Uptake and acceptability of medical male circumcision among young males in two culturally distinct settings in South Africa: A longitudinal, community-based study (the MACHO study)

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Estimates suggest that 36% of all heterosexual transmission of HIV occurs in the 15 - 24-year age group.[11] While HIV counselling and testing is on the increase in young South Africans,[12,13] men use diagnostic and prevention services less than women and are less likely to be in HIV care.[14] Consequently, men have higher levels of HIV-related mortality than women.

Male medical circumcision (MMC), defined as complete surgical removal of the foreskin, was found to reduce HIV incidence in heterosexual men[5] by 60% in South Africa (SA) and Kenya,[6,7] and by 67% in Uganda.[8] The keratinisation of the remaining skin, reduced skin surface area and exposed HIV target cells, and faster drying after sexual contact post circumcision, are some of the factors thought to contribute to prevention.[9,10] This once-off intervention has been shown to accrue cumulative prevention benefit over a sustained period.[5] Moreover, modelling suggests that MMC may offer protection for women and significantly increase the number of infections averted.[10] Accordingly, MMC has been recommended as an efficacious strategy to support combination prevention for men in areas with a high HIV disease burden.[11,12]

Both traditional male circumcision (TMC) and MMC are variably practised across SA, with TMC traditionally performed in Limpopo, KwaZulu-Natal, Eastern Cape and Western Cape provinces (Sepedi-, Tshivenda-, isiZulu- and isiXhosa-speaking areas).[13,14] While there is provision for 16- and 17-year-olds to undergo MMC with written parental or guardian permission, the legal age has been set at 18 years.[15] SA data indicate high rates of MMC uptake in boys aged 10 - 14 years outside the Eastern and Western Cape.[16] One SA study found that the mean age for circumcision was 19 years, with 90% of 472 males circumcised in late adolescence and early adulthood between the ages of 17 and 22 years.[17] Another study conducted in Cape Town, with a large isiXhosa-speaking population who practise TMC, found low acceptability for MMC, that approximately a quarter
issues related to circumcision were covered, including attitudes were collected via researcher-administered surveys. A number of (ref. no. 05/2013) and the Witwatersrand (ref. no. M130747). from the institutional review boards of the universities of Cape Town informants in Cape Town and Soweto. Ethical approval was obtained MMC in 100 males (14 - 17 years), their guardians and other key stakeholders and were linked to the local MMC service provider. The study investigated the acceptability of MMC in young men (aged 14 - 17 years) in two locations with culturally distinct practices, (Gauteng Province). Residents of Masiphumelele are largely isiXhosa speaking (Census 2011), and data from the Cape Area Panel Study[17] showed that Xhosa men in Cape Town were generally circumcised at age 17 years or later.[10,13,14] Soweto is a predominantly isiZulu speaking (37%), Sesotho- (16%) and Setswana- (13%) speaking township, with large cohorts of people who speak Xitsonga (9%), isiXhosa (9%) and Tshivenda (5%) (http://www.statsza.gov.za). Participants were recruited through extensive community outreach using links with key stakeholders and were linked to the local MMC service provider. Young males were eligible for the study if they were in good health, tested HIV-negative at screening, were between the ages of 14 and 17 years, and were not circumcised. Overall, 50 participants and their legal guardians were enrolled at each site. In addition to providing assent for study participation, enrolment was contingent upon written consent or agreement by the parent or guardian.

Design
The MACHO (Male Adolescent Choices for HIV Prevention Options) study was a multi-site, longitudinal mixed-methods cohort study that investigated preferences for, attitudes towards and uptake of elective MMC in 100 males (14 - 17 years), their guardians and other key informants in Cape Town and Soweto. Ethical approval was obtained from the institutional review boards of the universities of Cape Town (ref. no. 05/2013) and the Witwatersrand (ref. no. M130747).

Participants were followed up over a 24-month period and data were collected via researcher-administered surveys. A number of issues related to circumcision were covered, including attitudes towards adolescent male circumcision, adolescent preferences regarding male circumcision, whether perceived protection against HIV infection provided by male circumcision might lead to sexual disinhibition or risk compensation, condom use and practices, and other factors that could affect the decision to undergo circumcision.

Objectives
The limited data on the acceptability of MMC promotion[18,20] require further investigation to explore desirable features of an ideal HIV prevention service offering an MMC programme for young men. While other studies have investigated acceptability of and attitudes towards circumcision among SA men,[19,20] the present observational study was designed to investigate preferences for and uptake of MMC at youth-friendly clinics in young SA men from different ethnic groups, around the time of sexual debut.

Methods
This study was part of the CHAMPS (Choices for HIV Adolescent Methods of Prevention in South Africa) project (NIH award 1R01AI094586), which specifically focused on the needs and preferences of adolescents in HIV prevention.

Setting and participants
The study investigated the acceptability of MMC in young men (aged 14 - 17 years) in two locations with culturally distinct practices, Masiphumelele in Cape Town (Western Cape Province) and Soweto (Gauteng Province). Residents of Masiphumelele are largely isiXhosa speaking (37%), Sesotho- (16%) and Setswana- (13%) speaking township, with large cohorts of people who speak Xitsonga (9%), isiXhosa (9%) and Tshivenda (5%) (http://www.statsza.gov.za). Participants were recruited through extensive community outreach using links with key stakeholders and were linked to the local MMC service provider. Young males were eligible for the study if they were in good health, tested HIV-negative at screening, were between the ages of 14 and 17 years, and were not circumcised. Overall, 50 participants and their legal guardians were enrolled at each site. In addition to providing assent for study participation, enrolment was contingent upon written consent or agreement by the parent or guardian.

Analysis
The results were described and bivariate analyses were conducted to identify statistically significant associations (p<0.05) for inclusion in the multivariate analysis. Cox proportional hazards models examined the association between research site (exposure) and time to circumcision (event). Time to circumcision was measured in days, and participants were followed from baseline (day of enrolment) until circumcision, loss to follow-up, or censoring (the last day of follow-up). The data were analysed in Stata 14 (StataCorp, USA).

Results
The study enrolled 100 adolescent boys (Cape Town n=50, Soweto n=50) (Table 1), with a mean (interquartile range (IQR)) age of 15 (14 - 16) years, and their legal guardians (n=97). Most participants from the Cape Town site were isiXhosa speaking (n=44; 88%), while half of the participants at the Soweto site were isiZulu speaking (n=25; 50%).

At baseline, 27% had had their sexual debut, with a median (IQR) age of 15 (15 - 17) years. At the final study visit, nearly three-quarters (n=73; 73%) of the participants reported sexual activity. Prior to circumcision, no boys in Cape Town preferred MMC, while in Soweto most (42 of 50) preferred MMC over TMC. Participants had an average of 417 days’ follow-up, and in ~2 years of follow-up, 13 boys underwent circumcision, 1 in Cape Town and 12 in Soweto. Each site accounted for 1 of the 2 TMCs, and all 11 MMCs took place
Uptake of circumcision differed by ethnicity: 5.4% in Xhosa (1 TMC in Cape Town, 1 TMC and 1 MMC in Soweto), 19% in Zulu (5 MMCs in Soweto) and 33% in Sotho/Tswana (3 MMCs in Soweto) people (for 2 MMCs, ethnicity was unspecified). There were no seroconversions during study follow-up.

Knowledge/awareness
At baseline, almost all legal guardians wanted circumcision for their son or ward, and most adolescents wanted to be circumcised (Table 2).

Table 1. Characteristics of the Cape Town and Soweto cohorts

| Characteristic                      | Cape Town (N=50) | Soweto (N=50) | Total (N=100) | p-value |
|-------------------------------------|------------------|---------------|---------------|---------|
| Circumcised, n (%)                  |                  |               |               | 0.001   |
| MMC                                 | 0                | 11 (22)       | 11 (11)       |         |
| TMC                                 | 1 (2)            | 1 (2)         | 2 (2)         |         |
| Had sex before enrolment, n (%)     | 18 (36)          | 9 (18)        | 27 (27)       | 0.043   |
| Age at enrolment (years), median (IQR) | 15 (14 - 16)    | 15 (15 - 16)  | -             | 0.082   |
| Had sex during follow-up, n (%)     | 37 (74)          | 36 (72)       | 73 (73)       | 0.824   |
| Age of sexual debut (years), median (IQR) | 15 (13.5 - 16) | 15 (14 - 15.8)| -             | 0.034   |
| In school, n (%)                    | 49 (98)          | 50 (100)      | 99 (99)       | -       |
| Working, n (%)                      | 3 (6)            | 0             | 3 (3)         | 0.086   |
| Race, n (%)                         |                  |               |               | 0.694   |
| Black                               | 49 (98)          | 48 (96)       | 97 (97)       |         |
| Coloured                            | 1 (2)            | 0             | 1 (1)         |         |
| Other                               | 0                | 2 (4)         | 2 (2)         |         |
| Ethnicity, n (%)                    |                  |               | <0.001        |         |
| Xhosa                               | 44 (88)          | 12 (24)       | 56 (56)       |         |
| Zulu                                | 1 (2)            | 25 (50)       | 26 (26)       |         |
| Sotho/Tswana                        | 3 (6)            | 9 (18)        | 12 (12)       |         |
| Afrikaans                           | 1 (2)            | 0             | 1 (1)         |         |
| Other                               | 1 (2)            | 4 (8)         | 5 (5)         |         |
| Circumcision by ethnicity, n        |                  |               |               |         |
| Xhosa                               | 1 TMC            | 1 TMC, 1 MMC  |               |         |
| Zulu                                | 0                | 5 MMC         |               |         |
| Sotho/Tswana                        | 0                | 3 MMC         |               |         |
| Afrikaans                           | 0                | 0             |               |         |
| Other                               | 0                | 2 MMC         |               |         |
| New HIV infection, n                | 0                | 0             | 0             | -       |
| Follow-up (days), mean (SD)         | 492 (169)        | 341 (167)     | -             | -       |

MMC = male medical circumcision; TMC = traditional male circumcision; IQR = interquartile range; SD = standard deviation.
*Participant demographics were self-identified.

Table 2. Baseline preferences for circumcision

| Knowledge and preferences | Cape Town (N=50), n (%) | Soweto (N=50), n (%) | Total (N=100), n (%) | p-value |
|---------------------------|-------------------------|----------------------|----------------------|---------|
| Legal guardian            |                         |                      |                      |         |
| MMC protects against HIV  | Yes 38 (72)             | 47 (94)              | 85 (85)              | 0.001   |
| Want circumcision         | Yes 50 (100)            | 46 (92)              | 95 (95)              | 0.305   |
| Preference                | MMC 11 (22)             | 42 (84)              | 53 (53)              | <0.001  |
| Concerns about TMC        | Yes 32 (64)             | 42 (84)              | 74 (74)              | 0.01    |
| Concerns about MMC        | Yes 28 (56)             | 1 (1)                | 29 (29)              | <0.001  |
| Adolescent                |                         |                      |                      |         |
| MMC protects against HIV  | Yes 38 (76)             | 48 (96)              | 86 (86)              | 0.019   |
| Want circumcision         | Yes 45 (90)             | 47 (94)              | 92 (92)              | 0.156   |
| Preference                | MMC 0                   | 42 (84)              | 42 (42)              | <0.001  |
| Concerns about TMC        | Yes 13 (26)             | 43 (86)              | 56 (56)              | <0.001  |
| Concerns about MMC        | Yes 22 (44)             | 3 (6)                | 25 (25)              | <0.001  |

MMC = male medical circumcision; TMC = traditional male circumcision.

in Soweto. Eighty-five out of 97 guardians (87%) were aware that male circumcision protected against HIV and sexually transmitted infections (STIs). The 10 guardians who were unaware of the protection offered by MMC were all from Cape Town (p=0.001). Overall, most adolescents (86%) were aware of the protection offered by MMC. Participants in Cape Town were less aware of the protection offered by MMC at baseline (p=0.019). At the fourth study visit, the difference between the two sites was not significant (p=0.164). At the fourth study visit, participants’ desire to be circumcised had not changed from enrolment.
Concerns raised

Compared with Cape Town, TMC was more frequently a concern among participants (p<0.000) and guardians (p<0.005) in Soweto. In contrast, MMC generated more concerns among participants (p<0.000) and guardians (p<0.000) in Cape Town.

Compared with MMC, TMC was the source of most concern, with 73 guardians (p=0.005) and 62 adolescents (p<0.000) reporting being worried, most in Soweto (Table 3). Adolescents (n=27) and guardians (n=28) in Cape Town were more likely than those in Soweto (n=3 and n=1, respectively) to state concerns around MMC. Guardians in Cape Town and Soweto were more likely to express concerns about TMC (n=73) than about MMC (n=29). A total of 62 adolescents were worried about traditional circumcision. Around a third of guardians (n=29), mainly in Cape Town, worried about MMC. Approximately a third of adolescents (n=31), mainly in Cape Town, were worried about MMC.

Motives for circumcision

Overall, ‘protection from HIV and STIs’ was the most common motive for circumcision (Table 4), with ‘religious/cultural’ reasons and ‘to become a man’ coming in second and third. When disaggregated by site, Cape Town participants chose religious/cultural motivations for circumcision most frequently. Of those who were circumcised, 8 out of 10 participants who gave reasons regarded protection from HIV and STIs as the only reason for circumcision. In the uncircumcised group, cultural motivations were more common.

Sexual risk behaviour

Pro-circumcision preference was not significantly associated with sexual risk behaviour, age of sexual debut, sexually active status over the course of the study, or age at enrolment.

Association between circumcision and research site

There were more circumcisions (TMC and MMC) in Soweto (n=12) than in Cape Town (n=1). Participants in Soweto were more likely to elect circumcision (TMC n=1, MMC n=11) than those in Cape Town (TMC n=1) over time (hazard ratio 18.9; 95% confidence interval 2.37 - 150.71; p=0.006) (Table 5, Fig. 1).

Discussion

Uptake of circumcision in this study overall was low in the cohort, in which the Soweto component contributed most to circumcision numbers. It was evident from participant responses that those in Cape Town preferred TMC and were more likely to offer concerns regarding MMC than those in Soweto. In contrast, participants in Soweto were significantly more likely to exhibit preference for MMC and offer concerns regarding TMC than those in Cape Town. Despite reasonable knowledge about the benefits of early MMC, bolstered by the men’s sexual health educational sessions, the evidence from this study echoes the results of other research showing that many young males delay uptake,[16] and Xhosa participants preferred TMC over MMC. While research on male circumcision in SA is rich, this study was novel because it followed young men in high HIV disease burden communities in SA at the time of sexual debut. Additionally,

### Table 3. Concerns about circumcision

|                      | Adolescents, n | Guardians, n |
|----------------------|----------------|--------------|
|                      | Cape Town | Soweto | Total | p-value | Cape Town | Soweto | Total | p-value |
| TMC concerns         |           |         |       |         |           |         |       |         |
| Safety of the procedure | 5        | 25     | 30    | 0.000   | 9        | 28     | 37    |         |
| Pain                 | 8        | 9      | 17    |          | 7        | 2      | 9     |          |
| Cost                 | 5        | 5      | 8     |          | 8        |         |       |          |
| Lack of expertise/training to circumcise | 0 | 4 | 4 | 3 | 3 |
| Tradition            | 4        | 4      | 8     |          | 3        |         |       |          |
| Partial/inappropriate circumcision | 1 | 2 | 3 | 2 |
| Length of process    | 1        | 1      | 1     |          | 1        |         |       |          |
| Cold weather         | 0        | 1      | 1     |          | 0        |         |       |          |
| Not knowing what happens | 0   | 1       | 1     |          | 0        |         |       |          |
| Missing school       | 0        | 1      | 1     |          | 0        |         |       |          |
| Complications with the procedure | 0 | 1 | 1 | 1 |
| Fear                 | 1        | 1      | 1     |          | 0        |         |       |          |
| Not practised in the community/family | 1 | 1 | 1 | 1 |
| Not specified        | 1        | 1      | 1     |          | 0        |         |       |          |
| MMC concerns         |           |         |       |         |           |         |       |         |
| Will not be regarded as a man | 12 | 12 | 5 | 12 | 5 |
| Not practised in my culture | 4 | 1 | 5 | 9 | 9 |
| Not practised in the community/family | 5 | 5 | 9 | 9 |
| Cost                 | 3        | 3      | 6     |          | 2        |         |       |          |
| Safety of the procedure | 1   | 1      | 2     |          | 1        |         |       |          |
| Pain                 | 2        | 2      | 1     |          | 1        |         |       |          |
| Fear                 | 1        | 1      | 1     |          | 0        |         |       |          |
| No teaching about manhood | 1 | 1 | 1 | 0 |
| Not specified        | 1        | 1      | 1     |          | 0        |         |       |          |

TMC = traditional male circumcision; MMC = medical male circumcision.
the findings are useful because the study suggests that sexual health research and interventions should be designed for the intended context and population.

Soweto had higher overall circumcision uptake and MMC uptake. Xhosa participants accounted for a minority of circumcisions (3 of the 13 circumcisions overall, and 1 of the 11 MMCs), even though Xhosa participants comprised the majority of study participants. Overall, 3 isiXhosa-speaking adolescents underwent circumcision in this cohort. Since Xhosa males in Cape Town are circumcised between the ages of 19 and 21 years,[15,16] these participants may have had lower uptake of circumcision owing to the preference of Xhosa men to undertake TMC when slightly older.

Although participants’ and legal guardians’ knowledge about the protection offered by MMC was high, and almost all participants reported wanting circumcision, uptake was generally slow and limited in this cohort, suggesting some barriers or concerns. Concerns among the respondents from the two cities were different. In Soweto, concerns were raised by participants and guardians regarding safety of TMC. Conversely, concerns about MMC were mainly raised among participants in Cape Town. Their most cited concerns were not being accepted in the community, going against their cultural beliefs, or failing to be regarded as a man, if they opted for MMC. Qualitative data may provide more detailed insights about the contextual and cultural influences upon circumcision uptake, and how to adapt the service to the context.

Study limitations
There were a number of limitations to this study. While the age group was specifically chosen to investigate circumcision around sexual debut, when HIV acquisition risk increases, very few participants underwent circumcision in this time frame, and it would have been instructive to extend

| Table 5. Cox proportional hazard model: Association between time to circumcision and research site |
| --- |
| Unadjusted HR | 95% CI | p-value | Adjusted HR | 95% CI | p-value |
| Age (years) | 1.36 | 0.80 - 2.31 | 0.254 | 1.16 | 0.64 - 2.12 | 0.630 |
| Sites |  |  |  |  |  |  |
| Cape Town | 1 (base) |  |  |  |  |  |
| Soweto | 19.85 | 2.51 - 156.82 | 0.005 | 18.90 | 2.37 - 150.71 | 0.006 |

HR = hazard ratio; CI = confidence interval.
the follow-up period. The cohort was small, which may have led to overestimated or missed associations, so associations with circumcision status should be viewed with caution. Accordingly, since most (92%) participants were pre-circumcision, the study was not powered to detect differences in behaviour between the pre- and anti-circumcision groups. Finally, since TMC is culturally practised in Cape Town, there is far more acceptance there for this method of circumcision. This underlying ethos may also influence decisions for a number of reasons. Since most staff were Xhosa, their cultural beliefs and practice may also have a significant role in influencing circumcision election.

Conclusions
Male circumcision is an integral part of the culture in many places in SA. MMC is an important male-specific tool in the HIV prevention package for Africa, where much of the epidemic is fuelled by heterosexual sex. Programmes to promote circumcision should take into consideration cultural and traditional mores including ensuring collaboration with cultural Xhosa leaders and people. Efforts should be made to ensure that all circumcision is safe, culturally sensitive, effective and acceptable. Additionally, public messaging based on policy should be tested with target populations, and their input should be used to ensure the message is heard as intended.

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