Designing Family-Centered Male Circumcision Services
A Conjoint Analysis Approach

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Abstract

**Background:** Male circumcision (MC) has become an important weapon in the fight against HIV/AIDS in many Sub-Saharan African countries. The successful implementation of a national MC program requires the design of circumcision services that are attractive to young men of various ages. For many potential clients, mothers and/or fathers will play an important role in the decision to be circumcised, and hence services will need to be designed with the preferences of mothers, fathers, and sons in mind.

**Objective:** Our objective was to value multiple design characteristics of potential community-based MC services from the perspectives of mothers, fathers, and sons in Johannesburg, South Africa, and to test for concordance between their values for the design characteristics.

**Methods:** Potential design characteristics of MC services were identified through open-ended interviews with key informants (n = 25). Preferences were estimated using conjoint analysis implemented as part of a cluster randomized household survey. Each participant was randomized to receive one of two possible blocks of conjoint analysis, each consisting of six forced-choice tasks comparing two possible MC services varying on 11 design characteristics. With only two levels for each attribute, our experimental design utilized a main effects orthogonal array. Data were analyzed using linear probability models, with tests of concordance of values using Wald tests generated from stratified estimates calculated using restricted least square estimation.

**Results:** A racially and geographically diverse sample consisting of 204 fathers, 204 mothers, and 237 sons completed the survey. In aggregate, requiring a follow-up visit was the most valued design factor (p < 0.001), followed by having a lower infection rate (p < 0.001), having less pain (p = 0.001), and a private waiting room (p = 0.001). Based on stratified analysis, sons also valued
having the risks and benefits of MC explained (p = 0.01) and mothers valued requiring an HIV test as part of the procedure. Requiring an HIV test was the most significant difference between the respondents (p = 0.03), with sons finding it somewhat repulsive (p = 0.30).

**Conclusion:** Our findings suggest that valuation of aspects of MC clinic design can diverge by decision maker. To better ensure utilization of services, these variations should be taken into account prior to implementation of a national strategy in South Africa.

### Key points for decision makers

- Male circumcision (MC) is efficacious in preventing the transmission of HIV among heterosexual men. The widespread implementation of MC will require the design of specific services
- Given that MC will have to be applied to boys and young men of different ages, the design of services will need to accommodate the wishes of fathers, mothers, and sons
- We utilized conjoint analysis to explore the preferences for the design of MC services among fathers, mothers, and sons in Johannesburg, South Africa
- Having a follow-up visit, a lower infection rate, less pain, and a private waiting room were seen as most important across the family, but having the risks and benefits of MC explained was valued higher by sons, and sons did not value requiring a HIV test

### Introduction

Male circumcision (MC) has a proven efficacy in reducing the risk of HIV acquisition in heterosexual males. Three recent clinical trials confirmed numerous observational studies. The World Health Organization subsequently recommended that medical MC be made available by governments in areas of hyper-endemic HIV, where HIV prevalence exceeds 15% in the general population. Several Sub-Saharan African countries are implementing mass scale-up of medical MC strategies. South Africa, a country with a seroprevalence of 30% among pregnant women, would benefit from such public health measures. At the time of writing, however, South Africa was still preparing its national MC program.

While more is written about the influence of the parent in risk-taking behavior and sexual initiation, the role of parents in HIV prevention has received some attention. Yet the literature on decision making for MC is relatively sparse. An American study aimed at reducing MC found no impact of a MC educational program on the decision to circumcise, concluding that neonatal MC was more a factor of parents’ beliefs and education. In a comprehensive review of the literature on the acceptability of MC, Westercamp and Bailey found that, “acceptance of MC by men and by parents of males in traditionally non-circumcising communities will be crucial to the success of [an] MC intervention for reducing HIV prevalence.”

Madhivanan et al. focused specifically on determining the primary decision makers in MC, finding that father, mother, and both parents were primarily involved in the decision to circumcise. While the primary focus of policy makers and advocates associated with MC has been on implementation and scale-up, widespread acceptance of MC will hinge on the motivations for demand, the quality of the procedure, and the appropriate social marketing strategies. Despite the need for scale-up, there has been little...
written on the actual design of MC services and the preferences of decision makers for MC. We sought to identify design characteristics of MC services in Johannesburg, South Africa, and to estimate preferences for the identified characteristics. We took the perspectives of mothers, fathers, and sons (a term that we will use broadly to include the young men who we interviewed as potential clients for the MC services) into account, given the importance of these decision makers for MC. While the interaction of parents and children in pediatric decision making is not a new topic,\cite{16,17} they have not been adequately explored with respect to MC services.

### Methods

For this study, we utilized conjoint analysis as a methodological approach to evaluate mothers’, fathers’, and sons’ preferences for the design of MC services. The application of conjoint analysis in healthcare has increased in the past decade,\cite{18-20} and can be a useful and rigorous method for eliciting patient and community preferences in healthcare.\cite{21-23} Conjoint analysis allows a potential decision maker to value the level of a characteristic of a good or service (in this instance, a circumcision service) in terms of his or her decision to select it. In addition, conjoint analysis can estimate the relative importance of multiple methods of service delivery. This is particularly relevant when evaluating the preferences of a diverse population, such as that potentially reached by publicly provided MC services in Johannesburg.

### Participants

Participants were recruited to be representative of the potential clients of publicly provided MC services in Johannesburg. Households were selected randomly in two stages from three predominantly Black (African), Coloured (mixed-race), and White census neighborhoods in the Greater Johannesburg metropolitan area as demarcated by the boundaries of the local authority. First, ten enumerator areas were selected randomly from each racially defined majority neighborhood. Then, a starting household was selected randomly using aerial photos. Adjacent households to the left or right of the start household were included in the study, alternating households by the respondent’s decision-maker status – i.e. either as a son (males aged 14–30 years who self-report being uncircumcised and were regarded as potential clients) or as parents (men or women aged 18 years and above, who had a son). A household was excluded if no suitable respondent (son or parent) resided there or if consent was not obtained.

Traditionally, conjoint analysis applications have not applied formal sample size calculations.\cite{24} Orme\cite{25} reviewed a number of possible rules of thumb, but we applied one relevant to stratified or segmented models. Here Orme suggested that one needs at least 200 respondents per stratum. With three such strata, we aimed for a minimal sample size of 600. Such a sample is consistent with the average sample size of all other health systems’ applications of conjoint analysis\cite{19} and larger than the majority of recent applications of the method in health.\cite{20}

Given a concern that our random sampling might not lead to an appropriate ethnic balance, due to either a lack of eligible respondents and/or low participation rates, we envisioned the need for oversampling. The most recent household survey assessing national HIV prevalence in South Africa, for example, experienced difficulties in accessing Whites, who cite security concerns and lack of immediately tangible benefit as reasons for non-participation.\cite{26} We determined, \textit{a priori}, that if our sampling strategy could not provide sufficient numbers for a particular race, we would revert to a convenience sampling of shoppers at local malls until sufficient respondents were identified. Upon completion of the survey, all participants received a 20 South African rand (approximately US$2.50) telephone card.

The research protocol for the preliminary key informant interview and household survey was reviewed and approved by the University of the Witwatersrand Ethics Committee. The preliminary key informant interview and the secondary data analysis of the survey data were reviewed and approved by the Johns Hopkins School of Public Health Institutional Review Board.
Design Characteristics Evaluated

Important characteristics of MC services were identified via open-ended qualitative interviews with relevant stakeholders from the study area. Stakeholder interviews (n = 25) were conducted by the lead author (JB) and included a racially diverse set of respondents including fathers and mothers of uncircumcised and recently circumcised boys; uncircumcised and recently circumcised young men; local experts in MC (including doctors and nurses at local HIV clinics); and local elected and religious community leaders.

Data from the stakeholder interviews were transcribed and analyzed using standard methods, and 11 relevant characteristics of MC services were identified. These characteristics included:

- Whether a follow-up visit after circumcision is required or not;
- The infection rate following circumcision (i.e. 1 in 100 or 3 in 100);
- The number of days of pain following circumcision (i.e. 1 or 4 days);
- The type of waiting room for the circumcision service (i.e. wait outside or in a private waiting room);
- Whether counseling on the risks and benefits of circumcision is provided or not;
- Whether staff are predominantly male or female;
- Having links to traditional circumcision schools or not;
- Is a 3-day advance booking required or is it a same day service;
- Can the boys come individually to the clinic or in groups with their friends or peers;
- Whether an HIV test is required or not; and
- Whether clinic staff members are predominantly formal or informal.

This qualitative research highlighted the important role of parents in the education of their sons about MC specifically, and HIV prevention more generally. As a young White male put it, “Adults are more aware of HIV than the teenagers.” A Black community leader saw a greater role for the individual, stating that, “A person decides individually on circumcision, because it is a sacred thing,” but also stressed the importance of parents, specifically indicating that “the mother is the one who is the strongest decision maker in as far as circumcision is concerned.”

These sentiments were also reinforced by a young White male, who suggested that, “At the age of 13 and 14 the decision would come from them rather than parents, as teenagers like to make decisions for themselves.”

Procedure

After selection, respondents were randomly assigned to receive one of two versions of a survey instrument (see figure 1 for an example card). Each version of the instrument consisted of six different paired sets of MC services characteristics presented as an illustrated card with two columns. Each column described a set of characteristics of a hypothetical MC clinic. Respondents were asked to select from the two possible clinics and asked which one they preferred. This process was repeated six times per participant with the six different conjoint cards.
Given that specific MC clinics did not exist in South Africa at the time of the study, nor did their existing health services provide circumcisions for the sole purpose of preventing future disease, we did not include a *status quo* option. Likewise, given that our research question was focused on improving design, rather than predicting potential utilization, all conjoint tasks were forced choice (i.e. respondents could not opt out and choose neither service). Finally, respondents were not required to justify their answers, indicate their strength of preference, or discuss their confidence in their answer.

Overall, we utilized a minimal main effects orthogonal array to arrange the MC clinic design characteristics on the cards. The orthogonal array generated an experimental design of 12 possible sets of the identified characteristics. Each characteristic was then paired with its complement via the fold-over technique, to guarantee that all 11 determinants appeared once on each card, ensuring no overlap between cards.

The primary outcome in our analysis was the preferred clinic by the respondent – if the respondent chose the set of characteristics on the left side of the conjoint card, it was coded as zero, and if the respondent chose the set of characteristics on the right side, it was coded as one. These were then regressed upon the design characteristics, coded to ensure all aggregate results were estimated as positive values (i.e. based on the aggregate results, the preferred level of each attribute was coded as a one and the less preferred was coded as a zero).

Given the underlying symmetry in the data, regression analysis utilized a linear probability model estimated via ordinary least squares. Stratified analysis utilized the restricted least squares approach, and the Wald statistic was generated to test for homogeneity in preferences across the strata (mothers, fathers, and sons). While other estimation methods (e.g. logistic regression) confirmed our results, we report the ordinary least square regression results. These results come
from a simple model where the choice between two profiles, for instance, left (L) and right (R), are a function of the difference between the attributes of L and R, respectively. Not including subscripts for multiple respondents and questions, this can be seen in equation 1:

\[ C_L = \beta_1(L_1 - R_1) + \beta_2(L_2 - R_2) + \ldots + \beta_{11}(L_{11} - R_{11}) + e \]  

(Eq 1)

where \( C_L \) is a dichotomous variable if a particular respondent chose left for a particular card; \( L_i \) and \( R_i \) are dichotomous variables indicating the 11 design characteristics; and \( e \) is an error term.

Linear probability models allow for the simplest interpretation of results; in other words, parameter estimates can be interpreted as absolute probabilities. For example, if a parameter is estimated as 0.1, then a chance in that attribute would affect the probability of a scenario being chosen by 10%.

Our results are not based on the magnitude of the various parameter estimates or their relative importance, but on hypothesis testing. Here we test two important hypotheses: first, whether a factor is important in decision making, and second, whether this importance differs across mothers, fathers, and sons. Here the statistical significance of the parameter estimates and the statistical difference, as measured by an F-test, between these estimates across fathers, mothers, and sons are the primary focus of our analysis. To facilitate the estimation of the differences between our strata, we utilized a restricted least squares estimation technique where the \( \beta_s \) in equation 1 were conditional upon the three strata (i.e. mothers, fathers, and sons).

We chose not to analyze preferences by other strata, particularly race, given that we aimed to analyze differences across members of the family (fathers, mothers, and sons) [and we had insufficient sample to do any further stratification within these groups]. Furthermore, our previous research on social marketing for MC services indicated that all races had a preference for a national approach that saw all South Africans receive a similar service.[15] Based on these results, we deemed that it would be politically incorrect to tailor MC services based on race, and hence this was not the focus of our study (although some key differences in attitudes by race are summarized).

The survey included several elements besides the conjoint tasks. We asked individuals to provide age, sex, ethnicity, religion, language spoken at home, education, number of children in the household, and number of rooms in the house. Wealth indicators such as income, television and mobile phone ownership, and employment status were also gathered.

**Results**

The mean age of the respondents overall was 38 years of age, with a mean age of 21 years for sons, 48 years for fathers, and 47 years for mothers. Racially, the sample represented Black, Coloured, and White groups approximately equally, making up 34.3%, 31.6%, and 34.1% of the total, respectively (table I). While it is possible to discern aggregate preferences for design attributes of MC service delivery, a stratified analysis of results demonstrates that a large degree of variation in valuation exists between respondent types. Hence, in table II we present both aggregate preference weights and stratified results for mothers, fathers, and sons.

### Aggregate Results

In an aggregate analysis of the total study sample (see table II), requiring a follow-up visit was the most valued design factor (\( p < 0.001 \)), followed by having a lower infection rate (\( p < 0.001 \)), having less pain (\( p = 0.001 \)), and a private waiting room (\( p = 0.001 \)). To a lesser extent, fathers, mothers, and sons also valued having the risks and benefits of circumcision explained (\( p = 0.07 \)) and there appeared to be a preference for having predominately male staff (\( p = 0.07 \)).

### Stratified Analysis

Our null hypothesis for our stratified analysis was that mother, fathers, and sons had concordant values for design characteristics for MC services – i.e. all \( \beta_s \) were the same for the three strata. This hypothesis, however, was rejected (\( p = 0.02 \)) in favor of one implying heterogeneity.
Pair-wise comparisons, however, revealed lesser differences between fathers and mothers (p = 0.31), fathers and sons (p = 0.26), and mothers and sons (p = 0.48). While these differences are reflecting less variation between two groups, as compared to three, they are also a less powerful test as they are using only two-thirds of the data.

Heterogeneity in values can also be explored for each of the design characteristics individually. Here, table II presents the valuations by stratum, reporting whether a characteristic was statistically significant in that stratum’s decision making, and table III reports on a statistical test for heterogeneity across strata (including all strata and the pair-wise comparisons). Finally, figure 2 illustrates the underlying ordinal preferences for the three strata, indicating in red where differences were statistically significant.

As a service delivery design attribute, follow-up was most valued by sons and mothers (p < 0.001 for both), but not as much by fathers (p = 0.07). The difference between fathers and sons for this design attribute was statistically significant (p = 0.04).

By the same token, a lower infection rate was valued most by mothers (p = 0.003), but also valued significantly by sons (p = 0.01). Lower infection rate was not valued significantly by fathers (p = 0.32), but the differences between fathers, mothers, and

Table I. Demographic characteristics of the study population

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>Overall</th>
<th>Sons (n = 237)</th>
<th>Fathers (n = 204)</th>
<th>Mothers (n = 204)</th>
<th>p-Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y [mean (SD)]</td>
<td>21.40 (4.97)</td>
<td>47.98 (13.20)</td>
<td>47.24 (12.67)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Racial category (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>34.3</td>
<td>31.4</td>
<td>37.9</td>
<td>35.6</td>
<td>0.160</td>
</tr>
<tr>
<td>Coloured</td>
<td>31.6</td>
<td>25.5</td>
<td>32.5</td>
<td>36.6</td>
<td>0.081</td>
</tr>
<tr>
<td>White</td>
<td>34.1</td>
<td>43.1</td>
<td>29.6</td>
<td>27.8</td>
<td>0.002</td>
</tr>
<tr>
<td>Primary language (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zulu</td>
<td>18.6</td>
<td>20.4</td>
<td>18</td>
<td>17.1</td>
<td>0.469</td>
</tr>
<tr>
<td>English</td>
<td>40</td>
<td>41.7</td>
<td>39.8</td>
<td>38.4</td>
<td>0.549</td>
</tr>
<tr>
<td>Afrikaans</td>
<td>25.3</td>
<td>26.3</td>
<td>23.3</td>
<td>26.1</td>
<td>0.585</td>
</tr>
<tr>
<td>Other</td>
<td>16.1</td>
<td>11.7</td>
<td>18.9</td>
<td>18.5</td>
<td>0.026</td>
</tr>
<tr>
<td>Economic indicators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television ownership (%)</td>
<td>96.7</td>
<td>98.3</td>
<td>96.6</td>
<td>95.1</td>
<td>0.278</td>
</tr>
<tr>
<td>Average household income (ZAR)</td>
<td>3787.06</td>
<td>4143.20</td>
<td>4034.94</td>
<td>3211.27</td>
<td>0.875</td>
</tr>
</tbody>
</table>

ZAR = South African rand.

Table II. Aggregate and stratified parameter estimates for design characteristics

<table>
<thead>
<tr>
<th>Design characteristics</th>
<th>Aggregate</th>
<th>Fathers</th>
<th>Sons</th>
<th>Mothers</th>
<th>p-Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-up required</td>
<td>0.0973*** (0.016)</td>
<td>0.0508* (0.028)</td>
<td>0.1253*** (0.025)</td>
<td>0.1103*** (0.027)</td>
<td></td>
</tr>
<tr>
<td>Lower infection rate</td>
<td>0.0574*** (0.016)</td>
<td>0.0274 (0.028)</td>
<td>0.0623*** (0.025)</td>
<td>0.0808*** (0.027)</td>
<td></td>
</tr>
<tr>
<td>Pain for 1 day</td>
<td>0.0529*** (0.016)</td>
<td>0.0606* (0.028)</td>
<td>0.0618*** (0.025)</td>
<td>0.0358 (0.027)</td>
<td></td>
</tr>
<tr>
<td>Private waiting room</td>
<td>0.0515*** (0.016)</td>
<td>0.0226 (0.028)</td>
<td>0.0514* (0.025)</td>
<td>0.0790*** (0.027)</td>
<td></td>
</tr>
<tr>
<td>Risk/benefit counseling</td>
<td>0.0288* (0.016)</td>
<td>0.0031 (0.028)</td>
<td>0.0649*** (0.025)</td>
<td>0.0130 (0.027)</td>
<td></td>
</tr>
<tr>
<td>Predominantly male staff</td>
<td>0.0284* (0.016)</td>
<td>0.0096 (0.028)</td>
<td>0.0306 (0.025)</td>
<td>0.0447* (0.027)</td>
<td></td>
</tr>
<tr>
<td>No booking ahead needed</td>
<td>0.0233 (0.016)</td>
<td>0.0476* (0.028)</td>
<td>0.0079 (0.025)</td>
<td>0.0168 (0.027)</td>
<td></td>
</tr>
<tr>
<td>HIV test required</td>
<td>0.0198 (0.016)</td>
<td>0.0190 (0.028)</td>
<td>−0.0263 (0.025)</td>
<td>0.0702* (0.027)</td>
<td></td>
</tr>
<tr>
<td>Links to trad. circ. schools</td>
<td>0.0062 (0.016)</td>
<td>0.0155 (0.028)</td>
<td>0.0022 (0.025)</td>
<td>0.0039 (0.027)</td>
<td></td>
</tr>
<tr>
<td>Come individually</td>
<td>0.0041 (0.016)</td>
<td>0.0037 (0.028)</td>
<td>−0.0091 (0.025)</td>
<td>0.0206 (0.027)</td>
<td></td>
</tr>
<tr>
<td>Staff are informal</td>
<td>0.0015 (0.016)</td>
<td>0.0258 (0.028)</td>
<td>−0.0169 (0.025)</td>
<td>−0.0012 (0.027)</td>
<td></td>
</tr>
</tbody>
</table>

a Standard errors are denoted in parentheses.

circ. = circumcision; trad. = traditional; *p ≤ 0.1, **p ≤ 0.01, ***p ≤ 0.001.
sons were not significant (p = 0.37), even when comparing mothers (representative of highest positive valuation of this attribute) and fathers (p = 0.16).

Perhaps predictably, sons (p = 0.01) and fathers (p = 0.03) strongly valued less pain associated with MC, but when compared with mothers, the differences between all three strata were not statistically significant (p = 0.73). On the other hand, mothers were most attuned to sons’ valuation of having a private waiting room (p = 0.004 and p = 0.04, respectively). Fathers valued a private waiting room less (p = 0.41), but this was not statistically different to mothers’ valuation (p = 0.14).

No statistical differences were identified between participants’ stratified valuations with regard to links to traditional circumcision schools (p = 0.92). Fathers, however, were the only group that found any value for this design feature (p = 0.57).

From a public health perspective, several service delivery design characteristics stood out in the results. Counseling on the risks and benefits of MC, for example, was most valued by sons (p = 0.01). Fathers (p = 0.91) and mothers (p = 0.63) valued this design characteristic to a lesser extent than sons, the difference almost reaching statistical significance (p = 0.09 and 0.16, respectively). Perhaps most telling when comparing the

<table>
<thead>
<tr>
<th>Design characteristics</th>
<th>F = M = S</th>
<th>F = S</th>
<th>S = M</th>
<th>M = F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow-up required</td>
<td>2.21 (0.11)</td>
<td>4.06 (0.04)</td>
<td>0.17 (0.68)</td>
<td>2.42 (0.12)</td>
</tr>
<tr>
<td>Lower infection rate</td>
<td>1.01 (0.37)</td>
<td>0.89 (0.35)</td>
<td>0.25 (0.52)</td>
<td>1.95 (0.16)</td>
</tr>
<tr>
<td>Pain for 1 day</td>
<td>0.31 (0.73)</td>
<td>&lt;0.01 (0.97)</td>
<td>0.50 (0.48)</td>
<td>0.42 (0.51)</td>
</tr>
<tr>
<td>Private waiting room</td>
<td>1.09 (0.34)</td>
<td>0.61 (0.44)</td>
<td>0.56 (0.45)</td>
<td>2.18 (0.14)</td>
</tr>
<tr>
<td>Risk/benefit counseling</td>
<td>1.66 (0.19)</td>
<td>2.79 (0.09)</td>
<td>1.99 (0.16)</td>
<td>0.07 (0.80)</td>
</tr>
<tr>
<td>Predominantly male staff</td>
<td>0.43 (0.65)</td>
<td>0.32 (0.57)</td>
<td>0.15 (0.70)</td>
<td>0.84 (0.36)</td>
</tr>
<tr>
<td>No booking ahead needed</td>
<td>0.63 (0.54)</td>
<td>1.15 (0.28)</td>
<td>0.06 (0.81)</td>
<td>0.65 (0.42)</td>
</tr>
<tr>
<td>HIV test required</td>
<td>3.45 (0.03)</td>
<td>1.50 (0.22)</td>
<td>6.69 &lt;0.01</td>
<td>1.79 (0.18)</td>
</tr>
<tr>
<td>Links to trad. circ. schools</td>
<td>0.07 (0.92)</td>
<td>0.13 (0.72)</td>
<td>&lt;0.01 (0.96)</td>
<td>0.09 (0.76)</td>
</tr>
<tr>
<td>Come individually</td>
<td>0.33 (0.72)</td>
<td>0.12 (0.73)</td>
<td>0.65 (0.42)</td>
<td>0.19 (0.65)</td>
</tr>
<tr>
<td>Staff are informal</td>
<td>0.68 (0.51)</td>
<td>1.34 (0.25)</td>
<td>0.18 (0.67)</td>
<td>0.50 (0.47)</td>
</tr>
</tbody>
</table>

a p-Values are in parentheses.

...
aggregate analysis with the stratified analysis, however, was the stratified valuation of requiring an HIV test at the visit. Although this characteristic was not even statistically significant at the aggregate level ($p = 0.21$), requiring an HIV test during MC service delivery provoked the strongest difference between strata ($p = 0.03$). Here, mothers positively valued that circumcision include an HIV test ($p = 0.01$), while fathers only marginally valued it ($p = 0.69$). Uncircumcised sons, by contrast, had a mild aversion to requiring an HIV test at circumcision ($p = 0.30$).

While it was not an objective of this analysis, we also explored (but do not report) differences stratified by race. Here we compared the preferences of Black, Coloured, and White families (without stratifying by family member). While having follow-up care remained the primary objective of all racial groups in aggregate, some other differences were detected. Whites did not value having a lower infection rate ($p = 0.92$), potentially because of a subjective belief that they would be less affected by such an infection. Blacks valued a private waiting room and male staff more than average, but valued benefit and risk counseling less ($p = 0.17$).

The strongest difference found was in the attribute of having informal staff ($p < 0.01$). While Coloured respondents strongly preferred having formal staff ($p = 0.02$), Black and White families tended to prefer informal staff, but these valuations were not significant ($p = 0.10$ and $p = 0.43$, respectively). The formality of the staff attribute highlights one of the problems in estimating the preferences of a heterogeneous population. In aggregate, the parameter estimate is very close to zero, but stratified analysis has identified groups that prefer either level.

**Discussion**

This is the first study that we are aware of assessing MC service design and its potential impact on sons’ and parents’ decisions to have a circumcision. Our data suggest the MC service design will impact upon demand for circumcision. Overall, we found that a follow-up visit, low infection rate, post-operative pain, and outside waiting were important characteristics that should be managed in the design and operation of mass circumcision services.

In general, the trends that emerged as most valued in the design of MC services were similar across all subsets of decision makers and income levels. Nevertheless, the variations that do appear in subset analyses are particularly significant in tailoring MC services to a target population. Other work also suggests that this patient-centered design of MC services is important. The Joint United Nations Programme on HIV/AIDS (UNAIDS) states that it is a government’s duty to ensure that health services provided are acceptable to the public. In terms of MC specifically, this implies that assessing the acceptability of MC is an important part of introducing or expanding the availability of services. Acceptability of the services to patients will be influenced by a range of factors, including how those services are delivered.

The study was potentially limited in three ways. First of all, the sampling method used for inclusion in the study could not be utilized for Whites. Instead, Whites were surveyed at a local shopping mall. Similar problems have been experienced in other household survey administration. Secondly, as with any survey that seeks to identify preferences, there may be issues of ‘hypothetical bias.’ In other words, there are concerns that preferences elicited by a survey may not reflect actual choices. However, it has been shown that preferences do guide choices, and have been identified as a good indicator of actual behavior. Finally, while our study has a relatively large sample size for a conjoint analysis application in medicine, we designed this study to look at only three strata and this limited our capacity to further disaggregate the data. Furthermore, underlying preference heterogeneity, even within groups, and the complexity of the choice task made it hard to identify differences between groups. The subsequent within and across respondent variation would imply that our tests would be biased towards the null (homogeneity). This said, it does provide for a rather robust test of differences, but at the cost of potentially missing some differences on the margin.
Conclusion

The conjoint analysis detailed here provides the important first step to introducing or expanding MC service delivery in South Africa. As many countries in Sub-Saharan Africa move forward in the development of national MC programs, analysis such as that presented here should be a part of developing policies. The preferences of patients themselves are critical in planning for and ensuring the success of such widespread interventions.

Acknowledgments

This study was funded by a grant from the President’s Emergency Plan for AIDS Relief (PEPFAR), through the US Agency for International Development (USAID) [award no. 674-A-00-05-00003-00]. Neil A. Martinson received support from a Fogarty International Center grant (grant no. U2RTW007370).

JB and NM were responsible for the qualitative research and survey instrument design. JB, FS, and SS did the statistical analysis. All authors were involved in manuscript preparation and reviewed the final manuscript. JB is the guarantor for the overall content of this article.

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Designing Family-Centered Male Circumcision Services


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