Published in final edited form as:

Glob Public Health. 2018 November ; 13(11): 1682–1690. doi:10.1080/17441692.2018.1427277.

Male Circumcision for HIV Prevention: Awareness, Risk Compensation, and Risk Perceptions among South African Women

Seth Kalichman¹, Catherine Mathews², Moira Kalichman¹, Lisa A. Eaton¹, and Koena Nkoko

¹University of Connecticut

²Health Systems Research Unit, South African Medical Research Council

Abstract

Medical male circumcision is a proven method of HIV risk reduction for men in southern Africa. Medical male circumcision (MMC) promotion campaigns and scale-up programs are widely implemented throughout the Republic of South Africa. However, the impact of promoting MMC on women's awareness, beliefs, and behaviors has been understudied. We conducted a self-administered anonymous survey of 279 women receiving health services in an impoverished township located in Cape Town, South Africa. Results showed that two in three women were unaware that male circumcision partially protects men from contracting HIV. Women who were aware of MMC for HIV prevention also endorsed beliefs that male circumcision reduces the need for men to worry about HIV and reduces the need for men to use condoms. Male circumcision awareness was also related to reduced perceptions of HIV risk among women. Multivariable models showed that women's MMC awareness, circumcision risk compensation beliefs, and risk perceptions were associated with decreased condom use and higher HIV risk index scores defined as condomless vaginal intercourse X number of sex partners. These results suggest a need for MMC education efforts tailored for women living in communities with high-HIV prevalence where men are targeted for MMC.

Keywords

HIV prevention; Medical male circumcision; Risk compensation; Women's health

Introduction

Medical male circumcision (MMC) is among the most heralded breakthroughs in HIV prevention. Definitive evidence for the protective effects of MMC is based on numerous epidemiological studies and three randomized clinical trials, all consistently showing that MMC lowers the risk of female-to-male HIV transmission by more than 50% (Auvert et al., 2005; Bailey et al., 2007; Byakika-Tusiime, 2008; Gray et al., 2008). At the population-level, medical male circumcision has the potential to reduce HIV prevalence in men and thereby lowering women's risks of HIV exposure (Baeten, Celum, & Coates, 2009; Carrasco, Nguyen, & Kaufman, 2016; Turner et al., 2007). Unlike antiretroviral therapy-based prevention, MMC offers permanent partial protection against HIV. Unlike a preventive vaccine, MMC is available. While the scale-up of MMC has been slower than was hoped

(Brooks et al., 2009; Carrasco et al., 2016; Kahn, Marseille, & Auvert, 2006), there are substantial efforts to promote MMC for HIV prevention in southern Africa. Media campaigns in particular have aimed at raising public awareness about the HIV protection benefits of MMC (Sgaier et al., 2015). Studies show that there is rising awareness throughout southern Africa that MMC is an effective strategy for HIV prevention (Rennie, Perry, Corneli, Chilungo, & Umar, 2015; Westercamp & Bailey, 2007; Wilcken, Miiro-Nakayima, Hizaamu, Keil, & Balaba-Byansi, 2010).

Awareness that MMC reduces HIV risk has the potential to increase a sense of safety and protection in communities where circumcision programs are scaled-up. MMC promotion campaigns send the message to men and women, both directly and indirectly, that condoms are less necessary when men are circumcised (Bridges, Selck, Gray, McIntyre, & Martinson, 2011). Because MMC is partially protective, there are concerns that accompanying reductions in condom use with selected circumcised partners could increase women's risks for other sexually transmitted infections (STI) (Kalichman, Eaton, & Pinkerton, 2007). Furthermore, there is evidence that male circumcision performed for traditional cultural rites of passage does not provide the same HIV protection to men afforded by MMC (Maffioli, 2017). For example, analyses performed on the National Malawi Demographic and Health Survey from 2010 failed to demonstrate any difference in HIV infections among circumcised and uncircumcised men (Mutombo et al., 2016). Multiple factors may account for differences between MMC and traditional male circumcision including incomplete removal of foreskin in traditional practice and unmeasured behavioral risk factors. However, there is no evidence that individuals living in communities targeted for MMC scale-up distinguish between types of circumcision in terms of health benefits, suggesting that HIV prevention beliefs and perceptions will not vary between MMC and traditional male circumcision.

The expectation that men will reduce their condom use following MMC is explained by theories of risk compensation (Eaton & Kalichman, 2007; Eaton & Kalichman, 2009). Specifically, Risk Compensation Theory (Hedlund, 2000) posits that people adjust their behavior in response to changes in perceived risk such that as perceived risk increases so too will protective behaviors (Eaton & Kalichman, 2007). Likewise, as risk perceptions decrease so too will protective behaviors. The evidence for risk compensation in response to MMC in southern Africa is mixed (Agot et al., 2007). For example, men who participated in the MMC randomized trials have not evidenced reductions in condom use over time (Mattson et al., 2008). In contrast, men who have been traditionally circumcised in South Africa and are aware of the protective benefits of MMC report less condom use than men who are not aware of the preventive benefits of MMC (Eaton et al., 2011). In addition, men who perceive lower risks for HIV infection due to their traditional circumcision status have a significantly greater number of recent female sex partners and are more likely to have a history of STI.

Medical male circumcision promotion campaigns send the message that circumcised men are at less risk for HIV and by extension are less likely to place women at risk. Thus, women with circumcised male sex partners may exhibit risk compensation, reducing their perceived risks and reducing condom use (Riess, Achieng, & Bailey, 2014; Westercamp, Agot, Ndinya-Achola, & Bailey, 2012). A large study in Cape Town, South Africa found that one in four women had heard that male circumcision reduces a man's risk for HIV. The study

also found that women who were aware of the protective benefits to circumcised men evidenced lower perceived personal risk and less condom use compared to women who were not informed about male circumcision for HIV prevention (Maughan-Brown & Venkataramani, 2012). In another study of women surveyed in South African townships, Eaton and Kalichman (2014) found that women who perceived HIV as less of a threat when male partners are circumcised engaged in higher-rates of condomless vaginal intercourse. Haberland, Kelly, Mulenga, Mensch, and Hewett (2016) also found that women in Zambia were becoming increasingly aware that male circumcision protects men from HIV. Furthermore, Zambian women overestimated the protection offered by male circumcision against other STI. Another study found that 40% of married women who completed a Ugandan national survey believed that MMC effectively prevents HIV and that women who were aware of HIV prevention benefits of MMC were six times as likely to recommend male friends undergo circumcision (Mati, Adegoke, & Salihu, 2016).

The current study extends previous research on women's awareness of the HIV protective benefits of MMC and its impact on their own risk perceptions and behaviors. We examined levels of awareness that male circumcision reduces men's risks for HIV infection among women living in a South African community that has been targeted by public health campaigns encouraging MMC. In this same community, male circumcision is commonly performed for traditional cultural reasons. We investigated HIV risk compensation beliefs, HIV risk perceptions, and behaviors among (a) women who were aware and (b) women who were not aware of the HIV preventive benefits of male circumcision. Based on theories of risk compensation, we hypothesized that circumcision awareness, risk compensation beliefs, and risk perceptions would be associated with multiple indicators of sexual risk for HIV, including condomless vaginal sex, empirically-derived HIV risk index scores, and genital tract infection symptoms and STI diagnoses.

Methods

Study setting and procedures

Women receiving family planning and STI diagnostic and treatment services from a community-based clinic in Cape Town, South Africa were asked to complete a brief anonymous survey while waiting to see a clinic nurse. Surveys were collected between February 2015 to February 2016. Participants were at least 18 years of age and provided written informed consent. Surveys were not linked to consent forms and were self-administered anonymously using a paper-pencil format. The survey required approximately 10 minutes to complete. Participants were offered a nominal food incentive for their participation. A staff member was present at all times and available to participants who requested assistance (< 5%). A total of 348 women completed surveys, representing an approximate 80% acceptance rate. For the entire sample, 69 (20%) women indicated that they had tested HIV positive and, therefore, were excluded from analyses. The public health clinic that served as the site for the current research is located in a historically Black African and impoverished township. All procedures were approved by the University of Connecticut and Medical Council of South Africa institutional ethical review boards.

Measures

Information was collected using an anonymous survey available in English and Xhosa, the two languages spoken by nearly all clinic patients. The instruments captured information on individual demographic and health characteristics, sexual behaviors, circumcision awareness, circumcision risk compensation beliefs, and circumcision risk reduction perceptions.

Demographic and health characteristics.—Participants reported their age, race, years of formal education, income and marital status. We also asked participants about their HIV testing history and HIV status, whether they had been told to come to the clinic that day to be checked for an STI, had been diagnosed with an STI in the previous month, and whether they were currently experiencing genital pain, unexplained genital discharge, or genital ulceration.

Sexual behaviors and partner circumcision status.—Participants responded to a series of questions assessing their number of sex partners and frequency of sex acts in the previous month; specifically, vaginal and anal intercourse with and without condoms. We also asked participants the number of sex partners they had in the previous month and whether they currently had main and casual sex partners. Each sexual behavior and sexual partner question was asked independently. Participants were instructed to think back over the past 30 days (one month) and estimate the number of partners and occasions in which they practiced each behavior. For condom use, participants were asked the number of times they or their sex partner had used condoms in the past month during vaginal and anal intercourse. We calculated the percent of times condoms were used during the previous month by taking the sum of condom-protected acts and dividing that value by the sum of all acts during that time period. We also calculated an index of sexual risks for HIV that weights the number of condomless vaginal intercourse occasions by the number of partners reported in the same month (Susser, Desvarieux, & Wittkowski, 1998).

Circumcision awareness.—To assess awareness that male circumcision provides protection against HIV, participants were asked to respond to the following statement: “I have heard that a man who is circumcised is safer from getting HIV” (yes/no). Participants were also asked if their most recent male sex partner was circumcised and if so whether he was medically or traditionally circumcised. In addition, we asked whether participants knew men who had been medically circumcised to protect themselves from HIV.

Circumcision risk compensation beliefs.—Risk compensation beliefs are defined as a state of mind in which confidence is placed on the benefits of male circumcision for reducing HIV infection in men. We administered seven items adapted from Eaton and Kalichman (2014) that represent beliefs that circumcision reduces a man’s risks for HIV. These beliefs encompass multiple aspects of male circumcision for preventing HIV infection including reduced threat of HIV for circumcised men, less need for circumcised men to use condoms, and lower risk for women who have circumcised sex partners. The exact items are shown in the results section. The circumcision risk compensation beliefs were responded to on a 6-point scale, 1 = Strongly Disagree, 6 = Strongly Agree. Each item was analyzed as an

indicator of risk compensation beliefs and the items were summed to obtain an internally consistent risk compensation beliefs score, Cronbach's $\alpha = .81$.

Circumcision risk-reduction perceptions.—Risk-reduction perceptions are defined as subjective judgments made about the severity of risk for HIV under specified circumstances. To assess participants' perceptions of HIV risk in the context of male circumcision, individuals read a hypothetical scenario followed by rating the perceived risk of three behaviors. The scenario read, "Imagine that an HIV negative man has sex with an HIV positive woman. Please rate how risky you believe each sexual activity is for the HIV negative man becoming HIV infected." The subsequent items asked participants to rate their perceived risk of HIV for male sex partners of HIV-positive women, specifically (a) "vaginal sex without a condom" (b) "vaginal sex with a condom" and (c) "vaginal sex without a condom when the male partner is circumcised". Responses were made on a 5-point Likert-type scale, 1 = Very Low Risk, 5 = Very High Risk. We created two risk perception difference scores to index the relative increased protection condoms and circumcision were perceived to offer [(perceived risk of sex with a condom - perceived risk of sex without a condom) and (perceived risk of sex without a condom when circumcised - perceived risk of sex without a condom)]. For both difference scores, negative values indicate greater protection of condoms and circumcision over condomless sex, respectively. Difference scores for the measure of HIV protective value of condoms and circumcision ranged from -4 to 4, with 0 indicating no difference.

Data Analyses

We examined factors associated with awareness that male circumcision reduces the risk for men contracting HIV. Specifically, the 91 women who responded 'yes' to the item "I have heard that a man who is circumcised is safer from getting HIV" were defined as aware of male circumcision reducing risks, whereas 188 women who responded 'no' were classified as not aware. We compared circumcision aware and unaware participants on demographic and health characteristics, sexual behaviors, circumcision risk compensation beliefs and risk perceptions using chi-square contingency tables for categorical variables and independent t-tests for continuous measures. We also tested the hypothesis that male circumcision awareness, circumcision risk compensation beliefs, and risk perceptions would be associated with condomless vaginal sex, HIV risk index scores, and genital tract infection symptoms / STI diagnoses. Because our models predicted count variables (i.e., condom use, HIV risk index scores, genital tract infection symptoms) we conducted a series of Poisson regressions to examine the simultaneous effects of awareness that circumcision is protective, risk compensation beliefs and risk perception difference score as predictors of sexual risk outcomes. Our results report likelihood ratios for each predictor in each model. For all analyses, statistical significance was defined as $p < .05$.

Results

Findings from the descriptive analyses comparing women who were aware that male circumcision protects men against HIV in comparison to women who were not aware that male circumcision protects men are shown in Table 1. Analyses indicated that education was

the only demographic characteristic that distinguished women in the two male circumcision awareness groups. Women who were aware that male circumcision protects men from HIV were more likely to have completed primary or greater education. In terms of social and health characteristics, women who were aware that male circumcision offers protection against HIV were more likely to have male friends who were medically circumcised for HIV prevention, were more likely experiencing genital tract infection symptoms, and were less likely to use condoms.

Risk compensation beliefs

As expected, women who were aware that circumcision protects men from HIV also held more beliefs that sex is safer for women with circumcised male partners (see Table 2). Specifically, women who were aware of circumcision protection were more likely to endorse the beliefs “A man is less likely to have HIV if he is circumcised” and “Women are less likely to be infected with HIV if their sex partner is circumcised”. In addition, women who were aware that circumcision protects men were also more likely to endorse the belief that “Being circumcised means a man can worry less about HIV/AIDS”. The least prevalent beliefs across groups were “If a man is circumcised, he can have more sexual partners” and “Condom use is not necessary if the man is circumcised”.

Risk perceptions

Table 3 shows the perceived HIV risk conferred to men with HIV positive female sex partners under three conditions: (a) vaginal intercourse without condoms; (b) vaginal intercourse with condoms, and (c) vaginal intercourse without condoms when the man is circumcised. As expected, results showed that risk perceptions for vaginal sex with an HIV positive partner were substantially lower when condoms were used. In addition, perceived risk when male partners are circumcised was lower than the general condomless intercourse scenario, but not as protective as condom use. There was a significant difference between groups for the perceived protection offered by male circumcision; women who were aware that male circumcision reduces HIV risk perceived a greater difference in protection of circumcision offered to men relative to condomless sex without male circumcision. A dependent t-test comparing ratings of perceived risk reduction offered by condoms versus risk reduction offered by male circumcision showed that condoms were perceived as offering greater protection against HIV, $t(278) = 14.6, p < .001$.

Sexual risks in relation to circumcision awareness, beliefs, and perceptions

Three Poisson regression models tested for three sexual risk indicators (condomless intercourse, HIV risk index, and genital tract infection symptoms/STI diagnoses) as dependent variables and circumcision awareness, risk compensation beliefs, and risk reduction perception difference scores as independent variables. Results showed that all three factors - circumcision awareness, risk compensation beliefs and risk perceptions were associated with condomless sex and HIV risk index scores. In the final model, only circumcision awareness and risk compensation beliefs were associated with genital tract symptoms/STI diagnoses (see Table 4).

Discussion

This study extends previous research showing that South African women are becoming increasingly aware that MMC offers protection to men against HIV (Haberland et al., 2016; Mati et al., 2016). An estimated \$14.2 million was spent in 2014 on promotional campaigns to increase demand for MMC in South Africa (Tchuenche et al., 2016). Given this investment, it was therefore surprising that two-thirds of women were not aware of the HIV prevention benefits of MMC. We interpret this finding as evidence that public health campaigns promoting MMC for HIV prevention may not have broadly penetrated communities in this area of South Africa. We also found that women who were aware that MMC offers HIV protection to men were better educated and were more likely to know men who have been medically circumcised. In addition, women who were aware of the benefits of MMC reported less condom use and were more likely to report symptoms of genital tract infection.

As expected, women who were aware of the protective benefits of male circumcision were also more likely to endorse beliefs that HIV is less of a threat to circumcised men and that circumcised men should be less concerned with condom use. These findings occurred in the context of clear evidence from the risk perception measures that women perceive male circumcision as protective against HIV, although not as protective as condoms. These findings are similar to a previous study of women in a different part of South Africa (Mantell et al., 2013). In that study, women believed that MMC would ultimately increase their risk of contracting HIV as a result of circumcised men increasing their numbers of sex partners and using condoms less. In our study, multivariable models showed that male circumcision awareness, risk compensation beliefs, and perceived relative risk reduction offered by male circumcision were associated with less condom use and higher HIV risk index scores. These findings replicate and extend past research showing that women's perceptions of circumcision-related HIV risk reduction are related to less condom protected behaviors (Eaton et al., 2011).

The current study findings should be interpreted in light of their methodological limitations. Our sample was one of convenience and cannot be considered representative of STI clinic patients in South Africa. In addition, our measures were self-administered and may have resulted in under-reporting of sensitive behaviors, particularly sexual behaviors, genital tract symptoms and STI diagnoses. Although participants were assured of anonymity, collecting data in the context of a public clinic may have suppressed responses. Thus, rates of condom use and numbers of partners may not represent actual behaviors. In addition, we did not specify MMC versus traditional circumcision in most of our measures. Although the difference in terms of HIV protection between the two types of circumcision was unlikely known among our participants, we cannot be certain of this. Another factor that may have limited our study is the potential impact of reading literacy on survey responses. While few participants required assistance to complete the survey, the degree to which misinterpretation of items interfered with responses is unknown. With these limitations in mind, we believe that the current study has implications for male circumcision messaging and HIV prevention campaigns.

Prevention messaging to promote MMC aims to increase uptake among men in high-HIV prevalence communities. Women are exposed to these same messages. For women, interpretation of MMC promotion messages may carry unexpected consequences. While there is mixed evidence that men who undergo MMC or traditional male circumcision demonstrate changes in numbers of sex partners or other risk compensatory behaviors (Agot et al., 2007; Bailey et al., 2007), less is known about the impacts of MMC messages on women. Our findings suggest a need for increased awareness and educational campaigns regarding the partial protection of MMC targeted to women in high HIV prevalence communities. Messages targeted to women should describe the indirect benefits of MMC by reducing the number of men with HIV in their communities. There are also specific behaviors that male circumcision awareness may uniquely influence in women that should be included in education efforts. For example, women who are aware of the protective benefits of male circumcision may integrate this information as a partner selection strategy in much the same way that individuals may select partners on the basis of their known or perceived HIV status (e.g., serosorting). That is, women may factor a man's circumcision status into their perceptions of desirability and relationship interests (e.g., circumsorting). Women may also make selective decisions regarding greater condom use with uncircumcised male sex partners relative to circumcised partners. Future research is needed to examine women's understanding of partial protection, specifically what a 50% reduction in men's risk for HIV means in terms of their own risks (Milford et al., 2015). Research is also needed to better understand women's interpretation of male circumcision messages intended for men and the impacts these messages may have on women's behavior.

Acknowledgement

This project was supported by National Institute of Child Health and Development grant R01-HD74560. The authors thank the City Health Department, Cape Town, South Africa.

References

- Agot KE, Kiarie JN, Nguyen HQ, Odhiambo JO, Onyango TM, & Weiss NS (2007). Male circumcision in Siaya and Bondo districts, Kenya: Prospective cohort study to assess behavioral disinhibition following circumcision. *Journal of Acquired Immune Deficiency Syndrome*, 44, 66–70.
- Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, & Puren A (2005). Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: The ANRS 1265 trial. *PLoS ONE*, 11, 1112–1122
- Baeten JM, Celum C, & Coates TJ (2009). Male circumcision and HIV risks and benefits for women. *Lancet*, 374(9685), 182–184. [PubMed: 19616704]
- Bailey RC, Moses S, Parker CB, Agot K, Maclean I, Krieger JN, Ndinya-Achola JO (2007). Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial. *Lancet*, 369(9562), 643–656. [PubMed: 17321310]
- Bridges JF, Selck FW, Gray GE, McIntyre JA, & Martinson NA (2011). Condom avoidance and determinants of demand for male circumcision in Johannesburg, South Africa. *Health Policy Plan*, 26(4), 298–306. [PubMed: 20961943]
- Brooks R, Etzel M, Klosinski L, Leibowitz A, Sawires S, Szekeres G, Coates TJ (2009). Male circumcision and HIV prevention: Looking to the future. *AIDS and Behavior*, 14, 1203–1206. [PubMed: 19212813]
- Byakika-Tusiime J (2008). Circumcision and HIV infection: assessment of causality. *AIDS and Behavior*, 12(6), 835–841. [PubMed: 18800244]

- Carrasco MA, Nguyen TQ, & Kaufman MR (2016). Low uptake of voluntary medical male circumcision among high risk men in Malawi. *AIDS and Behavior*. Epub ahead of print.
- Eaton LA, Cain DN, Agrawal A, Jooste S, Udemans N, & Kalichman SC (2011). The influence of male circumcision for HIV prevention on sexual behaviour among traditionally circumcised men in Cape Town, South Africa. *International Journal of STD and AIDS*, 22, 674–679. [PubMed: 22096055]
- Eaton LA, & Kalichman SC (2007). Risk compensation in HIV prevention: implications for vaccines, microbicides, and other biomedical HIV prevention technologies. *Current HIV/AIDS Reports*, 4(4), 165–172 [PubMed: 18366947]
- Eaton LA, & Kalichman SC (2009). Behavioral aspects of male circumcision for the prevention of HIV infection. *Current HIV/AIDS Reports*, 6(4), 187–193 [PubMed: 19849961]
- Eaton LA, & Kalichman SC (2014). *Biomedical advances in HIV prevention : social and behavioral perspectives*. New York: Springer.
- Gray RH, Kigozi G, Serwadda D, Makumbi F, Watya S, Nalugoda F, . . . Wawer MJ (2007). Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. *Lancet*, 369(9562), 657–666. [PubMed: 17321311]
- Gray RH, Wawer MJ, Polis CB, Kigozi G, & Serwadda D (2008). Male circumcision and prevention of HIV and sexually transmitted infections. *Current Infectious Disease Reports*, 10(2), 121–127 [PubMed: 18462586]
- Haberland NA, Kelly CA, Mulenga DM, Mensch BS, & Hewett PC (2016). Women's perceptions and misperceptions of male circumcision: A mixed methods study in Zambia. *PLoS One*, 11(3), e0149517. [PubMed: 26937971]
- Hedlund J (2000). Risky business: safety regulations, risk compensation, and individual behavior. *Injury Prevention*, 6, 82–90. [PubMed: 10875661]
- Kahn JG, Marseille E, & Auvert B (2006). Cost-effectiveness of male circumcision for HIV prevention in a South African setting. *PLoS Medicine*, 3(12), e517. [PubMed: 17194197]
- Kalichman SC, Eaton LA, & Pinkerton S (2007). Circumcision for HIV prevention: failure to fully account for behavioral risk compensation. *PLoS Medicine*, 4(3), e138; author reply e146. [PubMed: 17388676]
- Maffioli EM (2017) Is traditional male circumcision effective as an HIV prevention strategy? Evidence from Lesotho. *PLoS One*, 12 (5): e0177076. [PubMed: 28498835]
- Mantell JE, Smit J, Saffitz JL, Milford C, Morsery N, Mabude Z, Tesfay N et al. (2013). Medical male circumcision and HIV risk: perceptions of women in a higher learning institution in KwaZulu-Natal, South Africa. *Sexual Health*, 10, 112–118. [PubMed: 23448912]
- Mati K, Adegoke KK, & Salihu HM (2016). Factors associated with married women's support of male circumcision for HIV prevention in Uganda: a population based cross-sectional study. *BMC Public Health*, 16, 696–699. [PubMed: 27484177]
- Mattson CL, Campbell RT, Bailey RC, Agot K, Ndinya-Achola JO, & Moses S (2008). Risk compensation is not associated with male circumcision in Kisumu, Kenya: A multi-faceted assessment of men enrolled in a randomized controlled trial. *PLoS One*, 6, 1–9
- Maughan-Brown B, & Venkataramani AS (2012). Learning that circumcision is protective against HIV: risk compensation among men and women in Cape Town, South Africa. *PLoS One*, 7(7), e40753. [PubMed: 22829883]
- Mutombo N, Maina B, & Jamali M (2015), Male circumcision and HIV infection among sexually active men in Malawi. *BMC Public Health*, 15, 1051–1060. [PubMed: 26463045]
- Rasmussen DN, Wejse C, Larsen O, Da Silva Z, Aaby P & Sodemann M (2016). The when and how of male circumcision and the risk of HIV: a retrospective cross-sectional analysis of two HIV surveys from Guinea-Bissau. *Pan African Medical Journal*, 23, 21. doi: 10.11604/pamj.2016.23.21.7797. [PubMed: 27200126]
- Rennie S, Perry B, Corneli A, Chilungo A, & Umar E (2015). Perceptions of voluntary medical male circumcision among circumcising and non-circumcising communities in Malawi. *Global Public Health*, 10(5–6), 679–691. [PubMed: 25630610]

- Riess TH, Achieng MM, & Bailey RC (2014). Women's beliefs about male circumcision, HIV prevention, and sexual behaviors in Kisumu, Kenya. *PLoS One*, 9(5), e97748. [PubMed: 24844845]
- Sgaier SK, Baer J, Rutz DC, Njeuhmeli E, Seifert-Ahanda K, Basinga P, . . . Laube C (2015). Toward a systematic approach to generating demand for voluntary medical male circumcision: Insights and results from field studies. *Global Health Science and Practice*, 3(2), 209–229.
- Susser E, Desvarieux M, & Wittkowski K (1998). Reporting sexual risk behavior for HIV: a practical risk index and a method for improving risk indices. *American Journal of Public Health*, 88, 671–674 [PubMed: 9551017]
- Tchuenche M, Palmer E, Haté V, Thambinayagam A, Loykissoonlal D, Njeuhmeli E, & Forsythe S (2016). The cost of voluntary medical male circumcision in South Africa. *PLoS One*, 11(10):e0160207 [PubMed: 27783612]
- Turner AN, Morrison CS, Padian NS, Kaufman JS, Salata RA, Chipato T, . . . Miller WC (2007). Men's circumcision status and women's risk of HIV acquisition in Zimbabwe and Uganda. *AIDS*, 21(13), 1779–1789. [PubMed: 17690577]
- Westercamp M, Agot KE, Ndinya-Achola J, & Bailey RC (2012). Circumcision preference among women and uncircumcised men prior to scale-up of male circumcision for HIV prevention in Kisumu, Kenya. *AIDS Care*, 24(2), 157–166. [PubMed: 21854351]
- Westercamp N, & Bailey RC (2007). Acceptability of male circumcision for prevention of HIV/AIDS in sub-Saharan Africa: a review. *AIDS and Behavior*, 11(3), 341–355. [PubMed: 17053855]
- Wilcken A, Miiro-Nakayima F, Hizaamu RN, Keil T, & Balaba-Byansi D (2010). Male circumcision for HIV prevention--a cross-sectional study on awareness among young people and adults in rural Uganda. *BMC Public Health*, 10, 209. [PubMed: 20420701]

Table 1

Demographic, social and health characteristics of women receiving clinic services who were and were not aware that male circumcision prevents HIV.

	Aware of Circumcision Protection (N = 91)		Not Aware of Circumcision Protection (N = 188)		X ²
	N	%	N	%	
Single/Not Married	10	11	9	5	3.5
Family/spouse source of income	84	90	191	91	0.1
Primary or greater education	59	65	95	51	5.5 [*]
Genital ulcer	5	5	10	5	0.1
Genital Discharge	20	21	26	13	2.6
Urinary burning	21	23	18	10	8.4 ^{**}
Any genital tract infection symptom	31	33	41	21	4.4 [*]
Genital tract symptoms or STI diagnosis	33	36	44	23	4.6
Partner-referral to clinic	11	12	17	9	0.5
Tested for HIV	89	97	170	91	2.7
Most recent sex partner circumcised	75	82	149	79	0.2
Partner traditionally circumcised	66	71	115	61	2.7 ⁺
Male friends circumcised to protect themselves from HIV	33	36	19	10	31.9 ^{**}
2+ Male Partners	14	16	23	13	3.9
	M	SD	M	SD	t
Age	26.1	5.3	27.5	5.3	2.2
Condomless vaginal sex	3.3	6.6	2.1	4.7	1.7 ⁺
Condom protected vaginal sex	2.2	4.7	3.0	9.1	0.7
Condomless anal sex	0.5	2.3	1.0	6.5	0.6
Condom protected anal sex	0.2	0.7	1.2	7.7	1.2
% Condom use	43.5	37.1	55.6	36.6	2.0 [*]
HIV Risk Index ^a	4.4	8.3	3.9	12.9	0.4

Note:

^a HIV risk index = condomless vaginal sex x number of partners

⁺ p < .1

^{*} p < .05

^{**} p < .01

Table 2

Male circumcision risk compensation beliefs among women receiving clinic services who were and were not aware that male circumcision prevents HIV.

	Aware of Circumcision Protection (N = 91)		Not Aware of Circumcision Protection (N = 188)		X ²
	N	%	N	%	
A man is less likely to have HIV if he is circumcised.	52	57	67	35	11.3 ^{**}
Women are <u>less likely</u> to be infected with HIV if their sex partner is circumcised.	35	38	42	22	7.5 ^{**}
Condom use is not necessary if the man is circumcised.	11	12	28	15	0.5
HIV is less of a threat if the man is circumcised.	15	16	33	17	0.8
If my partner is circumcised, sex is safe without a condom.	16	17	18	9	3.5 ⁺
Being circumcised means a man can worry less about HIV/AIDS.	24	26	31	11	3.9 [*]
If a man is circumcised, he can have more sexual partners.	7	7	20	10	0.6
Risk Compensation Beliefs Score (M, SD)	2.3	1.1	2.0	1.2	2.2 [*]

Note: Responses dichotomized at scale midpoint with agree endorsements shown in table

⁺ p < .1

^{*} p < .05

^{**} p < .01

Table 3

HIV risk perceptions and risk perception relative difference scores among women receiving clinic services who were and were not aware that male circumcision prevents HIV.

	Aware of Circumcision Protection (N = 91)		Not Aware of Circumcision Protection (N = 188)		t
	M	SD	M	SD	
Perceived Risk of HIV Transmission to Men					
Vaginal sex without a condom.	3.2	1.1	3.1	1.3	0.5
Vaginal sex with a condom.	0.9	1.2	1.0	1.3	0.6
Vaginal sex without a condom when the man is circumcised .	2.3	1.3	2.6	1.5	1.8
Perceived Circumcision Protective Difference	-0.9	1.3	-0.5	1.6	2.2 *
Perceived Condom Protective Difference	-2.3	1.5	-2.1	1.9	0.7

Note: mean ratings on 5-points scale; 1 = Very Low Risk to 5 = Very High Risk; differences range from -4 to 4

*
p < .05

Table 4

Multivariable regression models for sexual risks in relation to male circumcision awareness, beliefs and perceptions.

	Condomless vaginal/anal sex	HIV Risk Index	Genital tract symptoms / STI diagnosis
	Likelihood Ratio	Likelihood Ratio	Likelihood Ratio
Male Circumcision Awareness	28.7 **	12.1 **	9.1 **
Risk Compensation Beliefs	392.6 **	589.0 **	41.7 **
Perceived Circumcision Protective Difference	144.5 **	145.9 **	12.9

Note:

**
p < .001