

# Circumcision and HIV Infection among Men Who Have Sex with Men in Britain: The Insertive Sexual Role

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**Abstract** The objective was to examine the association between circumcision status and self-reported HIV infection among men who have sex with men (MSM) in Britain who predominantly or exclusively engaged in insertive anal intercourse. In 2007–2008, a convenience sample of MSM living in Britain was recruited through websites, in sexual health clinics, bars, clubs, and other venues. Men completed an online survey which included questions on circumcision status, HIV testing, HIV status, sexual risk behavior, and sexual role for anal sex. The analysis was restricted to 1,521 white British MSM who reported unprotected anal intercourse in the previous 3 months and who said they only or mostly took the insertive role during anal sex. Of these men, 254 (16.7 %) were circumcised. Among men who had had a previous HIV test ( $n = 1,097$ ), self-reported HIV seropositivity was 8.6 % for circumcised men (17/197) and 8.9 % for uncircumcised men (80/900) (unadjusted odds ratio [OR], 0.97; 95 % confidence interval [95 % CI], 0.56, 1.67). In a

multivariable logistic model adjusted for known risk factors for HIV infection, there was no evidence of an association between HIV seropositivity and circumcision status (adjusted OR, 0.79; 95 % CI, 0.43, 1.44), even among the 400 MSM who engaged exclusively in insertive anal sex (adjusted OR, 0.84; 95 % CI, 0.25, 2.81). Our study provides further evidence that circumcision is unlikely to be an effective strategy for HIV prevention among MSM in Britain.

**Keywords** Circumcision · Men who have sex with men · HIV · Insertive role · Sexual orientation

## Introduction

Male circumcision has been shown to substantially reduce the risk of acquiring HIV infection among heterosexual men enrolled in randomized controlled trials in Africa (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007). These trials have raised the possibility that circumcision might also be protective for men who have sex with men (MSM) who take the insertive role during anal sex. Relatively few studies, however, have taken sexual role into account when examining the relationship between circumcision and HIV infection among MSM. Where they have taken this into account, the findings are conflicting.

Three observational studies (Lane et al., 2009; Reisen, Zea, Poppen, & Bianchi, 2007; Templeton et al., 2009a) found an association between circumcision and a reduced risk of HIV infection among MSM who exclusively or primarily engaged in insertive anal sex while four others (Gust et al., 2010; Jameson, Celum, Manhart, Menza, & Golden, 2010; Millett et al., 2007; Sanchez et al., 2011) found no statistical evidence of an association.

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## Evidence that Circumcision may be Protective for MSM Who take the Insertive Role

In a prospective study of over 1,400 HIV negative MSM in Sydney, Australia, conducted between 2001 and 2007, HIV incidence was 0.78 per 100 person-years (Templeton et al., 2009a). HIV incidence was not associated with circumcision overall (adjusted hazard ratio [AHR], 0.78; 95 % confidence interval [95 % CI], 0.42, 1.45). However, among men who reported a preference for the insertive role in anal intercourse, being circumcised was associated with a reduction in HIV incidence (AHR, 0.11; 95 % CI, 0.03, 0.80).

Nearly 400 MSM living in Soweto, South Africa were recruited for a cross-sectional seroprevalence survey in 2008 (Lane et al., 2009). Laboratory-confirmed HIV prevalence was 13.2 %; HIV prevalence was lower among circumcised men than among uncircumcised men (5.8 vs. 17.3 %, adjusted odds ratio [aOR], 0.2; 95 % CI, 0.1, 0.2). Most men in the study reported only practicing insertive anal intercourse. Lane et al. concluded that there may be a protective association between circumcision and HIV for MSM in South Africa who were consistently insertive when they had anal sex with men.

Almost 500 Latino MSM living in New York City took part in a cross-sectional study in 2005 (Reisen et al., 2007). Just over one quarter (27 %) of the men were HIV positive, based on self-report. In multivariable analysis, after controlling for a number of risk factors, including a preference for the receptive role in anal intercourse, uncircumcised men were nearly twice as likely to be HIV positive compared with circumcised men (aOR, 1.90; 95 % CI, 1.01, 3.59).

## No Evidence of an Association Between Circumcision and HIV Infection among MSM Who take the Insertive Role

In 1998–1999, nearly 5,000 HIV negative MSM living in the U.S., Canada, and the Netherlands enrolled in a Phase III vaccine trial and were followed up for 36 months. The HIV incidence rate was 2.6 per 100 person-years of observation. In a multivariable model that included unprotected insertive anal sex, being circumcised was not associated with incident HIV infection (AHR, 0.97; 95 % CI, 0.56, 1.68) (Gust et al., 2010).

In a prospective study of 1,362 HIV-negative MSM from Peru and 462 from the U.S. (Sanchez et al., 2011), 85 men seroconverted during the 18 month follow up (incidence 3.2 per 100 person years). In univariate analysis, there was no significant association between male circumcision and HIV acquisition (relative risk [RR], 0.84; 95 % CI, 0.50, 1.42). In a multivariate model, circumcision was associated with a reduced risk of acquiring HIV among MSM who predominantly reported insertive unprotected anal intercourse (UAI)

but the confidence intervals were wide and the statistical evidence was weak.

Between 2001 and 2006, nearly 5,000 MSM who reported having anal intercourse in the last 12 months were enrolled in an STD clinic-based study in Washington state (Jameson et al., 2010). Among the 3,828 men whose circumcision status was assessed, the percentage of men newly testing HIV positive or with previously diagnosed HIV did not differ between circumcised and uncircumcised men, even among those who only reported insertive anal intercourse (newly diagnosed HIV, circumcised men, 2.0 %; uncircumcised men, 2.4 %; aOR, 0.92; 95 % CI, 0.17, 4.97).

Over 2,000 Black and Latino MSM were recruited in 2005–2006 in New York City, Philadelphia, and Los Angeles for a cross-sectional HIV seroprevalence survey (Millett et al., 2007). Half the Black MSM and a third of the Latino MSM tested HIV positive. Overall, circumcision was not associated with HIV prevalence among Black or Latino MSM (Black MSM, aOR, 1.23; 95 % CI, 0.87, 1.74; Latino MSM, aOR, 1.10; 95 % CI, 0.73, 1.66; reference group, uncircumcised men). There was also no association among MSM who only engaged in unprotected anal sex as the insertive partner (Black men, OR 1.47,  $p = .25$ ; Latino MSM OR 0.59,  $p = .28$ ).

## HIV among MSM in Britain

In Britain, MSM are disproportionately affected by HIV infection (Health Protection Agency, 2011). In 2010, sex between men accounted for nearly half the new HIV diagnoses and there is evidence of ongoing transmission among MSM in Britain. HIV prevalence among MSM in Britain is approximately 5 %; prevalence is higher among MSM living in London than elsewhere in the country and also varies between ethnic groups. Prevalence is higher among Black MSM and lower among South Asian MSM (Elford et al., 2012; Hickson et al., 2004). Clearly, developing new strategies for HIV prevention among MSM in Britain is a priority. The question remains as to whether circumcision among MSM in Britain could be one such strategy.

The objective of this analysis was to examine, in a cross-sectional study, the association between circumcision status and self-reported HIV infection in a convenience sample of white British MSM who exclusively or primarily engaged in insertive anal intercourse.

## Method

### Participants

We recruited a large convenience sample of MSM from across Britain and invited them to complete an online survey

for the Men and Sexual Health (MESH) project (Elford et al., 2010). Men were recruited “online” (via the Internet) as well as “offline” (e.g., through sexual health clinics and gay venues). The questionnaires were completed anonymously and confidentially.

Between August 2007 and April 2008, we promoted the MESH project “online” using banner advertisements on Gaydar (the most popular gay dating site in the UK), as well as on community, health promotion, and social networking websites. Gaydar also sent a personal message about the project to its subscribers in February 2008. The banner advertisements and personal message contained a direct link to the free standing MESH project website and online questionnaire. We also advertised the project “offline” in sexual health clinics, bars, and clubs in 15 large British towns and cities between October 2007 and February 2008. Men recruited “offline” were asked to complete the questionnaire using the Internet.

Over 19,000 people clicked through to the homepage of the MESH online questionnaire and gave their consent to take part in the survey. Of these, 17,245 matched the inclusion criteria, i.e., they were male, older than 18 years, lived in the UK, and reported ever having sex with a man. Of the 17,425 men, 13,130 men provided information on their HIV status, ethnicity, sexual risk behavior, and circumcision status. Because of differences between ethnic groups in the percentage of men who were circumcised (Elford, McKeown, Nelson, Low, & Anderson, 2008), the analysis focused on white British men who were born in the UK ( $n = 11,839$ ). Of the white British men, 4,914 (41.5 %) said that they had had UAI during the last 3 months, of whom 4,898 provided information on their sexual role for anal sex. This analysis was restricted to the 1,521 white British MSM who indicated that they only or mostly took the insertive role during anal sex (30.9 % of those reporting UAI). Of these 1,521 men, 960 (63.1 %) said they were mostly insertive and 561 (36.9 %) said that they were only insertive during anal sex.

Estimating a response rate for the MSM recruited online was problematic. It is impossible to gauge how many men saw the banners or read the online message promoting the survey. Nor do we know what percentage of those seeing the banners or online message went on to complete the questionnaire (Elford et al., 2010). Based on estimates provided by Gaydar on the number of people using their Internet chatrooms and profiles during the survey period, it is likely that <1 % of all their users completed the questionnaire. This level of response is standard for online surveys. Equally, we were not able to estimate a response rate for those recruited offline (e.g., in a sexual health clinic or in a commercial venue) since we do not know how many people saw the posters or picked up postcards advertising the project in the different locations.

The research project received Multisite Research Ethics Committee (MREC) approval from South West MREC in

January 2007 (ref: 06/MRE06/71). The methods for the study have been described in detail elsewhere (Elford et al., 2010).

## Measures

Men answered questions about their sociodemographic characteristics (age, ethnicity, country of birth, place of residence, employment and education), sexual identity, sexual risk behavior, recreational drug use, and HIV treatment optimism (Elford, Bolding, Davis, Sherr, & Hart, 2004; Elford, Bolding, & Sherr, 2002). Men were also asked whether or not they were circumcised.

We asked men to indicate if they had ever been tested for HIV infection and, if so, to report their HIV status. Among other sexually transmitted infections, information was sought on whether or not men had had a syphilis diagnosis within the past 12 months.

## Sexual Risk Behavior

We asked participants if they had had UAI in the previous 3 months. Men who reported UAI were asked to provide information on their partner’s HIV status. UAI was classified as either concordant (only with a partner of the same HIV status) or non-concordant (with a partner of unknown or discordant HIV status). Men reporting both concordant and non-concordant UAI were assigned to the group of greatest risk for HIV transmission, i.e., non-concordant UAI (Elford et al., 2002, 2004).

## Sexual Role

We asked men: “Which role do you normally take when you are having anal sex with another man?” Participants could choose one of five possible options: “only bottom” (receptive), “mostly bottom,” “versatile, equal” (top and bottom), “mostly top,” “only top” (insertive). We refer to men who reported having UAI in the 3 months before the survey and who said they were “mostly top” as having “mostly insertive UAI” and to men who said they were “only top” as having “only insertive UAI.”

## HIV Seropositivity

We calculated self-reported HIV positivity by dividing the number of men who said they had ever received a positive HIV test result by the number who said they had ever had an HIV test (Elford et al., 2012). HIV seropositivity derived in this way has been used as a proxy for HIV prevalence in convenience samples in UK studies where the collection of

biological samples was not feasible (Evans et al., 2011; Hickson et al., 2004).

### Statistical Analysis

Data were managed and analyzed using Stata 11IC (Version 11.2). We initially compared the characteristics of circumcised and uncircumcised men using Mann–Whitney and Chi square tests (Table 1). We examined, in a logistic regression model, the crude association between self-reported HIV seropositivity and circumcision status in men who reported mostly or only insertive UAI.

We then examined the association between circumcision status and HIV seropositivity among men who reported mostly or only insertive UAI in a multivariable model. Factors associated with circumcision in univariable analysis ( $p < .05$ ), as well as individual risk factors for HIV infection in this sample (age, place of residence, recreational drug use, concordant and non-concordant UAI and HIV treatment optimism), were

initially included in the model along with the main exposure variable: circumcision status. The final model contained those factors that remained associated with HIV infection in a Likelihood Ratio Test. Odds ratios (OR) and 95 % CI were estimated according to the final models.

The multivariable analysis was carried out for: (1) men reporting mostly insertive or only insertive UAI combined (Model 1); (2) men reporting mostly insertive UAI (Model 2); and (3) men reporting only insertive UAI (Model 3). In all models, the analysis was based on those men who had had a previous HIV test.

## Results

### Univariable Analysis

Of the 1,521 men included in the analysis, 254 (16.7 %) were circumcised. Compared with uncircumcised men, circumcised

**Table 1** Participants' characteristics by circumcision status

	All men (N = 1,521) n (%)	Uncircumcised men (N = 1,267) n (%)	Circumcised men (N = 254) n (%)	<i>p</i>
Median age (range)	36 [18–75]	36 [18–72]	41 [18–75]	<.001
Lives in London	296 (20.5 %)	238 (18.8 %)	58 (22.8 %)	ns
Higher education	1,068 (70.2 %)	874 (69.0 %)	194 (76.4 %)	.017
Occupation				
Employed	1,244 (81.9 %)	1,043 (82.5 %)	201 (79.1 %)	
Student	107 (7.0 %)	90 (7.1 %)	17 (6.7 %)	
Unemployed	80 (5.3 %)	70 (5.5 %)	10 (3.9 %)	
Retired	64 (4.2 %)	43 (3.4 %)	21 (8.3 %)	
Other	23 (1.5 %)	18 (1.4 %)	5 (2.0 %)	.008
Sexual identity				
Homosexual/gay	1,339 (88.9 %)	1,121 (89.5 %)	218 (86.5 %)	
Bisexual	166 (11.0 %)	132 (10.5 %)	34 (13.5 %)	ns
HIV treatment optimism 1 <sup>a</sup>	337 (22.3 %)	275 (21.8 %)	62 (24.6 %)	ns
HIV treatment optimism 2 <sup>b</sup>	270 (17.9 %)	224 (17.8 %)	46 (18.3 %)	ns
Recreational drug use	877 (57.7 %)	727 (57.4 %)	150 (59.1 %)	ns
UAI				
Concordant UAI	516 (33.9 %)	420 (33.1 %)	96 (37.8 %)	
Non-concordant UAI	1,005 (66.1 %)	847 (66.9 %)	158 (62.2 %)	ns
Sexual role during UAI				
Mostly insertive	960 (63.1 %)	808 (63.8 %)	152 (59.8 %)	
Only insertive	561 (36.9 %)	459 (36.2 %)	102 (40.2 %)	ns
Previously tested for HIV	1,097 (72.1 %)	900 (71.0 %)	197 (77.6 %)	.034
HIV positive <sup>c</sup>	97 (8.8 %)	80 (8.9 %)	17 (8.6 %)	ns
Syphilis diagnosis in last 12 months	26 (1.7 %)	22 (1.7 %)	4 (1.6 %)	ns

Denominators vary slightly for some variables because of missing data

<sup>a</sup> HIV treatment optimism 1: Number (%) of men who agreed with the statement “I am less worried about HIV now that treatments have improved”

<sup>b</sup> HIV treatment optimism 2: Number (%) of men who agreed with the statement “I believe that drug therapies make people with HIV less infectious”

<sup>c</sup> As a percentage of men who have ever had an HIV test

men were older, more likely to be educated to degree level and more likely to be retired ( $p < .05$ ) (Table 1). Circumcised and uncircumcised men did not differ in terms of their sexual identity, HIV treatment optimism, recreational drug use, sexual behaviour (concordant and non-concordant UAI) or having a syphilis diagnosis in the previous 12 months.

Circumcised men were more likely to have had an HIV test than uncircumcised men (77.6 vs. 71.0 %,  $p = .03$ ). Among men who had ever had an HIV test ( $n = 1,097$ ), there was no significant difference between circumcised and uncircumcised men in self-reported HIV seropositivity (8.6 vs. 8.9 %) (unadjusted OR, 0.97; 95 % CI, 0.56, 1.67) (Table 1).

Among men who had ever had an HIV test, self-reported HIV seropositivity was lower among men who were only insertive (5.0 %, 20/402) compared to men who were mostly insertive (11.1 %, 77/695) (OR, 0.42; 95 % CI, 0.25, 0.70). However, there was no difference in HIV seropositivity between circumcised and uncircumcised men in each sexual role group (HIV seropositivity among only insertive men: circumcised 5.3 %, uncircumcised 4.9 %, OR = 1.08, 95 % CI, 0.35, 3.32; HIV seropositivity among mostly insertive men, circumcised 10.7 %, uncircumcised 11.2 %, OR = 0.96; 95 % CI, 0.51, 1.80).

### Multivariable Analysis

We initially examined only insertive and mostly insertive MSM together (Table 2, Model 1). There was no evidence of an association between self-reported HIV seropositivity and circumcision status after adjusting for age, place of residence, UAI, recreational drug use, and HIV treatment optimism, although the point estimate of the aOR was  $< 1$ .

We then examined the association between HIV infection and circumcision status separately for mostly insertive men (Table 2, Model 2) and only insertive men (Table 2, Model 3). There was no association between circumcision status and self-reported HIV seropositivity in the multivariable models,

even among men who indicated only taking the insertive role during UAI.

### Discussion

In this study, we found no evidence of an association between circumcision and self-reported HIV seropositivity among MSM who predominantly or exclusively engaged in insertive anal intercourse. Several randomized controlled trials conducted among heterosexual males in Africa (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007) have raised the possibility that circumcision might offer some protection against HIV among MSM who take the insertive role during anal sex. If that were the case, we would expect to find an association between HIV seropositivity and circumcision among MSM who predominantly or exclusively engaged in insertive anal intercourse in our sample; HIV seropositivity should be lower among circumcised men compared to those who are uncircumcised. Yet, we found no evidence of such an effect among our sample of MSM living in Britain.

Our findings add to the growing body of evidence which suggests that circumcision among MSM is unlikely to offer protection against acquiring HIV infection, even among MSM who take the insertive role for anal sex (Gust et al., 2010; Jameson et al., 2010; Millett et al., 2007; Sanchez et al., 2011).

We also found no evidence of an association between being diagnosed with syphilis in the 12 months before the survey and circumcision. To date, two studies (Kreiss et al., 1993; Templeton et al., 2009b) have suggested that circumcision may offer protection against syphilis for MSM while three studies (Jameson et al., 2010; Mor, Kent, Kohn, & Klausner, 2007; Tabet et al., 2002) have not found evidence to support this finding. Our study provides further evidence that circumcision is unlikely to offer protection against syphilis for MSM who mostly or only take the insertive role for UAI.

**Table 2** Association between self-reported HIV seropositivity and circumcision status: multivariable models

	Model 1		Model 2		Model 3	
	Mostly and only insertive men		Mostly insertive men		Only insertive men	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
Unadjusted model	0.97	0.56–1.67	0.96	0.51–1.80	1.08	0.35–3.32
Adjusted model	0.79 <sup>a</sup>	0.43–1.44	0.75 <sup>b</sup>	0.37–1.51	0.84 <sup>c</sup>	0.25–2.81

OR odds ratios comparing HIV seropositivity among circumcised men with uncircumcised men (reference group, uncircumcised men). All models were based on men who have had a previous HIV test

<sup>a</sup> OR adjusted for age, place of residence, non-concordant versus concordant UAI, recreational drug use and HIV treatment optimism (missing  $n = 4$ ). Likelihood ratio test for circumcision status in the adjusted model:  $\chi^2 < 1$

<sup>b</sup> OR adjusted for age, place of residence, non-concordant versus concordant UAI, recreational drug use, and HIV treatment optimism (missing  $n = 2$ ). Likelihood ratio test for circumcision status in the adjusted model:  $\chi^2 < 1$

<sup>c</sup> OR adjusted for place of residence, recreational drug use, and HIV treatment optimism. Likelihood ratio test for circumcision status in the adjusted model:  $\chi^2 < 1$

There is evidence that syphilis can be transmitted by oral as well as anal sex among MSM (Jin et al., 2005). The lack of an association between syphilis infection and circumcision among MSM could be explained, at least in part, by syphilis being transmitted by oral sex. An individual's circumcision status is not going to offer protection against acquiring syphilis through oral sex although conceivably one's partner's circumcision status may play a role.

In the MESH project, just under one-third of MSM reporting UAI said they predominantly or exclusively engaged in insertive anal sex. A similar proportion of MSM said they only or mostly took the insertive role during anal sex in recent studies conducted in London gyms and in Scottish bars and clubs (McDaid, Weiss, & Hart, 2010; Thornton, Lattimore, Delpach, Weiss, & Elford, 2011). All these studies highlight the fact that the overwhelming majority of MSM reporting UAI in Britain engage in receptive anal sex either exclusively or as part of a versatile sexual repertoire. This finding further underscores the limited potential for circumcision as an HIV prevention strategy and public health intervention for MSM in Britain.

The findings of our study were based on self-reported HIV seropositivity rather than HIV incidence. However, the early ecological (Bongaarts, Reining, Way, & Conant, 1989; Drain, Halperin, Hughes, Klausner, & Bailey, 2006; Moses et al., 1990) and cross-sectional studies (Bailey, Plummer, & Moses, 2001) conducted among African heterosexual males consistently found a strong association between male circumcision and prevalent HIV infection. HIV prevalence was elevated among uncircumcised men compared with those who were circumcised. The strong association between circumcision status and HIV prevalence among African heterosexual males in these early studies provided a springboard for the randomized controlled trials which subsequently demonstrated that circumcision substantially reduced the risk of HIV acquisition for African heterosexual men (Avert et al., 2005; Bailey et al., 2007; Gray et al., 2007).

If the strong protective effects of circumcision seen in heterosexual men in Africa also pertained among MSM, we would expect to see a clear association between prevalent HIV infection and circumcision in this population group. Among MSM, however, observational studies have failed to consistently report a strong association between circumcision status and prevalent HIV (or HIV seropositivity), even among men who take the insertive role for anal sex. Physiological factors may play a part here. Tissue damage may be more likely to occur during anal sex than vaginal sex (Wilton, 2011). In addition, the pH of the vagina is more acidic than the anus, which may impact on viral viability (Connor, 2006; Ongradi et al., 1990). As a consequence, HIV may be more easily transmitted during anal sex than during vaginal sex. The increased risk of HIV transmission for MSM during anal sex may counteract any potential

(and theoretical) protection circumcision might confer on the insertive partner.

There were a number of limitations to this study. Like most research conducted among MSM, we recruited a convenience sample. Our findings may, therefore, not be generalizable to all MSM in the UK although our results did mirror those of recent studies conducted among MSM in London, Glasgow, and Edinburgh (McDaid et al., 2010; Thornton et al., 2011). The analysis was restricted to white British men only because of large variations in rates of circumcision between ethnic groups (Elford et al., 2008). As a consequence, we are unable to make inferences about MSM who are not from a white British background. All information gathered in our survey was self-reported. It is possible that some participants did not disclose sensitive information, such as high risk sexual behavior or an HIV positive status. However, given the anonymous and confidential nature of the survey, any reporting bias on risk behaviors and HIV status is likely to be minimal. Furthermore, there is little reason to believe that misreporting would be related to circumcision status. Circumcision status was also self-reported. However a validation study conducted among MSM in Australia reported high agreement between reported and actual circumcision status (Templeton et al., 2008). We did not collect information on age at circumcision. However, it is likely that most participants were circumcised before rather than after their sexual debut (Rickwood & Walker, 1989). Finally, since the study was cross-sectional, we could not examine the association between circumcision status and HIV incidence.

Self-reported HIV seropositivity was estimated for men who had ever had an HIV test at any time in the past. It is possible that some of the men in our sample who said they were HIV negative had seroconverted since their last test and had undiagnosed HIV at the time of the survey. It is estimated that about a quarter of MSM in Britain were unaware of their HIV infection in 2010 (Health Protection Agency, 2011). In this study, we found no association between circumcision and the percentage of men living with diagnosed HIV. Nor was there an association between circumcision and high risk sexual behavior. It is unlikely, therefore, that there would be an association between circumcision and the percentage of men living with undiagnosed HIV. Consequently, we believe that misclassification of HIV status because of undiagnosed HIV is unlikely to be a major source of bias in our analysis.

Our study was originally designed to examine HIV infection and risk behaviors among ethnic minority and white MSM in Britain (Elford et al., 2010, 2012). In this article, our multivariable analysis was based on 1,097 white British MSM who had had a previous HIV test and who predominantly or exclusively took the insertive role during unprotected anal sex. This was a large sample; indeed, it is larger than some of the other studies cited here that have also examined the

relationship between circumcision and HIV infection among MSM who take the insertive sexual role. Reisen et al. (2007) reported a twofold difference in HIV seropositivity between circumcised and uncircumcised MSM in New York City. Our analysis had sufficient power to detect a differential of the same magnitude.<sup>1</sup> Our study also had a number of strengths, including a large sample size, national coverage, and that it was the first study in Britain to investigate the association between HIV infection and circumcision among MSM, with a focus on men who predominantly or exclusively engaged in insertive anal sex.

In conclusion, this study adds to the growing body of evidence that shows a lack of an association between circumcision and HIV infection among MSM, even for those who take the insertive role for anal sex. This suggests that circumcision is unlikely to be an effective HIV prevention strategy for MSM in Britain. Sexual health promotion and HIV prevention programs which focus on all MSM regardless of their circumcision status are more likely to be effective in the long term.

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## References

- Auvert, B., Taljaard, D., Lagarde, E., Sobngwi-Tambekou, J., Sitta, M., & Puren, A. (2005). Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: The ANRS 1265 trial. *Plos Medicine*, *2*, 1112–1122.
- Bailey, R. C., Moses, S., Parker, C. B., Agot, K., Maclean, I., Krieger, J. N., et al. (2007). Male circumcision for HIV prevention in young men in Kisumu, Kenya: A randomised controlled trial. *Lancet*, *369*, 643–656.
- Bailey, R. C., Plummer, F. A., & Moses, S. (2001). Male circumcision and HIV prevention: Current knowledge and future research directions. *Lancet Infectious Diseases*, *1*, 223–231.
- Bongaarts, J., Reining, P., Way, P., & Conant, F. (1989). The relationship between male circumcision and HIV infection in African populations. *AIDS*, *3*, 373–377.
- Connor, R. (2006). Sensitivity of non-clade B primary HIV-1 isolates to mildly acidic pH. *Journal of Acquired Immune Deficiency Syndromes*, *43*, 499–501.
- Drain, P. K., Halperin, D. T., Hughes, J. P., Klausner, J. D., & Bailey, R. C. (2006). Male circumcision, religion, and infectious diseases: An ecologic analysis of 118 developing countries. *BMC Infectious Diseases*, *6*, 1–10.
- Elford, J., Bolding, G., Davis, M., Sherr, L., & Hart, G. (2004). Trends in sexual behaviour among London homosexual men 1998–2003: Implications for HIV prevention and sexual health promotion. *Sexually Transmitted Infections*, *80*, 451–454.
- Elford, J., Bolding, G., & Sherr, L. (2002). High-risk sexual behaviour increases among London gay men between 1998 and 2001: What is the role of HIV optimism? *AIDS*, *16*, 1537–1544.
- Elford, J., Doerner, R., McKeown, E., Nelson, S., Anderson, J., & Low, N. (2012). HIV infection among ethnic minority and migrant MSM in Britain. *Sexually Transmitted Diseases*, *39*, 678–786.
- Elford, J., McKeown, E., Doerner, R., Nelson, S., Low, N., & Anderson, J. (2010). Sexual health of ethnic minority MSM in Britain (MESH project): Design and methods. *BMC Public Health*, *10*, 419. doi:10.1186/1471-2458-10-419.
- Elford, J., McKeown, E., Nelson, S., Low, N., & Anderson, J. (2008). *Circumcision status and HIV infection in a diverse sample of MSM in Britain*. Paper presented at the XII International AIDS Conference, Mexico City, Mexico.
- Evans, A. R., Hart, G. J., Mole, R., Mercer, C. H., Parutis, V., Gerry, C. J., et al. (2011). Central and Eastern European migrant men who have sex with men: An exploration of sexual risk in the UK. *Sexually Transmitted Infections*, *87*, 325–330.
- Gray, R. H., Kigozi, G., Serwadda, D., Makumbi, F., Watya, S., Nalugoda, F., et al. (2007). Male circumcision for HIV prevention in men in Rakai, Uganda: A randomised trial. *Lancet*, *369*, 657–666.
- Gust, D. A., Wiegand, R. E., Kretsinger, K., Sansom, S., Kilmarx, P. H., Bartholow, B. N., et al. (2010). Circumcision status and HIV infection among MSM: Reanalysis of a Phase III HIV vaccine clinical trial. *AIDS*, *24*, 1135–1143.
- Health Protection Agency. (2011). *HIV in the United Kingdom: 2011 Report*. London: Health Protection Services.
- Hickson, F., Reid, D., Weatherburn, P., Stephens, M., Nutland, W., & Boakye, P. (2004). HIV, sexual risk, and ethnicity among men in England who have sex with men. *Sexually Transmitted Infections*, *80*, 443–450.
- Jameson, D. R., Celum, C. L., Manhart, L., Menza, T. W., & Golden, M. R. (2010). The association between lack of circumcision and HIV, HSV-2, and other sexually transmitted infections among men who have sex with men. *Sexually Transmitted Diseases*, *37*, 147–152.
- Jin, F., Prestage, G. P., Kippax, S. C., Pell, C. M., Donovan, B. J., Kaldor, J. M., et al. (2005). Epidemic syphilis among homosexually active men in Sydney. *Medical Journal of Australia*, *83*, 179–183.
- Kreiss, J. K., & Hopkins, S. G. (1993). The association between circumcision status and human immunodeficiency virus infection among homosexual men. *Journal of Infectious Diseases*, *168*, 1404–1408.
- Lane, T., Raymond, H. F., Dladla, S., Rasethe, J., Struthers, H., McFarland, W., et al. (2009). High HIV prevalence among men who have sex with men in Soweto, South Africa: Results from the Soweto Men's Study. *AIDS and Behavior*, *15*, 626–634.
- McDaid, L. M., Weiss, H. A., & Hart, G. J. (2010). Circumcision among men who have sex with men in Scotland: Limited potential for HIV prevention. *Sexually Transmitted Infections*, *86*, 404–406.
- Millett, G. A., Ding, H., Lauby, J., Flores, S., Stueve, A., Bingham, T., et al. (2007). Circumcision status and HIV infection among Black and Latino men who have sex with men in 3 US cities. *Journal of Acquired Immune Deficiency Syndromes*, *46*, 643–650.
- Mor, Z., Kent, C. K., Kohn, R. P., & Klausner, J. D. (2007). Declining rates in male circumcision amidst increasing evidence of its public health benefit. *PLoS ONE*, *2*, e861. doi:10.1371/journal.pone.0000861.
- Moses, S., Bradley, J. E., Nagelkerke, N. J., Ronald, A. R., Ndinya-Achola, J. O., & Plummer, F. A. (1990). Geographical patterns of male circumcision practices in Africa: Association with HIV seroprevalence. *International Journal of Epidemiology*, *19*, 693–697.
- Ongradi, J., Ceccherini-Nelli, L., Pistello, M., Specter, S., & Bendinelli, M. (1990). Acid sensitivity of cell-free and cell-associated HIV-1:

<sup>1</sup> A post hoc calculation showed that our analysis had sufficient power to detect a twofold differential in HIV seropositivity between circumcised and uncircumcised men where overall HIV seropositivity was 9% (uncircumcised men 10%, circumcised men 5%, alpha = .05, beta = .24).

- Clinical implications. *AIDS Research and Human Retroviruses*, *6*, 1433–1436.
- Reisen, C. A., Zea, M. C., Poppen, P. J., & Bianchi, F. T. (2007). Male circumcision and HIV status among Latino immigrant MSM in New York City. *Journal of Lesbian, Gay, Bisexual and Transgender Health Research*, *3*, 29–36.
- Rickwood, A. M. K., & Walker, J. (1989). Is phimosis overdiagnosed in boys and are too many circumcisions performed in consequence? *Annals of the Royal College of Surgeons of England*, *71*, 275–277.
- Sanchez, J., Sal y Rosas, V. G., Hughes, J. P., Baeten, J. M., Fuchs, J., Buchbinder, S. P., et al. (2011). Male circumcision and risk of HIV acquisition among men who have sex with men. *AIDS*, *25*, 519–523.
- Tabet, S., Sanchez, J., Lama, J., Goicochea, P., Campos, P., Rouillon, M., et al. (2002). HIV, syphilis and heterosexual bridging among Peruvian men who have sex with men. *AIDS*, *16*, 1271–1277.
- Templeton, D. J., Jin, F., Mao, L., Prestage, G. P., Donovan, B., Imrie, J., et al. (2009a). Circumcision and risk of HIV infection in Australian homosexual men. *AIDS*, *23*, 2347–2351.
- Templeton, D. J., Jin, F., Prestage, G. P., Donovan, B., Imrie, J. C., Kippax, S. C., et al. (2009b). Circumcision and risk of sexually transmissible infections in a community-based cohort of HIV-negative homosexual men in Sydney, Australia. *Journal of Infectious Diseases*, *200*, 1813–1819.
- Templeton, D. J., Mao, L., Prestage, G. P., Jin, F., Kaldor, J. M., & Grulich, A. (2008). Self-report is a valid measure of circumcision status in homosexual men. *Sexually Transmitted Infections*, *84*, 187–188.
- Thornton, A., Lattimore, S., Delpech, V., Weiss, H. A., & Elford, J. (2011). Circumcision among men who have sex with men in London, United Kingdom: An unlikely strategy for HIV prevention. *Sexually Transmitted Diseases*, *38*, 928–931.
- Wilton, J. (2011). From exposure to infection: The biology of HIV transmission. *Prevention in Focus* (Issue 4). Available at <http://www.catie.ca/en/pif/fall-2011/exposure-infection-biology-hiv-transmission>.