A Cut Above the Rest: Traditional Male Circumcision and HIV Risk Among Xhosa Men in Cape Town, South Africa

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Background: Randomized clinical trials have shown that medical male circumcision substantially reduces the risk of contracting HIV. However, relatively little is known about the relationship between traditional male circumcision and HIV risk. This article examines variations in traditional circumcision practices and their relationship to HIV status.

Methods: We used data from the fifth wave of the Cape Area Panel Study (n = 473) of young adults in Cape Town, South Africa, to determine attitudes towards circumcision, whether men were circumcised, at what age, and whether their foreskin had been fully or partially removed. Probit models were estimated to determine the association between extent and age of circumcision and HIV status.

Results: There was strong support for traditional male circumcision. 92.5% of the men reported being circumcised, with 10.5% partially circumcised. Partially circumcised men had a 7% point greater risk of being HIV positive than fully circumcised men ($P < 0.05$) and equal risk compared with uncircumcised men. Most (91%) men were circumcised between the ages of 17 and 22 years (mean 19.2 years), and HIV risk increased with age of circumcision ($P < 0.10$).

Conclusions: Efforts should be made to encourage earlier circumcisions and to work with traditional surgeons to reduce the number of partial circumcisions. Data on the extent and age of circumcision are necessary for meaningful conclusions to be drawn from survey data about the relationship between circumcision and HIV status.

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INTRODUCTION

Randomized clinical trials have shown that medical male circumcision substantially reduces the risk of contracting HIV,[1,2] leading many to espouse this practice as a means to combat HIV on a large scale.[3–5] However, relatively little is known about the relationship between traditional male circumcision and HIV risk. Understanding this relationship is important for HIV prevention because many men in Africa continue to be circumcised by traditional providers, despite the scale-up of medical male circumcision.[6]

Traditional male circumcision (hereafter referred to as circumcision) has long been practiced in many parts of Africa as part of a broader initiation process marking the transition between boyhood and manhood, and early ecological research suggested that it may help reduce HIV prevalence.[7] The relationship between traditional circumcision and HIV risk in Africa is, however, not obvious a priori. On the one hand, similar to medical circumcision, it may help reduce HIV infections. On the other, traditional circumcisions do not necessarily remove all the foreskin,[8,9] thereby providing continued viral access to resident immune cells[10,11] and potentially little or no HIV reduction benefit. And as traditional circumcisions in Africa typically occur after puberty,[6] it is possible that this also raises the risk of HIV infection relative to earlier circumcision.[12]

Recent analysis of survey data from the African Demographic and Health Surveys (DHS) revealed an inconsistent relationship between HIV status and circumcision.[13–16] These findings have prompted some analysts to argue that behavioral disinhibition may be at work and, hence, that population-wide circumcision programs may not be effective in reducing incident HIV infections as implied by the randomized clinical trials.[14,17] However, an alternative explanation is that the aforementioned variations in age and extent of circumcision may lead to protective benefits for some individuals but not others, thus obscuring the relationship between circumcision and HIV at the population level.

Unlike the DHS, which typically only asks respondents if they have been circumcised, the data set used in this study—a survey of Xhosa-speaking Africans living in Cape Town—goes further by asking the men about the extent and age of circumcision and attitudes toward traditional initiations. Furthermore, it is the first data set with information on both the

extent of foreskin removal during traditional circumcision and HIV status. This article uses these data to assess variations in circumcision practices among an ethnic group that has traditionally used circumcision as a rite of passage into manhood and to examine the consequences of this variation for the risk of contracting HIV.

MATERIALS AND METHODS

Data and Measures

The data for this study come from the Cape Area Panel Study (CAPS). The first wave of CAPS (in 2002) surveyed a representative sample of 4752 young adults aged 14–22 years living in Cape Town. For the first wave of the study, a 2-stage sample was used, stratified by the 3 main population groups (African, colored, and white). In the first stage, clusters were selected, categorized by predominant population group, and in the second stage, households were randomly selected from clusters to achieve a representative sample. Respondents were reinterviewed up to 4 more times, most recently in 2009 (wave 5), then with the cohort aged 20–30 years. The African male sample initially comprised 930 men, and 582 were reinterviewed in 2009. The final estimation sample for this article (n = 473) consists of African men interviewed in 2009 with complete data on all dependent and independent variables.

In all waves, study participants were asked detailed questions on a variety of demographic, socioeconomic, and behavioral topics. In wave 5, African respondents were asked to provide specimens for an HIV test and to fill in a self-administered module on circumcision. Ethical approval was granted by the University of Cape Town and Michigan University. Information regarding CAPS, including the initial sampling strategy, consent, ethical approval, and access to data and questionnaires can be found at http://www.caps.uct.ac.za.

In wave 5, African respondents were asked questions probing cultural preferences toward the practice of circumcision (Table 1). Men were also asked whether they had been circumcised and to what extent. We created a binary indicator for whether the individual reported being circumcised, equal to 1 for those who answered "yes" to the question "Are you circumcised? (that is, some or all of your foreskin has been removed)" and zero for those who answered "no." Respondents were asked: "If you are circumcised: How much of your foreskin has been removed?" Response options were "the entire foreskin," "only some of the foreskin," "don't know," "refused," and "not applicable." From these data, we constructed binary variables for (1) fully circumcised, (2) uncircumcised, and (3) circumcised but the extent of foreskin removal was not reported, with partial circumcision treated as the reference group in each case. Finally, we used responses to the question "About how old were you when you were circumcised?" to create a continuous measure of age of circumcision. In addition to an open response option, participants were also given the choice to report "Don't know but very young." We coded these individuals as being circumcised at the age of 0; the results were robust to age assigned (0–12 years) and to the exclusion of these respondents from the analysis.

HIV tests were conducted using a dry blood spot specimen (preferred) or saliva (using the OraSure Device; OraSure Technologies, Inc, Bethelhem, PA). Ninety-four percent of respondents consented to the test, and 86% provided a dry blood spot specimen. HIV tests were done using HIV antibody enzyme-linked immunosorbent assays. The screening assay was the Vironostika Uniform 11 Plus O (HIV-1p24; HIV-1gp160; HIV-1ANT70; HIV-2 env peptide amino acids 592-603; bioMérieux, Boxtel, the Netherlands). The second and third tests were the SD third generation Bioline (HIV-1 gp41 including Subtype O, p24, HIV-2 gp36; Standard Diagnostics, Inc, Suwon, Korea) and the HIV1/2 Bio-Rad Western blot. The testing algorithm is displayed in Figure 1.

CAPS collected a range of socioeconomic and behavioral information that we used as controls in our models. Measures of educational attainment (0–12 years of schooling, with any tertiary education recorded as 13) and socioeconomic status (monthly household income from wave 1) were included given their importance in predicting HIV status in other studies.[18–21] In addition, we used a set of sexual behavior indicators obtained across all waves. First, given that sexually transmitted disease (STDs) have been shown to

TABLE 1. Attitudes and Preferences Toward Traditional Male Circumcision

	% Yes/ Agree (n)	n
"How important to you and your friends is it that Xhosa men are circumcised" (very important or important)	98.5 (575)	584
"A man is not really a man until he has been to the mountain/bush" (agree or strongly agree)	89.2 (521)	584
"What is the best way to conduct male circumcisions?"	—	584
"Men should always get their foreskin removed by a traditional surgeon only"	89.4 (522)	—
"Men should always get their foreskins removed in the mountain/bush by a traditional surgeon, but a male Xhosa nurse should help with the circumcision"	6.0 (35)	—
"It would be better if men got their foreskins removed in a clinic/hospital first and then went to the mountain/bush" or "It would be better if men got their foreskins removed in a clinic/hospital and never went to the mountain/bush"	2.2 (13)	—
"Have you ever heard that removing a man's foreskin reduces the risk of him getting HIV?"	32.9 (192)	584

Responses for "What is the best way to conduct male circumcisions?" do not add up to 100% as the categories "It would be better to stop circumcision" and "Don't know" are not included in the table.

n, number of respondents answering yes or agreeing with the left hand side statement; N, total number of respondents.

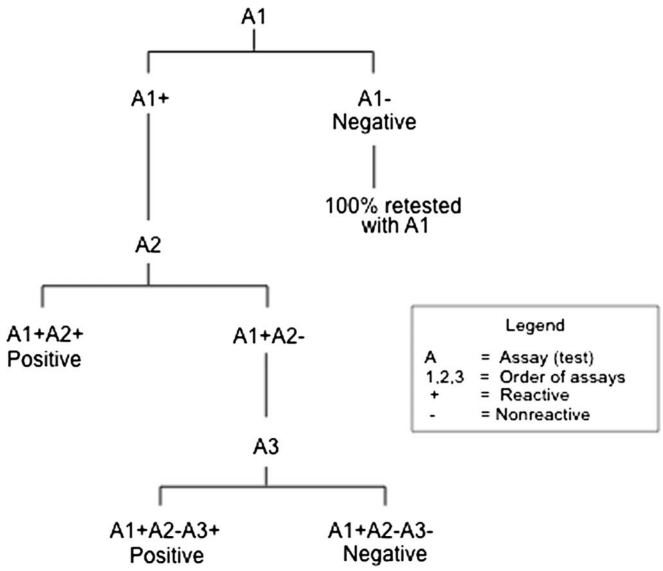

FIGURE 1. CAPS wave 5 HIV testing algorithm.

be associated with HIV serostatus,[22] we created a binary indicator for respondents who reported ever having an STD or a history of dysuria, genital discharge, ulcers, or sores. Second, we included a binary measure reflecting the number of lifetime sexual partners (1 if the individual reported 5 or more lifetime partners and zero otherwise), as this has been found to be a statistically significant correlate of HIV status.[22] We also constructed a continuous measure of years sexually active to control for increases in HIV risk that accrue from additional years of sexual exposure.[23] Third, we included binary measures of whether the individual reported ever being in a concurrent sexual partnership [equal to 1 if the individual reported "ever (having) been in a sexual relationship with someone and had sex with somebody else"] and whether respondents used contraception the first time they had sex as additional controls for types of partnerships and attitudes/preferences toward unprotected sex and/or access to protective contraceptives, respectively.

Analysis

We began with an analysis of cultural preferences for traditional circumcision among Xhosa men and then focused specifically on the link between circumcision and HIV status. We computed descriptive statistics for the entire sample and then stratified by circumcision practices. We then estimated 4 probit regression models on HIV status. The first assessed the relationship between HIV status and the binary indicator for whether the individual was circumcised. We started with this specification as it is the dominant one in the literature on male circumcision and the usual option for those using DHS data sets. In the second model, we replaced the general circumcision variable with the indicators for the extent of circumcision. The third examined the relationship between age of circumcision and HIV status. Because uncircumcised individuals cannot report an age of circumcision, the sample for this model comprised circumcised individuals only. Finally, our fourth model included both circumcision extent and age.

For each model, we controlled for age and age-squared, education, household income, and the sexual behavior variables. Age is included because HIV risk accumulates with time and age squared because this accumulation may not be linear. We also included the binary indicator for whether the individual had heard about the protective benefits of circumcision to control for possible behavioral disinhibition among circumcised individuals.[24,25] The goal of these specifications was to assess the robustness of the results to the inclusion of factors that may jointly be correlated with the circumcision practice variables and HIV serostatus. In addition, the control variables may represent pathways between circumcision and HIV, that is, circumcision may lead to change in sexual behaviors (via change of social status or teachings about sexual conduct) that influence HIV risk.

Finally, for all models, we present marginal effects instead of the probit coefficients as these are more easily interpretable (for a continuous variable, the coefficient reflects the percentage point increase in the probability of observing the dependent variable for a 1 unit change in the independent variable; for binary variables, it reflects a similar change in the dependent variable from moving from 0 to 1 on the independent variable of interest). All standard errors were corrected for heteroskedasticity.

RESULTS

Table 1 presents our findings on attitudes toward traditional male circumcision among Xhosa men. Almost all men (99%) reported that it is important or very important that Xhosa men are circumcised. The data also show a strong cultural preference for traditional circumcision, with almost all men (89%) agreeing that a "man is not a man until he has been to the mountain/bush" (going to "the mountain" or "the bush" is the term used to describe participating in a traditional male circumcision ritual). A large majority of respondents (89%) reported the belief that men should always get their foreskin removed in the mountain/bush by a traditional surgeon only. Most of the other respondents (6%) indicated that circumcision should continue in the mountain/bush but with a male Xhosa nurse assisting the traditional surgeon. Only 3% of men thought it best for circumcision to be done in a clinic or hospital.

Interestingly, only a third of men reported having heard that circumcision reduces the risk of contracting HIV. This suggests that information about this form of HIV prevention is lacking in this group. However, it also indicates that young men are unlikely to be engaging in unsafe sex after circumcision on the assumption that having been circumcised confers a protective benefit.

Descriptive statistics for the estimation sample of African men are presented in Table 2. The average age was roughly 25 years, and the average respondent completed just over 10 years of schooling. Almost all respondents (99%) reported Xhosa as their preferred language, and most men either were Christian (51%) or indicated no religious affiliation (45%). With regard to the circumcision variables, a total of 92.5% reported having been circumcised. Most (66%) reported full removal of the foreskin, 9.7% reported partial

TABLE 2. Descriptive Statistics for the Estimation Sample (African Men)

	Mean	SD	n
Demographic and Socioeconomic status			
Age	24.8	2.72	473
Education, years	10.4	1.91	473
Household income, Rand	2089	2017	473
Preferred language: Xhosa	0.99	0.10	473
Religion			473
None	0.45	0.50	215
Christian	0.51	0.50	242
Muslim	0.006	0.079	3
African traditional	0.03	0.16	13
Circumcision			
Extent of Circumcision			473
Not Circumcised (=1)	0.075	0.27	36
Partially Circumcised (=1)	0.097	0.30	46
Fully Circumcised (=1)	0.66	0.48	311
Circumcised, Extent Not Reported (=1)	0.17	0.38	80
Age of Circumcision	19.2	2.25	431
HIV			
HIV status (=1)	0.093	0.29	473
Sexual/risk behavior			
Ever had sex	1	0	473
Only had sex with women	0.98	0.15	466
Ever shared needles when injecting drugs	0.009	0.09	470
Years sexually active	9.33	2.80	473
5 or more sexual partners (=1)	0.55	0.50	473
History of STDs (=1)	0.23	0.42	473
History of concurrent partnerships (=1)	0.57	0.50	473
Condom used at first sex (=1)	0.42	0.49	473
First sex before circumcision	0.92	0.27	437
Heard male circumcision reduces HIV risk (=1)	0.33	0.47	473

removal of the foreskin, and 17% either refused to answer or said that they did not know how much of their foreskin was removed. The mean age of circumcision was roughly 19 years, with 90% of the sample circumcised between the ages of 17 and 22 years. Despite the near-universal normative endorsement of circumcision for men, a minority of men had not been circumcised at the time of the interviews. Uncircumcised men were, on average, younger (the majority being 20 or 21 years old) and from slightly poorer households than circumcised men, indicating that they had not been circumcised yet but might in the future. No significant difference was found between uncircumcised and circumcised men in terms of the sexual behavior variables (not displayed).

All men in the sample had had sex. The vast majority reported only having sex with women (96%), and less than 1% reported sharing needles while injecting drugs, indicating that the primary mode of HIV transmission in the sample was heterosexual intercourse. Significant variation in the other sexual behaviors was reported as follows: 55% reported 5 or more sexual partners, 23% a history of STDs, and 57% having had concurrent partnerships. Of note, 92% of circumcised participants reported sexual debut before circumcision.

In terms of HIV serostatus, 9% tested HIV positive. We computed descriptive statistics by HIV status (not shown here): We found that HIV-positive men were, on average, 1.3 years older ($P < 0.01$), 0.7 years less schooling ($P = 0.02$), sexually active for 1.2 years longer ($P < 0.01$), 15% points more likely to report an STD ($P = 0.02$), and 18% points more likely to have had a concurrent sexual partnership ($P = 0.02$). Differences in other characteristics by HIV status were not substantively or statistically significant. Results are available on request.

Table 3 presents descriptive statistics by extent (partial versus full, as this is the main comparison of interest) and age of circumcision. Regarding the former, there were no statistically significant differences between partially and fully circumcised respondents in terms of the demographic and sexual behavior variables. However, those who reported partial circumcision were generally circumcised at later ages (19.9 versus 19.2 years; $P = 0.02$). In addition, those reporting partial circumcision were nearly twice as likely to test HIV positive ($P = 0.08$).

With age of circumcision, we found that those who were circumcised earlier tended to be younger, more educated, and less likely to report a history of STDs. These differences were substantively small but statistically significant. We also found that early circumcisers were less likely to test HIV positive, although this difference was not statistically significant.

Table 4 presents the results of the multivariate regression analysis. Column 1 displays probit marginal effects for the circumcised or not variable. The estimate of −0.070 for the circumcised variable illustrates that being circumcised is associated with a 7.0% point reduction in the probability of testing HIV positive. This estimate does not reach statistical significance.

Column 2 examines the extent of circumcision variables, with the base group being those who reported partial removal of the foreskin. We find that, relative to partial circumcision, full circumcision is associated with a 7% point decrease in the probability of testing HIV positive ($P < 0.10$). Furthermore, the estimates suggest that partial circumcision provides no benefit over not being circumcised, as the estimate on the latter variable is close to zero and statistically insignificant. Interestingly, those who reported being circumcised but did not report an extent had a lower risk of testing positive than partially circumcised men, with the effect magnitude being similar to the estimate on full circumcision ($P < 0.05$). It is a priori unclear what is driving this result. It may be that the group not reporting extent comprises primarily those who had all their foreskin removed or it could be that those who felt uncomfortable reporting information about their penis were also more cautious sexually or that some other unobserved factor conferring reduced HIV risk was correlated with reluctance to report circumcision extent. Comparisons between nonreporters and fully circumcised individuals and nonreporters and partial circumcisers were unrevealing in this regard, as they show few significant differences in demographic, socioeconomic, and sexual behaviors (results not shown here), and removing these nonreporters from regression analysis did not change the substantive results.

TABLE 3. Descriptive Statistics Stratified by Extent and Age of Circumcision

	Partially Circumcised		Fully Circumcised			Circ. Age <= 19		Circ. Age > 19		
	Mean	SD	Mean	SD	*P*	Mean	SD	Mean	SD	*P*
HIV status (=1)	0.17	0.38	0.09	0.29	0.08	0.08	0.27	0.11	0.31	0.23
Demographic and SES										
Age	25.02	2.58	25.02	2.65	0.99	24.64	2.58	25.46	2.65	0.001
Education, years	10.15	2.17	10.44	1.98	0.36	10.67	1.79	10.21	2.09	0.02
Household income, Rand	1722	1439	2201	2168	0.14	2070	1758	2167	2325	0.62
Circumcision										
Extent of circumcision										
Not circumcised (=1)	NA		NA		—	NA		NA		
Partially circumcised (=1)	NA		NA		—	0.08	0.27	0.14	0.35	0.05
Fully circumcised (=1)	NA		NA		—	0.78	0.42	0.64	0.48	0.002
Circumcised, extent not reported (=1)	NA		NA		—	0.14	0.35	0.23	0.42	0.02
Age of circumcision	19.89	1.70	19.17	1.89	0.02	NA		NA		
HIV and sexual behavior										
Years sexually active	9.11	2.64	9.59	2.78	0.27	9.28	2.66	9.77	2.77	0.06
5 or more sexual partners (=1)	0.50	0.51	0.56	0.49	0.45	0.56	0.50	0.51	0.50	0.28
History of an STD (=1)	0.23	0.43	0.24	0.43	0.98	0.19	0.40	0.27	0.45	0.04
History of concurrent partnerships (=1)	0.52	0.51	0.56	0.60	0.60	0.56	0.50	0.59	0.49	0.51
Condom used at first sex (=1)	0.50	0.51	0.42	0.50	0.34	0.41	0.49	0.43	0.50	0.67
Heard male circumcision reduces HIV risk	0.37	0.49	0.31	0.46	0.41	0.31	0.46	0.37	0.49	0.15
n	46		311		—	250		182		—

Means and proportion by extent of circumcision (partial versus full) and age of circumcision (age less than or equal to 19 and age greater than 19).
The *P* values were derived from 2-sample differences in means or proportion test across groups.
NA, not applicable; SES, socioeconomic status. Statistics for the estimation sample.

Column 3 of Table 4 focuses on the age of circumcision variable. We find a robust association between timing of circumcision and HIV status, with a 1-year increase in the age of circumcision associated with roughly a 1.1% point increase in the risk of contracting HIV by the end of the survey period ($P < 0.10$). Given that most individuals were circumcised between 17 and 22 years of age, this amounts to a 5.5% point increase in HIV risk for those who were circumcised at the latest end of that interval vis-à-vis the earliest. Column 4, which presents results for the fully specified model, provides similar results: Full circumcision continues to show a 7% point reduction in HIV positivity vis-à-vis partial circumcision ($P < 0.05$), and a 1-year increase in age of circumcision is associated with a 1% point increase in HIV risk ($P < 0.10$).

DISCUSSION

There is growing interest in using medical male circumcision as a tool for HIV prevention.[4,26] But where there is strong cultural support for traditional circumcision, this can stymie efforts to promote early and medical circumcisions.[27] Under these circumstances, it is important to gain more understanding of the nature of traditional circumcision and its implications for HIV risk. To the best of our knowledge, ours is the first study to examine the relationship between variations in traditional circumcision practices and HIV status.

We found significant variation in circumcision practices in a population that expressed strong preferences for traditional circumcision and very little support for medical circumcision. Nearly 10% of respondents reported only partial removal of foreskin during circumcision, a figure that concords with previous research using medical examinations among a Xhosa sample.[9] We found that full circumcision and earlier age of circumcision were protective against contracting HIV: Circumcising an individual at the age of 17 years as opposed to 22 years was associated with a 5%–6% point reduction in the likelihood of contracting HIV, and full versus partial circumcision conferred a 7% point reduction. Partial foreskin removal conferred no benefit toward reducing HIV risk vis-à-vis no circumcision at all. These substantive results were robust to the inclusion of a rich set of covariates.

There are several limitations to this study, many of which motivate further research. First, extent and age of circumcision were self-reported, and a fifth of the men declined to report their extent of circumcision. Second, omitted variables may confound the relationship between circumcision practices and HIV status. Although we attempted to address this by demonstrating the robustness of the results to the inclusion of a rich set of controls, we still cannot be sure that our estimates reflect causal relationships. Also, complicating causal inference is the fact that some men may have seroconverted before circumcision. However, this is unlikely to be a major source of bias because the HIV prevalence of men 20 years and younger in South Africa is very low.[28] Third, sampling error could potentially affect the relationship between HIV status and circumcision extent due to the relatively small percentage of men who were both HIV positive and partially circumcised. Fourth, although the sample was initially representative in 2002, we cannot be certain that the sample was representative in 2009 due to survey

TABLE 4. Probit Marginal Effects Estimates of the Association Between Variations in Traditional Circumcision Practices and HIV Seropositivity

	(1)	(2)	(3)	(4)
Circumcised (base: uncircumcised)	−0.070 (0.070)	—	—	—
Fully circumcised (base: partial MC)	—	−0.071 (0.042)*	—	−0.073 (0.043)**
Not circumcised (base: partial MC)	—	−0.0056 (0.049)	—	—
Circumcised, extent not reported (base: partial MC)	—	−0.069 (0.022)**	—	−0.062 (0.020)**
Age of circumcision, years	—	—	0.011 (0.0058)*	0.010 (0.0054)*
Age, years	0.11 (0.094)	0.11 (0.089)	0.15 (0.10)	0.14 (0.094)
Age squared	−0.0020 (0.0019)	−0.0020 (0.0018)	−0.0027 (0.0020)	−0.0026 (0.0018)
Education	−0.0089 (0.0062)	−0.0078 (0.0061)	−0.0058 (0.0059)	−0.0047 (0.0057)
Logged wave 1 household income	−0.0040 (0.012)	−0.0037 (0.012)	−0.00085 (0.012)	−0.00097 (0.011)
History of concurrent partnerships (base: none)	0.058 (0.025)**	0.060 (0.024)**	0.065 (0.023)***	0.067 (0.022)***
History of STDs (base: none)	0.049 (0.034)	0.044 (0.033)	0.030 (0.032)	0.026 (0.029)
Condom used at first sex (base: not used)	−0.032 (0.023)	−0.034 (0.022)	−0.034 (0.021)	−0.036 (0.021)*
5 or more sexual partners (base: 1–4)	−0.017 (0.026)	−0.017 (0.025)	−0.018 (0.025)	−0.018 (0.023)
Years sexually active	0.00027 (0.0067)	0.0014 (0.0064)	0.0018 (0.0065)	0.0027 (0.0062)
Heard MC reduces HIV risk (base: not heard)	0.016 (0.026)	0.017 (0.026)	0.018 (0.026)	0.018 (0.025)
n	473	473	431	431

Robust standard errors in parenthses.
*$P < 0.1$
**$P < 0.05$
***$P < 0.01$.
MC, male circumcision.

attrition and migration into Cape Town. Fifth, our results are for a specific population group, and it is unclear whether they generalize to other populations.

Our findings have several policy implications. Our key finding is that the extent and age of traditional circumcision matters for HIV risk. Given that there is a strong preference for traditional circumcision among young Xhosa men, and medical circumcision is unlikely to be adopted in the near future, working with traditional surgeons to ensure that as much of the foreskin is removed as possible during initiation rites and encouraging earlier circumcision may play an important role in reducing HIV infections. Further research is required to improve our understanding of the relationship between partial removal of the foreskin during traditional circumcision and HIV infection and its implications for male circumcision provision.

Our findings also imply that analyses of DHS data showing no link between male circumcision and HIV status are likely hampered by incomplete measurements. It is not enough to report that the respondent is circumcised or not (as is often the case with the DHS): data must be collected on the extent and age of circumcision if meaningful conclusions are to be drawn about the relationship between HIV status and circumcision. Future studies of HIV determinants—especially in countries where a large percentage of men are circumcised in traditional settings—should measure and control for variations in traditional circumcision practices.

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