants had multiple sexual partners following circumcision, but all reported condom use with the extra marital partner due to the belief that there was continued HIV risk. They also said that they engaged in extramarital sex because they were away from the partners for a period of time, rather than due to the circumcision state:

P: Yes, I have had sex with another woman when I went on one of my business/working trips. You know it is hard not to have these casual partners when away from home for a long period.
I: Did you use a condom with her?
P: Yes, I did. You cannot be sure about their [casual partners'] HIV status and therefore you must take caution. I am not God and I cannot determine my chances [of HIV infection]. Even though I am circumcised, I still have to use a condom. I followed what the health workers said; that in case of casual sex, we should continue to use condoms (P18, follow up, age 26).

Beliefs regarding sexual cleansing

At both baseline and follow up, participants reported that many people believed that a circumcised man should have one-off post circumcision sex with a casual partner after healing before they have sex with their wife/stable partner. This belief was reported to be common by nearly all men in the baseline interviews and everyone in the follow up. Participants reported that they heard this from their circumcised friends, relatives, other men and women in the community, and surprisingly their sexual partners. Most

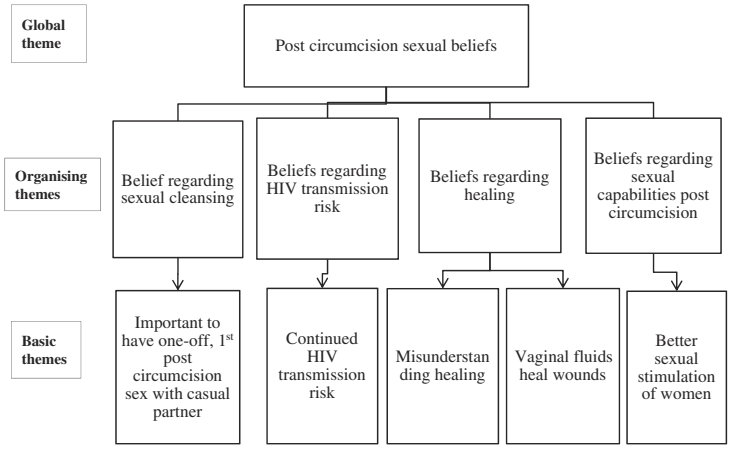

Figure 1. Thematic analysis for post circumcision sexual beliefs.

reported the belief to have originated from parts of eastern Uganda where circumcision is traditionally practiced:

> The first time I heard about this was from a woman actually. But she was not my sexual partner. We went to a health facility with our friend who was circumcised [in western Uganda]. This woman asked him, "now that they have circumcised you, haa! who is this woman that is going to have these 'blades' [perceived sharpening from the surgical blade]? If you have sex with your partner first, she is going to become a problem for you because of the 'blades'" Then when I came to Wakiso, people were saying the same here. But I do not think it is true, surely (P1, baseline, age 25).

The reasons given for this belief varied. Most men said that they were told that the woman with whom they had initial sex would have enhanced libido and ultimately become promiscuous. The enhanced libido that a woman would experience was suspected to result from the effects of surgical blades "sharpening" the penis. Others reported that the first sexual intercourse after circumcision was for cleansing to remove a bad omen from the circumcision act, but they could not explain it further. Some also said that a woman involved in first post-circumcision sexual intercourse would become wasted and physically unattractive. Both younger and older men reported these reasons:

> I have heard that you should not have first intercourse with your girlfriend after circumcision. That whoever you have first sex with will develop "akasagazi" [unusual libido]. That also her skin becomes pale and unattractive to men (P25, baseline, age 18).

In the baseline interviews, eight men (seven of them above 24 years) did not believe in this myth and the advice given by friends to comply with it. However, ten men were worried about the consequences in the event that they did not comply with this belief, and were confused about what to do when they healed. Four young men (18–24 years) were strongly inclined to find casual partners to have sex with soon after healing. The narratives below from baseline and follow up interviews are a typical example of a worried participant and his reaction:

> Yesterday my friend told me that 'now that you are circumcised, you cannot have first sex with your wife after healing.' I told him, 'you know that I do not have sexual partners outside my marriage. How come you are telling me to do this?' Then he told me that there are bad omens associated with this sex, but he could not explain. I asked my other friend today if he knows this and he told me the same thing... It is good that you have come, you can help me. I am really worried. I have been wondering what will happen to my wife... My friend who told me is circumcised too. It means he had another woman outside [marriage] that he first had sex with (P21, baseline, age 29).

Then at follow up he said:

> Even when I was healed, some of my friends at the construction site used to tell me that I should get someone else before having sex with my wife. But I told them that I had already had sex with her. They said that she will become promiscuous. That I should just wait for this. But up to now, I have not seen this happening. If she was promiscuous, I would have known by now. Naturally though, as any normal person you will have questions lingering in your mind, thinking about this. But I made up my mind and decided I will stick with my wife (P21, follow up, age 29).

Four young men were inclined to follow the advice they were given by those who had this belief:

I: How are you going to deal with this belief?
P: I will not have first sex with my partner. I already have another woman that I am planning to have first sex with.
I: Will she not refuse this too?
P: She will not know that I am recently circumcised (P25, baseline, age 18).

In the follow-up interviews, four men (P2, P13, P14 and P24) reported that they had first sexual intercourse post SMC with a casual partner in fear of the consequences of not complying with this belief. A fifth participant (P25) was also waiting to have such sex. Three of them were those who had indicated strong inclinations towards adhering to this belief in the baseline interviews. All the five men had primary-level education, and were aged below 25 years. Two of these young men said they had been influenced by their wives/partners to have such sex because they also worried about what would happen to them if they did not adhere to this belief. A third man had initiated sex with his wife but was consistently using condoms, waiting to find a woman that he would have condom-less sex with for cleansing. His partner, he said, had indicated that she would not accept condom-less sex until he found another woman with whom to have such intercourse. Only one of these four young men that confirmed to have sex with someone else reported using a condom during the sexual encounter with the casual partner following this belief:

P: They told us that after circumcision, it is not a good idea to start having sex with your wife or a woman you love. Haji told me this
I: Why do you think Haji said this?
P: Because he is my friend and he cares about me. I was also seeking advice from him since he had gone through this process [circumcision]. He knows my wife. He told me to look for another woman, maybe far from here...

I got a partner from the past and when I healed, I went back to her again, disguising it as a resumption of the casual sexual relationship we had before. I will not have sex with her again. Hajji told me that if I do, then the bad omen will come back to me again [. . .]

I: Sticking with this issue, did you use a condom with her on that occasion?

P: No, I did not.

I: Why did you not?

P: Haji told me that we cannot use condoms for cleansing sex (P13, follow up, age 21).

Sexual beliefs regarding healing

This theme was organized under two beliefs: vaginal fluids aiding wound healing, and misunderstanding of healing. Four men (both younger and older) reported that vaginal fluids helped to hasten wound healing. This belief was related to wounds of different kinds, especially on the fingers. The understanding was that when vaginal fluids were applied to the wound – or if it was a finger injured, it could be inserted in a partner's vagina- that would hasten healing. One man reported that he was told after SMC to have sexual intercourse before the wound healed to aid the healing process. However, none of the four participants believed in this, especially citing its dangers for such a sensitive body part:

P: There was a man who told me that for one to heal fast, you should have sexual intercourse. Imagine someone giving you such advice!

I: What did you do about this?

P: I could not follow this of course! How can you put your wound through such trouble? (P21, follow up, age 29).

Although most men waited to have sex until after the healing period with some taking even extra caution to wait several months, two men did not. These seemed to have misunderstood when full healing occurred, i.e. that it was more than the superficial closing of the skin, and that six weeks are needed for the inflammation to decrease and the tissue around the cut to become strong. They reported having had sexual intercourse before the recommended abstinence period ended. One had sex as soon as two weeks after surgery. Both were above 24 years of age:

P: I was not expecting this [self-ascertained quick healing]. They [health workers] had told me I will be fully healed after one month and two weeks and be able to resume sex. So I thought that is the time it will take me to heal. This [quick healing] put a smile on my face. . .

I: Do you mean full healing?

P: To be honest, in one week and about three days I was healed. But I waited for the full two weeks to elapse to resume sex. I was able to have sex after two weeks and I had no pain (P5, follow up, age 29)

In the discussion, both men indirectly blamed their partners as one of the reasons for engaging in early sex. One mentioned that: "There should be some tablets that women can take to reduce their sexual desire while their circumcised partners are still healing," in reference to his partner's sexual requests during this period. The second man who had sex before the prescribed healing period reported regrets as well as challenges of waiting, as expressed in this narrative:

> I resumed sex after four weeks. Although they had told me six weeks but I was healed after four weeks ((laughs)). I thought I was okay. However, from my experience I have realised that even if they say six weeks and truly you feel healed, the first three months your skin is still weak when you have sex. I think it should be about three months or even longer if possible. The problem is that it is so hard when you are living with your partner to wait yet you see with your eyes that you are healed. You also naturally want to test how it feels after circumcision; the urge is there. Your partner is also demanding [sex] and she sees that you have healed. . . [But] the skin is still weak for the first three months. I used to get some sores. . . I got these bruises several times, but they would heal quickly (P7, follow up, age 26).

Beliefs regarding sexual capabilities post circumcision

Participants believed that circumcision enhanced their sexual capabilities with better sexual stimulation and satisfaction for their partners. Half of the men (both young and older) had reported this belief at baseline as a part of the drivers for their circumcision decision. These also expressed a felt change at follow up after resumption of sex post SMC. Seven men further said that their partners attested to having better sexual experiences with them after undergoing SMC:

> I can confirm from my sex life that now I last longer during sexual intercourse than I did before circumcision. Even my partner thanked me the first time I had sex with her [after circumcision] and was excited that I was circumcised. She had never thanked me before (P14, follow up, age 19).

One participant sustained the extramarital sexual relationship that he had before SMC. This seemed to be an experimentation with his expectations of enhanced sexual stimulation of women, which he reported in the baseline interview. ". . .women have a perception that a man who is circumcised is better in bed. They say so. But I am not a woman to testify to this." Even though he reported that he had received health education at the health facility and was counselled about post SMC sexual behaviour at baseline, this did not change his behaviour. However, he noted during the follow-up interview that he was discontinuing the casual relationship:

> I had a casual sexual relationship with this woman before I was circumcised. After circumcision, I also had sex with her, and she told me that I had truly

> changed. That she was sexually more satisfied compared to the past before circumcision. This made me happy because another woman was telling me exactly the same thing that my wife was also saying; which means it is true... But I have now decided to stick to only one partner. I will not go back to the second partner now anymore.

He continued to say:

> When you are circumcised you feel better during sex and, a 'sharpened pencil writes better than one which is not sharpened' (P5, follow up, age 29).

Discussion

This qualitative study explores the sexual beliefs and behaviour among men followed up six months following SMC. The study offers possible underlying explanations for the protective and sexual risk behaviours among men circumcised in a programme setting. The most commonly reported beliefs in the study were, that it was important that the initial sexual intercourse post circumcision was with someone who was not a man's stable partner, and that circumcision offered better sexual stimulation of women. There was also some misunderstanding of what comprised complete healing, while some men had heard that vaginal fluids aided wound healing. Men also correctly believed that the risk of acquiring HIV remained even after SMC.

The findings show that some beliefs around circumcision could contribute to sexual risk behaviour. The belief that initial sexual intercourse post circumcision was intended for cleansing purposes was reported by all participants in this study. Although many participants who had heard about this misconception rejected it, some young men adhered to it, having one-off sex with casual partners, without using condoms. This should be a consideration for programme implementers because beliefs of this kind could put some newly circumcised men that adhere to them, as well as their sexual partners at the risk of HIV infection. This belief has also been reported among fishing communities on lake Victoria, Uganda [14,22] and in unpublished work in eastern Uganda [23]. It is also loosely mentioned in a national supervision report for HIV/AIDs activities [24], which may indicate that it is not only limited to this study. However, it is not mentioned in SMC social marketing documents and messages disseminated to the general public. It was also not reported to have featured during the pre-SMC counselling by the men in this study. Outside Uganda, initial post circumcision sex with casual partners has also been reported in a study in South Africa as a cleaning ritual [25].

Some beliefs around wound healing could also increase risk to HIV and other STIs. The men that reported sexual intercourse before the six weeks recommended abstinence period elapsed seemed to have misunderstood what comprised complete wound healing. Such sex has been associated with higher odds of HIV infection among circumcised men [26] and other consequences, like increased risk of infection of the surgical incision [27]. Indeed, one of these participants reported longer complete wound healing, possibly as a result. Non-adherence to the recommended healing period has also been reported elsewhere [13,28–30]. In a study by Herman-Roloff et al. in Kenya, men who reported that their sexual partners were pleased with their circumcision decision were more likely to engage in sex within the healing period [30]. The men in our study who had sex before healing had also reported at baseline that their partners were please with their decision to circumcise. The fear of partner infidelity during the healing period could also have contributed to early sex resumption. Such fears have also been reported by community members in a study in Tanzania [31]. Another reported belief related to healing was that vaginal fluids accelerate wound healing, which has also been reported in other areas of Uganda recently [14,22,23]. No man in this study reported engaging in early sex resumption for this purpose, but such misconceptions should not be ignored in SMC promotion messages to the general public.

There were also beliefs described by participants which may contribute to protective behaviour. Men believed that there was a continued risk of HIV transmission after SMC. As a result, most men either maintained or adopted safe sexual behaviour in the follow up period; having sex with only their wives or using condoms when they had extra marital sexual relations. The adherence to this correct belief could also indicate that the implementation of the SMC programme has not necessarily led to behavioural risk compensation among adult men in the general population, although this qualitative study cannot be generalized to that effect. Similar behaviours have been reported among SMC clients in Kenya [11,32] and Swaziland [12]. Some men attributed such decisions to the awareness from pre-SMC health education received at health facilities as well as public campaigns promoting SMC. These messages that emphasize partial risk reduction as opposed to complete protection seem to have positive effect on post SMC behaviour.

The belief that circumcision offered better sexual stimulation for women was also common but did not seem to result in sexual risk-taking behaviour among men in the study. Such a belief could result in sexual experimentation with casual partners after circumcision especially in the short period after healing [12], without using condoms. However, such potential risky behaviour seemed to have been neutralized among participants in this study, by the belief of continued existence of HIV risk. Nearly all participants who reported multiple sexual partners used condoms even though they expected better sexual stimulation of women after SMC.

There were other informal sources reported in this study where beliefs that may contribute to sexual risk behaviour among men arose. The belief of cleansing sex appears to be related to cultural/traditional circumcision practiced in the eastern part of Uganda as some men reported. Sexual partners of the participants, friends and other people within the community also played a role in diffusion of beliefs, while men who have gone through the circumcision

experience were also consulted for advice especially in the healing period. There is limited control over such sources of information and what advice circumcised men obtain from them. Although risk compensation was not evident in this study, the existence of these beliefs that might influence some men's post circumcision sexual behaviour should be considered in SMC programme implementation. These may be widespread. It is possible that some health workers were not aware of such beliefs at the time and missed them in the messages to SMC clients in this study. As such, these misconceptions may continue to infiltrate the communities with little control by public health authorities. Messages concerning beliefs and expected behaviours post SMC should not only target potential clients and their sexual partners, but also other influencers in the general population. This will further contribute to the success of the SMC intervention that has already reached millions of men.

There was very little variation in relation to age in reporting protective and risky beliefs, although men that adhered to beliefs leading to sexual risk behaviour were mainly of lower education levels and relatively young ages. Education generally improves knowledge and cognitive ability and is often associated with better behaviour outcomes. Men with lower education levels or no formal education may be easily influenced by such beliefs because of limited exposure to and comprehension of health promotion messages. Younger men may also be more easily influenced by their peers or by misconceptions that exist in the communities than their older counterparts. Since it may be easier for health care providers to tailor messages to young people rather than focus on client education levels, young men may benefit from further attention during health education sessions at the health facilities to allay the fears of consequences of not abiding by such beliefs. It should also be noted that most clients of the SMC intervention are likely to be young men.

The findings of this study should be regarded within the context of some limitations. The data are from self-reports of men interviewed at two time points. The follow-up data may be subject to bias for some men who may not have admitted, yet could have engaged in sexual risk behaviours. The risk of social desirability bias could have increased since at the end of the baseline interviews, men who were worried or inclined to sexual risk behaviours after healing, especially those who believed that they should have first sex with another woman, were advised against this by the interviewers and/or the first author. However, ethically we felt obliged to correct the misconceptions that would pose a risk to men after SMC and for which they had not received information from the health facilities. In-depth interviewing may have minimized this potential bias since many still reported that they adhered to the risky belief in the follow-up interviews. One of the strengths of this study is in interviewing the same clients at baseline and at six months with contact in between. Although a few studies [11–13] provide some understanding of post SMC behaviour, they were cross-sectional and with a substantial recall period of up to 12 months. Prospective qualitative studies help to build more trust with informants to discuss sensitive personal issues [20] and with shorter follow-up periods, they may yield more reliable findings and may be less prone to recall problems.

Conclusions

This study has explored the beliefs that may influence sexual behaviour of men before and after SMC. Although most men reported to have maintained or adopted safer sexual behaviour after circumcision with the knowledge that there was continued HIV transmission risk, there were cases of sexual risk behaviour as well. Such behaviours resulted from existing beliefs or from a misunderstanding of what comprised full healing. The cultural or society beliefs that could have contributed to sexual risk behaviour in this study were not addressed in the standard counselling/health education sessions preceding SMC. Such beliefs need to be addressed because they may be widespread beyond the context of this study population and/or area. If so, they may expose some of the SMC clients to HIV infection. Using circumcised men that have adopted or maintained safer sexual behaviour to encourage others to adhere to such desired behaviour may benefit the national SMC programme. Many newly circumcised men in this study sought advice from friends that had undergone this experience, and this may be the case for other men elsewhere.

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Competing interests
The authors declare that they have no competing interests.

Authors' contributions
SPSK conceived the study, designed research instruments, managed the data collection, led the data analysis and drafting of the manuscript. LMA contributed to the study conception and review of the study instruments, participated in data collection, analysis and writing of the manuscript. IFS and FEM contributed to study design and review of the study instruments, and writing the manuscript. MD contributed to the study conception and review of the study instruments, analysis and writing of the manuscript. All authors read and approved the final manuscript.

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References

[1] Gray RH, Kigozi G, Serwadda D, Makumbi F, Watya S, Nalugoda F, et al. Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. Lancet. 2007;369(9562):657–66.

[2] Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, Puren A. Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. Plos Med. 2005;2(11):e298.

[3] Bailey RC, Moses S, Parker CB, Agot K, Maclean I, Krieger JN, et al. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomized controlled trial. Lancet. 2007;369(9562):643–56.

[4] Hallett TB, Alsallaq RA, Baeten JM, Weiss H, Celum C, Gray R, et al. Will circumcision provide even more protection from HIV to women and men? New estimates of the population impact of circumcision interventions. Sex Transm Infect. 2011;87(2):88–93.

[5] WHO/UNAIDS. New data on male circumcision and HIV prevention: policy and programme implications. Geneva, Switzerland: World Health Organisation and Joint United Nations Programme on HIV/AIDS;2007 March 28.

[6] WHO/UNAIDS. Joint strategic action framework to accelerate the scale-up of voluntary medical male circumcision for HIV prevention in Eastern and Southern Africa 2012–2016. Geneva: World Health Organisation and Joint United Nations Programme on HIV/AIDS; 2011.

[7] Uganda AIDS Commission. The HIV and AIDS Uganda progress report 2014. Kampala: UAC;2015 June 15.

[8] Kagaayi J, Kong X, Kigozi G, Ssekubugu R, Kigozi G, Nalugoda F, et al. Self-selection of male circumcision clients and behaviors following circumcision in a service program in rakai. Uganda: AIDS (London, England);2016.

[9] Kong X, Kigozi G, Nalugoda F, Musoke R, Kagaayi J, Latkin C, et al. 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. Am J Epidemiol. 2012;176(10):875–85.

[10] Westercamp N, Agot K, Jaoko W, Bailey RC. Risk compensation following male circumcision: results from a two-year prospective cohort study of recently circumcised and uncircumcised men in Nyanza province, Kenya. AIDS Behav. 2014;18(9):1764–75.

[11] Riess HT, Achieng MM, Otieno S, Ndinya-Achola JO, Bailey CR. "When I was circumcised I was taught certain things": risk compensation and protective sexual behavior among circumcised men in Kisumu, Kenya. Plos One. 2010;5(8):1–9.

[12] Grund JM, Hennink MM. A qualitative study of sexual behavior change and risk compensation following adult male circumcision in urban Swaziland. AIDS Care. 2012;24(2):245–51.

[13] Toefy Y, Skinner D, Thomsen SC. "What do you mean I've got to wait for six weeks?!" Understanding the sexual behaviour of men and their female partners after voluntary medical male circumcision in the western cape. Plos One. 2015;10(7):e0133156.

[14] Mbonye M, Kuteesa M, Seeley J, Levin J, Weiss H, Kamali A. Voluntary medical male circumcision for HIV prevention in fishing communities in Uganda: the influence of local beliefs and practice. Afr J AIDS Res. 2016;15(3):211–18.

[15] Uganda Bureau of Statistics. The national population and housing census 2014- main report. Kampala, Uganda: UBOS;2016.

[16] The Republic of Uganda. Ministry of health. Health facilities inventory July 2012: master health facilities inventory. Kampala, Uganda: Ministry of Health, Department of Clinical Services;2012.

[17] Kibira SP, Daniel M, Atuyambe LM, Makumbi FE, Sandoy IF. Exploring drivers for safe male circumcision: experiences with health education and understanding of partial HIV protection among newly circumcised men in Wakiso, Uganda. Plos One. 2017;12(3):e0175228.

[18] Guest G, Bunce A, Johnson L. How many interviews are enough? An experiment with data saturation and variability. Field Method. 2006;18(1):59–82.

[19] Dew K. A health researcher's guide to qualitative methodologies. Aust N Z J Public Health. 2007;31(5):433–37.

[20] Murray SA, Kendall M, Carduff E, Worth A, Harris FM, Lloyd A, et al. Use of serial qualitative interviews to understand patients' evolving experiences and needs. BMJ. 2009;339:b3702.

[21] Attride-Stirling J. Thematic networks: an analytic tool for qualitative research. Qual Res. 2001;1(3):385–405.

[22] Nevin PE, Pfeiffer J, Kibira SP, Lubinga SJ, Mukose A, Babigumira JB. Perceptions of HIV and safe male circumcision in high HIV prevalence fishing communities on Lake Victoria, Uganda. Plos One. 2015;10(12):e0145543.

[23] Odong J Does Uganda need to realign its male circumcision campaign?: aVERTing HIV and AIDS; 2016 [cited 2016 Jun 2]. Available from: https://www.avert.org/news/does-uganda-need-realign-its-male-circumcision-campaign

[24] Uganda AIDS Commission. District HIV/AIDS support supervision and follow up of HIV/AIDS activities implemented in local governments. Kampala, Uganda: UAC;2014.

[25] Peltzer K, Kekana Q, Banyini M, Jooste S, Simbayi L. Adaptation of an HIV behavioural disinhibition risk reduction intervention for recently circumcised South African men. Gend Behaviour. 2011;9(1):3479–94.

[26] Ediau M, Matovu JK, Byaruhanga R, Tumwesigye NM, Wanyenze RK. Risk factors for HIV infection among circumcised men in Uganda: a case-control study. J Int AIDS Soc. 2015;18(1):19312.

[27] Zulu R, Jones D, Chitalu N, Cook R, Weiss S. Sexual satisfaction, performance, and partner response following voluntary medical male circumcision in Zambia: the spear and shield project. Glob Health Sci Pract. 2015;3(4):606–18.

[28] Odoyo-June E, Rogers JH, Jaoko W, Bailey RC. Factors associated with resumption of sex before complete wound healing in circumcised HIV-positive and HIV-negative men in Kisumu, Kenya. J Acquir Immune Defic Syndr. 2013;62(4):465–70.

[29] Abbott SA, Haberland NA, Mulenga DM, Hewett PC. Female sex workers, male circumcision and HIV: a qualitative study of their understanding, experience, and HIV risk in Zambia. Plos One. 2013;8(1):e53809.

[30] Herman-Roloff A, Bailey RC, Agot K. Factors associated with the early resumption of sexual activity following medical male circumcision in Nyanza province, Kenya. AIDS Behav. 2012;16(5):1173–81.

[31] Plotkin M, Castor D, Mziray H, Kuver J, Mpuya E, Luvanda PJ, et al. "Man, what took you so long?" Social and individual factors affecting adult attendance at voluntary medical male circumcision services in Tanzania. Glob Health Sci Pract. 2013;1(1):108–16.

[32] L'Engle K, Lanham M, Loolpapit M, Oguma I. Understanding partial protection and HIV risk and behavior following voluntary medical male circumcision rollout in Kenya. Health Educ Res. 2014;29(1):122–30.