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# Factors associated with the take-up of voluntary medical male circumcision amongst learners in rural KwaZulu-Natal

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Voluntary medical male circumcision (VMMC) is an integral part of South Africa's HIV prevention programme. School-going males, in particular, are considered a cost-effective target population. However, ambitious policy targets have not been achieved due to the plateau in demand for VMMC. This study documents the factors influencing demand for VMMC amongst school-going males. Data were collected from 750 learners (251 circumcised and 499 uncircumcised) from 42 secondary schools in KwaZulu-Natal, South Africa. There was a positive association between the perceived benefit of VMMC and the likelihood of undergoing circumcision (AOR: 1.41,  $p = 0.01$ ). There was a negative association between self-efficacy to use condoms and likelihood of undergoing VMMC (AOR: 0.75,  $p < 0.01$ ). Learners who perceived VMMC as having a number of health benefits, including reducing of the chances of contracting HIV and sexually transmitted infections (STIs), increasing penile hygiene and the belief that VMMC allows them to use condoms less frequently, were more likely to undergo VMMC. Of concern, learners who were confident in their ability to access condoms and to use a condom with their partner were less likely to undergo VMMC.

**Keywords:** adolescent friendly health services, circumcision for HIV prevention, demand for circumcision, HIV/AIDS, HIV prevention, South Africa

## Introduction

Three randomised control trials — in South Africa, Uganda and Kenya — have shown that medical male circumcision leads to an estimated 60% reduction in female-to-male HIV transmission (Auvert et al., 2005; Gray et al., 2007; Wawer et al., 2007). The World Health Organization (WHO) has therefore recommended that voluntary medical male circumcision (VMMC) should be a key component of prevention strategies in high HIV prevalence settings. Studies have revealed that to achieve the greatest reduction in HIV incidence, 80% of HIV-negative males, aged 15 to 49 years need to be circumcised with the potential to prevent 1.1 million new HIV infections by 2025 in South Africa alone (Kripke et al., 2016). The South African government, through its HIV/AIDS and TB Strategy 2012–2016 had committed to undertake 4.3 million circumcisions (SANAC, 2011, UNAIDS, 2011) with a further 2.5 million targeted in the 2017–2022 Strategy (SANAC, 2017). According to 2016 figures, only 54% (2.4 million) of the targeted number of circumcisions had been achieved (WHO, 2015). Without a significant increase in demand amongst South African men, the strategy targets will remain unmet.

In a study conducted by the Human Sciences Research Council in 2012, only 40% of South African men (older than 15 years old) indicated that they would be willing to undergo circumcision (Shisana et al., 2014). Numerous studies have

investigated the barriers and facilitators to the uptake of VMMC. The barriers identified include: fear of pain during and after surgery, fear of long healing periods and adverse events, financial and opportunity costs associated with getting circumcised, threats to masculinity, loss of penile sensitivity and size, concerns about sexual performance, religious concerns, and fear of undergoing HIV testing. In contrast, the reduction in the risk of contracting HIV, improved hygiene, peer pressure, preferences of intimate female partners, and improvement in sexual performance, were all facilitators to undergoing VMMC (George et al., 2014; International Initiative for Impact Evaluation, 2013; Lagarde, Dirk, Puren, Reathe, & Bertran, 2003; Mattson, Bailey, Muga, Poulussen, & Onyango, 2005; Scott, Weiss, & Viljoen, 2005; Westercamp & Bailey, 2007). For the most part, VMMC research has advocated for innovative demand-driven interventions, focusing on decreasing the opportunity costs of accessing VMMC services and inclusion of peers or partners of those targeted to undergo VMMC (International Initiative for Impact Evaluation, 2013). Evidence suggests that targeting youth (15–24 years old) has proven successful (Govender, George, Beckett, Montague, & Frohlich, 2017; Mahler et al., 2011; Montague et al., 2014; Mwandu et al., 2011) with young males less likely to be affected by many of the barriers to VMMC encountered by older men (Herman-Roloff, Otieno, Agot, Ndinya-Achola, & Bailey, 2011; Montague et al., 2014).

Building on existing literature, this study focuses on the factors that influence the uptake of circumcision. This study is unique in that the study population is school-going males, inclusive of circumcised and uncircumcised males aged 16 to 19 years. The HIV prevalence amongst the group of learners who were screened before undergoing VMMC was 0.7% for those aged 15 to 19 (Montague et al., 2014). The HIV prevalence for females aged 12–22 in 2 sample schools was approximately 7.6%, significantly higher than that of males (Kharsany et al., 2012). These HIV prevalence figures suggest that VMMC would be an important component of the HIV prevention package in this community.

To understand factors associated with the uptake of VMMC, this study used the following concepts from the health belief model (HBM): perceived susceptibility towards the disease, perceived seriousness of contracting the disease, the perceived benefits relating to undergoing the procedure, the perceived barriers to undertaking action to prevent HIV, and perceived self-efficacy to prevent HIV (Glanz, Rimer, & Viswanath, 2008; Ramprasad, Lang, & Sessa, 2014). These concepts were useful in elucidating our understanding on why school-going males underwent VMMC, and which psychosocial factors potentially influence their choices.

## Methods

### Population

The study was conducted in Vulindlela which is a rural sub-district in the midlands of KwaZulu-Natal, South Africa. Vulindlela has limited infrastructure and is characterised by high levels of poverty (Frohlich et al., 2014). This study ran concurrently to a VMMC campaign led by a local HIV/AIDS prevention organisation between March 2011 and February 2013 (Montague et al., 2014). The target of the campaign was to achieve 70% VMMC coverage of the male population aged 16 and over in 42 mixed sex schools ( $N = 11\,088$ ). However, only 47% coverage was achieved resulting in 5 165 circumcisions performed during the campaign (Montague et al., 2014). The recruitment procedures and population for the VMMC campaign are described elsewhere (Montague et al., 2014).

### Sample

This study enrolled 750 of the above-mentioned respondents between March 2012 and May 2013. This study comprised two study cohorts, one of 251 young men who underwent circumcision and a further 499 young men who refused the procedure and therefore remained uncircumcised (16 to 19 years old, see Table 1). The respondents were purposively selected from all the schools in the area. Those who underwent circumcision completed the questionnaire at the clinic before undergoing the procedure whilst the uncircumcised learners, were interviewed at their respective schools. All the schools targeted during the VMMC campaign were included in the sample.

### Ethics

Permission to publicise the study and elicit learner participation in the selected schools was sought from the headmaster/headmistress of the school. A waiver of parental/guardian informed consent for learners aged

between 16 and 18 years was obtained from the University of KwaZulu-Natal's Biomedical Research Ethics Committee (reference number: BF128/11). The motivation for the waiver was based on the low risk nature of the study and the fact that obtaining parental or guardian consent proved difficult within this setting due to high parental mobility and low literacy rates. We used the existing Community Research Support Group (CRSG) to seek broad approval for the study. In addition, we were of the opinion that learners over the age of 16 years would understand the implications of participating in the study. Learners completed an assent form before the administration of the survey instrument.

## Measures

The following measures were chosen as independent variables as they form part of the core constructs of the HBM: perceived susceptibility of contracting HIV, perceived severity of contracting HIV, perceived benefits of undergoing circumcision, perceived barriers to using condoms, and self-efficacy to use condoms.

*Perceived susceptibility* was measured by asking learners to respond to the item, "I feel the chances are high that I can get HIV" on a five-point Likert-type scale (strongly disagree to strongly agree).

*Perceived severity* was measured by asking learners to respond to the item, "AIDS is probably the worst disease a person can get" on a five-point Likert-type scale (strongly disagree to strongly agree).

*Perceived benefits of undergoing circumcision* was measured using three items: 1) "do you think medical male circumcision reduces the risk of HIV infection"; 2) "do you think medical male circumcision reduces the risk of STIs (sexually transmitted infections)"; and 3) "do you think medical male circumcision helps to improve hygiene" (Peltzer, Banyini, Simbayi, & Kalichman, 2009). The responses were coded into a binary for each item with one indicating a correct answer and zero indicating an incorrect answer. These responses were summed into a scale with a high score (three) indicative of good knowledge of the benefits of VMMC. The Cronbach's alpha for this scale is 0.7.

*Perceived benefits of condom use* was measured with one item and states, "I believe that the chances of contracting HIV can be reduced by using a condom"; learners were asked to respond using a Likert-type scale to this item (strongly disagree to strongly agree).

*Perceived barriers to using condoms* was measured by asking learners to respond to the following three statements: "using a condom seems like an insult to my partner"; "it is embarrassing to buy condoms"; and "I do not enjoy (or think I might not enjoy) sex when using a condom" (Peltzer, 2000). These variables were dichotomised with a score of 1 indicating the learner agrees with these statements and a score of 0 indicating they do not agree or are unsure. This was done to increase the Cronbach's alpha to 0.6 so that the items may be summed into a scale. A high score indicates greater barriers to using condoms.

*Self-efficacy for condom use* was measured using the following three items: 1) "how sure are you that you could use a condom correctly"; 2) "how sure are you that you could obtain condoms when you need them"; and 3) "how sure are you that could always use a condom with your sexual

**Table 1:** Socio-demographic, sexual activity, sexual and reproductive health, and health belief constructs according to circumcision status amongst learners in Vulindlela

		Circumcised (n = 251) ( $\bar{x}$ /%, 95% CI)	Uncircumcised (n = 499) ( $\bar{x}$ /%, 95% CI)	p-value
<b>Socio-demographics</b>				
Age (%)	16 years	52.6 (46.4–58.7)	36.5 (32.3–40.8)	<0.01
	17 years	25.5 (20.4–31.1)	24.6 (21.0–28.6)	
	18 years	15.1 (11.1–20.0)	25.1 (21.4–29.0)	
	19 years	6.8 (4.1–10.4)	13.8 (11.0–17.1)	
Age ( $\bar{x}$ )	16.8 (16.6–16.9)	17.2 (17.1–17.3)	<0.01	
Grade ( $\bar{x}$ ) (n = 748)	9.5 (9.4–9.6)	9.9 (9.8–10.0)	<0.01	
<b>Sex activity and SRH</b>				
Ever had sex (%) (n = 748)	Yes	37.8 (32.0–44.0)	49.3 (44.9–53.7)	<0.01
	No	62.2(56.0–68.0)	50.7 (46.3–55.1)	
Ever had an STI (%) (n = 731)	Yes	2.8 (1.3–5.5)	2.7 (1.5–4.4)	0.90
	No	97.2 (94.5–98.7)	97.3 (95.6–98.5)	
Condom usage in previous month (%) (n = 149)	Inconsistent	59.1 (44.4–72.7)	61.9 (52.4–70.8)	0.75
	Consistent	40.9 (27.3–55.6)	38.1 (29.2–47.6)	
Age at sexual debut ( $\bar{x}$ ) (n = 342)		14.8 (14.3–15.3)	15.0 (14.8–15.3)	0.40
Sexual acts previous month ( $\bar{x}$ )(n = 341)		0.9 (0.6–1.2)	1.2 (0.9–1.4)	0.22
Sexual partners previous month ( $\bar{x}$ ) (n = 342)		0.7 (0.5–0.8)	0.7 (0.5–0.8)	0.99
<b>Perceived susceptibility# (n = 705)</b>				
Feel chances high that contract HIV ( $\bar{x}$ )		3.4 (3.3-3.5)	3.6 (3.5-3.7)	0.02
<b>Perceived severity# (n = 705)</b>				
AIDS worst disease to contract ( $\bar{x}$ )		1.9 (1.8-2.0)	2.0 (1.9-2.1)	0.14
<b>Perceived benefits VMMC# (n = 703)</b>				
Reduces risk of STI ( $\bar{x}$ )		0.8 (0.7–0.8)	0.6 (0.6–0.7)	<0.01
Improves hygiene ( $\bar{x}$ )		0.8 (0.8–0.9)	0.6 (0.6–0.6)	<0.01
Reduces risk HIV infection ( $\bar{x}$ )		0.8 (0.7–0.8)	0.7 (0.7–0.8)	0.17
Allows for reduced condom use ( $\bar{x}$ )*		0.7 (0.2–0.3)	0.6 (0.2–0.2)	0.50
<b>Perceived benefits of using condoms# (n = 705)</b>				
Condom use reduces chances of contracting HIV ( $\bar{x}$ )		1.8 (1.7–1.8)	2.0 (1.9–2.1)	<0.01
<b>Perceived barriers to using condoms# (n = 703)</b>				
Using a condom insults partner ( $\bar{x}$ )		0.1 (0.1–0.2)	0.1 (0.1–0.1)	0.65
It is embarrassing to buy condoms ( $\bar{x}$ )		0.1 (0.1–0.1)	0.1 (0.1–0.1)	0.50
Don't enjoy sex with condoms ( $\bar{x}$ )		0.2 (0.1–0.2)	0.2 (0.2–0.2)	0.44
<b>Self-efficacy to use condoms# (n = 749)</b>				
Confident that could use a condom correctly ( $\bar{x}$ )		3.6 (2.6–4.6)	3.2 (2.7–3.7)	0.25
Confident that could obtain condoms ( $\bar{x}$ )		3.1 (3.0–3.2)	3.3 (2.8–3.8)	0.75
Confident that could always use a condom with partner ( $\bar{x}$ )		2.9 (2.7–3.0)	2.9 (2.9–3.0)	0.30

\*Reverse coded; #Health belief constructs measured on a dichotomous or Likert-type scale

partners” (self-constructed). The response options for these items were “very unsure”, “unsure”, “sure”, and “very sure”. A high score indicated high self-efficacy to use condoms. The minimum value on this scale is 3 and the maximum value is 12. The Cronbach’s alpha for this scale is 0.8.

The *dependent variable* for the study was whether individuals had undergone circumcision or not.

Age of the learners, grade attended by each of the learners, and whether the learners had engaged in sexual activity were included in the models. These variables were included as we hypothesised that they are correlated with the uptake of VMMC and should be controlled for when trying to understand the relationship between the selected variables and circumcision status.

### Statistical analyses

All descriptive analysis, bivariate and multivariate analysis was conducted in SPSS version 23 (IBM, 2016). To compare the two study groups (those who underwent circumcision

and those who did not), Pearson chi-square tests were used for categorical data, *t*-tests for normally distributed continuous data and Mann–Whitney *U*-tests for continuous data that was skewed. Mixed models were used to analyse these data to account for the clustering of learners in schools. Therefore school was included as a random effect and the other independent variables were included as fixed effects into the model.

### Results

Uncircumcised learners were slightly older ( $\bar{x}$  age 17.2 vs. 16.8 years;  $p < 0.01$ ) than circumcised learners. The difference in ages between the two groups accounted for the difference in grades attended by the learners in these two groups ( $p < 0.01$ ).

In relation to the sexual behaviour measures, both study groups were similar. Groups differed on one measure:

whether the learners had ever had sex ( $p < 0.01$ ; 39% for circumcised and 49% for the uncircumcised cohort).

Results from the psychosocial scales indicated that learners who were uncircumcised were more likely to perceive themselves as susceptible to contracting HIV ( $\bar{x}$  3.6 vs. 3.4,  $p = 0.02$ ) than those learners who underwent circumcision. Learners who underwent circumcision were more likely to agree with the statements that VMMC reduces their risk of contracting STIs ( $\bar{x}$  0.8 vs. 0.6,  $p < 0.01$ ) and improves their hygiene ( $\bar{x}$  0.8 vs. 0.6,  $p < 0.01$ ) than learners who were uncircumcised. Learners who were uncircumcised were more likely to disagree with the statement that condoms reduce their chance of contracting HIV ( $\bar{x}$  2.0 vs. 1.8,  $p < 0.01$ ) than learners who underwent circumcision. None of the self-efficacy to use condoms scale items were statistically significantly different for the two study groups (see Table 1), but once the three items are combined into a scale, learners who were uncircumcised had higher levels of self-efficacy to use condoms ( $\bar{x}$  9.1 vs. 8.2,  $p < 0.01$ ) than those learners who underwent circumcision.

The factors predicting the uptake of VMMC (Table 2) were stratified according to those learners who were sexually active (Model 3), those learners who had never had sex (Model 2), and the full sample of learners (Model 1). The full sample analysis (see Model 1) indicates that there is a positive association between perceived benefit of VMMC and the likelihood of undergoing circumcision (AOR: 1.41,  $p = 0.01$ ). This suggests that learners who perceived VMMC as having several health benefits, including reducing the chances of contracting HIV and STIs, increasing penile hygiene and, following the procedure, allowing one to use condoms less frequently, were more likely to undergo VMMC. The full sample results illustrate that there is a negative association between self-efficacy to use condoms and likelihood of undergoing VMMC (AOR: 0.75,  $p < 0.01$ ). This suggests that learners who were confident in their abilities to use a condom correctly, to access condoms, and use a condom with their partner were less likely to undergo VMMC. The results for the full sample analysis also highlights that having never engaged in sexual activity may increase the likelihood of undergoing VMMC, although this effect is not statistically significant at the 5% level (AOR: 1.62,  $p = 0.07$ ).

The disaggregated results by sexual activity status (Models 2 and 3) were similar to the full sample analysis (Model 1). The analysis on sexually inactive learners (Model 2) reveals that as the learners' belief in the perceived benefits of using condoms strengthens their likelihood of undergoing circumcision decreases (AOR: 0.70,  $p = 0.04$ ). The perceived benefits of VMMC appeared to have no impact on the uptake of VMMC amongst sexually active learners ( $p = 0.18$ ).

The random effects entered into the mixed models for school was statistically significant ( $p < 0.02$ ) in all three models, indicating that there was variation across the schools regarding the factors in the uptake of VMMC.

## Discussion

The results from this analysis indicate that the perceived benefits of undergoing VMMC and the learners' self-efficacy to use condoms was related to the uptake of VMMC. More specifically, the findings reveal that knowledge of the benefits of VMMC is a key motivating factor for learners to undergo VMMC. These findings are supported by those of a study on youth in Zimbabwe which found that increased knowledge of the risk reduction benefits of the procedure were positively associated with the intention to take up VMMC (Montaño, Kasprzyk, Hamilton, Tshimanga, & Gorn, 2014).

Of concern, the study noted that learner's confidence in their ability to use condoms may reduce their likelihood of undergoing VMMC. Additionally, the high levels of self-efficacy to use condoms (see Table 1) experienced by the learners is correlated with their lack of perceived barriers to using condoms. This was evidenced by a moderate to strong negative correlation coefficient ( $r = -0.16$ ,  $p < 0.01$ ) between the self-efficacy and the perceived barriers to use condoms (results not shown here).

In Vulindlela, learners are increasingly exposed to targeted HIV prevention campaigns advocating for the increased and consistent use of condoms. Positive attitudes and increased self-efficacy towards condom usage may adversely affect the demand for VMMC. Whilst increasing condom usage within this population is desirable, so too is increasing the demand for VMMC services. Ideally, learners would be adopting dual or multiple prevention behaviours.

**Table 2:** Mixed models highlighting the relationship between independent variables and choice to undergo voluntary medical male circumcision by sexual activity status

Independent variables	Model 1: Full sample		Model 2: Sexually inactive		Model 3: Sexually active	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value	AOR (95% CI)	p-value
Age	0.89 (0.72,1.10)	0.27	0.74(0.54,1.01)	0.06	1.05 (0.76,1.45)	0.76
Grade	0.70 (0.53,0.93)	0.01	0.83(0.56,1.23)	0.34	0.52(0.35,0.78)	<0.01
Engaged in sexual activity (yes is reference category)	1.62 (0.96,2.72)	0.07	n/a	n/a	n/a	n/a
Perceived susceptibility	0.88 (0.68,1.14)	0.33	0.87(0.61,1.23)	0.42	0.85(0.61,1.18)	0.33
Perceived severity	0.94 (0.73,1.22)	0.65	1.13(0.83,1.54)	0.43	0.79(0.53,1.17)	0.24
Perceived benefit of VMMC	1.41 (1.08,1.86)	0.01	1.55(1.18,2.02)	<0.01	1.24(0.90,1.69)	0.18
Perceived benefits of using condoms	0.78 (0.54,1.14)	0.20	0.70(0.50,0.98)	0.04	0.86(0.52,1.43)	0.57
Perceived barriers to using condoms	0.84 (0.54,1.30)	0.43	0.81(0.48,1.38)	0.44	0.87(0.53,1.42)	0.57
Self-efficacy to use condoms	0.75 (0.66,0.85)	<0.01	0.76(0.65,0.88)	<0.01	0.71(0.60,0.84)	<0.01
N	697		379		318	

Notes: Uncircumcised is the reference category for the dependent variable.

However, these data suggest that condoms and VMMC may be viewed as alternatives to each other. These data may, however, reflect a false optimism amongst adolescent boys in their ability and desirability to access and use condoms as the data reveal that less than half the learners engaging in sexual activity indicated using condoms consistently (see Table 1). This suggests that the perceived ability to use condoms is not translated in the revealed behaviour of these adolescent boys.

### Limitations

The sample was purposively selected because of limited time with learners at school and in the clinic. The number of learners recruited for the two study arms were slightly different due to the time sensitivities relating to the recruitment of learners who underwent circumcision. Although the sample is unbalanced there was sufficient power in the overall sample to analyse the factors related to the uptake of VMMC. To account for possible differences between the circumcised and uncircumcised learners, age of the respondent, grade currently attended by the respondent, and whether the respondent had ever engaged in sexual activity were included in the mixed model analysis. The interviews with the learners who underwent circumcision were conducted just before the procedure. Whether they followed through with the procedure is therefore uncertain, as some may have tested HIV-positive, which would have excluded them from getting circumcised. Although the percentage that tested HIV-positive was less than 2% for young men in the VMMC programme, aged 16 to 19 years (Montague et al., 2014), we only expect a few learners to have been misclassified as circumcised (Montague et al., 2014). The data were almost five years old and have been analysed previously (George et al., 2014; George, Govender, Beckett, Montague, & Frohlich, 2016; Govender et al., 2017). This paper is the last one published using these data and the findings remain relevant, as seen in the South African government's HIV/AIDS and TB Strategy 2017–2022, as there is a concerted effort to increase the coverage of VMMC amongst school-going adolescents (SANAC, 2017).

### Conclusion

The results suggest that the perceived benefits of VMMC and high self-efficacy to use condoms are key determinants of demand for VMMC amongst learners. Furthermore, learners' confidence in their ability to use condoms may reduce their motivation to get circumcised. This is of concern given the high levels of inconsistent condom use amongst these learners. This indicates an incongruence between learners' perceived abilities to use condoms and their behaviour. Behaviour change interventions should therefore focus on the benefits of dual protection (circumcision and consistent condom use) and highlight the additional protection offered by getting circumcised.

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