HIV testing preferences among pregnant women attending antenatal care and their male partners: a discrete choice experiment in Uganda

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HIV testing rates remain stubbornly low among men – a crucial target population for reaching the ambitious global and regional goals of the HIV programme. In an era of declining donor funding, identifying cost-effective strategies to increase testing rates amongst men remains paramount. Antenatal care is an effective entry-point for the delivery of HIV testing services for women, and partner testing presents an important opportunity to reach their male partners. We present the results of a discrete choice experiment in Uganda, examining preferences among 824 pregnant women and 896 male partners regarding service delivery characteristics of HIV testing. Both men and women preferred nurse administered testing to self-testing (OR = 0.835; p < 0.001), oral testing over a finger-prick test (OR = 1.176; p < 0.001) and testing with a partner over testing alone (OR = 1.230; p < 0.001). Men had a preference for testing at home compared to testing at a clinic (OR = 1.099; p = 0.024), but women were indifferent regarding the testing location. The cost of testing had the biggest effect on preferences. Free testing was preferred over a cost of US$2.90 (OR = 0.781; p < 0.001) or US$2.00 (OR = 0.670; p < 0.001). Offering an incentive of US$3.40 increased men’s preferences compared to a free test (OR = 1.168; p < 0.001), although this did not affect women’s preferences. Partner testing linked to antenatal care is a potential strategy to increase testing coverage among men, particularly given the preference for partner testing – provided costs to clients remain low. Future cost-effectiveness evaluations should investigate the economic impact of reaching men using these strategies.

Keywords: East Africa, randomized controlled trial, couples testing

Introduction

HIV testing rates among women in Uganda and other African countries are relatively high, partly due to near universal uptake of HIV testing during prenatal care (Government of Lesotho, 2013; Mumtaz, Merchant, & Levay, 2013; UNAIDS, 2018). However, male testing rates lag far behind (UNAIDS, 2018). Emerging evidence, from our studies and others, suggests that testing rates among male partners may significantly increase with the availability of HIV oral self-testing kits brought home from the clinic by their pregnant female partners both in Kenya (Gichangi et al., 2018; Masters et al., 2016) and Uganda (Korte et al., n.d.). The promising results of studies testing this delivery model have supported recent decisions by Ministries of Health in both Kenya and Uganda to incorporate HIV oral self-testing kits into their national HIV strategies.

As both Kenya and Uganda begin to roll out HIV oral self-testing, research is required to determine the effectiveness of this initiative aimed at increasing testing rates and attaining the UNAIDS target of ensuring that 90% of HIV-positive individuals are aware of their positive status. In addition, to further strengthen HIV testing initiatives, better information is needed to formulate and improve the most effective and efficient public health policies for HIV testing, including HIV self-testing.

In the current study we sought to address this gap in knowledge by conducting a discrete choice experiment (DCE), in which study participants were asked to make a series of choices to indicate which of two HIV testing scenarios they preferred. Each scenario was characterised by specific factors including cost, location, time required, needle stick vs oral test, and whether the test is administered by a nurse or self-administered. Using these questionnaire data, we sought to more explicitly examine the HIV testing preferences of women in antenatal care (ANC), and their male partners, with immediate implications for public health policy in Uganda.
Methods

Theoretical framework

The design and analysis of DCEs rely on two primary economic theories (Louviere, Hensher, & Swait, 2000). Lancaster’s theory of consumer choice states that individuals derive utility from the characteristics of goods or services, rather than from the good or service as a whole (Lancaster, 1966). The implication of this theory is that to understand preference structures, goods or services need to be broken down into their key characteristics (or attributes), so that the marginal utility derived from each characteristic can be estimated independently if all other characteristics were held constant. Random utility theory, which underpins the statistical analysis, states that total utility comprises a systematic component (the observable and measurable marginal utility derived from each attribute of the good or service moderated by the personal characteristics of the individuals making the choices) and a random component (unobservable or unobserved characteristics that contribute in a non-systematic way to utility, including measurement or specification error; Thurstone, 1927).

Under the assumption that consumers will make choices that maximise their total utility, this framework suggests that particular characteristics of HIV testing models are important in determining the total utility that clients derive when undergoing an HIV test. These testing characteristics ultimately drive the choices that consumers make about whether or not they test, how regularly they test, and under which conditions willingness to test may increase. Discrete choice experiments have previously been used to understand preferences regarding HIV testing service delivery models in a number of other settings (Strauss, George, Lansdell, et al., 2018; Strauss, George, & Rhodes, 2018), and have been shown to produce reliable predictions of health-related behaviour (Quaife et al., 2018).

Study context and sample size

This DCE was part of a randomised controlled trial (Korte et al., n.d.; Matovu et al., 2018) conducted in central Uganda among pregnant women and their primary male partners, to test whether providing HIV self-testing kits would increase HIV testing among the male partners. Pregnant female participants were recruited from three ANC clinics, and their male partners were recruited and followed separately. To meet eligibility criteria for the study, pregnant women attending ANC were required to be at least 14 years old, with a male partner at least 18 years old, whom the woman saw at least once a week. Since the primary study outcome was male partner HIV testing, women were eligible only if their male partner was either HIV-negative or had an unknown HIV status, and had not tested for HIV in the previous six months. We interviewed women and men separately at one month and three months follow-up, and the DCE was included in the questionnaire for the three-month visit.

A total of 1720 respondents completed the DCE, satisfying the minimum number of respondents required for statistical power in a DCE according to a commonly used rule of thumb:

\[ N \geq \frac{L}{S J} \]

where \( L \) is the maximum number of levels for any attribute (four in our study), \( S \) is the number of choices in each choice set (two), and \( J \) the number of choices presented to each participant (eight; Mele, 2008).

DCE attributes

DCE choices were designed to elicit preferences regarding attributes of testing within the control of service providers (Table 1). Two levels were included for the type of test offered (finger-prick blood test vs oral mouth swab), for the type of counselling (one-on-one counselling, either telephonic or in-person vs written counselling/guidance), who administers the test (nurse administered vs self-administered) and whether or not testing is performed with a partner/family member present (testing alone vs testing with a partner/family member present). Four levels were included for location (a clinic near home; a clinic away from home; at a place of work; at home), total time for testing (20 minutes; 40 minutes; 90 minutes; 3 hours) and cost (free; cost of 7,000 Ugandan shillings (~US$2.90); an incentive to test of 12,000 Ugandan shillings (~US$3.40))

To design the choice sets, we followed the method set out in Street, Burgess and Louviere (2005) for generating optimal designs according to the D-efficiency criteria and in line with the fundamental principles of efficient designs – orthogonality, level balance, minimum overlap and utility balance (Zwerina, Huber, & Kuhfeld, 1996). A fractional factorial design was used given the relatively large number of attributes and levels. We used a computer generated orthogonal main effects plan (OMEP) with 32 scenarios and included a blocking variable in the design to divide the choice sets into four questionnaire versions, so that each

Table 1: List of attributes and levels included in the DCE design

| Attributes          | Level 1 (Baseline)         | Level 2                     | Level 3                     | Level 4                     |
|---------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Type of test        | Finger prick blood test     | Oral mouth swab test        |                             |                             |
| Type of counselling | One-on-one counselling,     | Written counselling         |                             |                             |
|                     | either telephonic or in-person |                             |                             |                             |
| Who administers test? | Nurse administered        | Self-administered           |                             |                             |
| Partner/family support | Alone                   | With your partner/family     | present                     |                             |
| Location            | At a clinic near home       | At a clinic away from home   | At the company office       | At home                     |
| Time                | 90 minutes                  | 20 minutes                  | 40 minutes                  | 3 hours                     |
| Cost                | Free                        | You pay 7,000 shillings     | You pay 10,000 shillings   | We pay you 12,000 shillings |
participant would only need to make a choice from 8 of the 32 scenarios. Binary choice sets were constructed using the OMEP as the first alternative in each choice set (option A) and adding one level (cyclically) to generate the second alternative for each choice set (option B), with no opt-out option to maximise the amount of information on preference structures collected from each participant.

The design used generic labels, i.e. option A or option B, for each of the alternatives in the choice set (an unlabelled design), so that respondents had no additional information about the type of HIV test other than the different combinations of the levels in each alternative. For example, one choice was between a) in-person counselling, finger-prick, nurse-administered, no partner/family present, test at a clinic near home, testing takes 90 minutes, and testing is free, versus b) written counselling, oral test, self-administered, with partner/family present, test at a clinic away from home, testing takes 20 minutes, and testing costs you 7 000 shillings (US$2.00). Trained fieldworkers presented the choice sets to respondents on laminated cards, using words and pictures, in a one-on-one setting and using scripted instructions, containing detailed descriptions of the attributes and levels for consistency in the way respondents understood the task.

Analysis strategy and model estimation

Dummy coding was used for each level of every attribute. A baseline scenario was selected as a reference group for the analysis (Table 1). Conditional logit models were used to estimate parameters describing the strength, direction and statistical significance of associations between test attributes and the test chosen, and were estimated by:

$$P_{ij} = \frac{\exp(\beta X_{ij})}{\sum_{k} \exp(\beta X_{ik})}$$

for all alternatives K in the choice set where $P_{ij}$ is the probability of individual i choosing alternative j in each binary set of alternatives K, $\beta$ is a column vector of parameter estimates associated with $X_{ij}$, a row vector of the levels of the attributes in alternative j chosen by individual i, appropriate for analysis of data with a binary dependent variable (Haan, 2004). This model also allows estimates to be interpreted as odds ratios, allowing for easy comparison of preferences with the reference characteristic for each attribute.

To estimate differences in preference structures for different demographic and social characteristics, dummy variables were generated for sex, marital status, whether or not respondents were living with a partner, HIV testing history, previous experience of testing together with a partner, experience of violence, partner HIV status, and whether or not the respondents were in an age disparate relationship (a five year or more age difference between partners). First, we multiplied these dummy variables across the attributes and used conditional logit models to undertake interaction analyses. Where we found significant differences in preference structures, we then stratified the sample and ran independent conditional logit models on each stratification to determine how preferences diverged. Only models that identified differences in preference structures are presented in this article.

The conditional logit model is appropriate for modelling a binary choice DCE (Clark, Determann, Petrou, Moro, & de Bekker-Grob, 2014; de Bekker-Grob, Ryan, & Gerard, 2012; Ryan & Bernard, 2003; Strauss, George, & Rhodes, 2018) and is in line with assumptions about the experimental design of the study. Because both options in each choice set were unlabelled, the presence of a third option in any choice set would be unlikely to change the way respondents viewed the first two options in relation to each other. To test for violations of this assumption of the independence of irrelevant alternatives (IIA) (Louviere et al., 2000), we used a Hausman specification test, which returned a negative result, interpretable as strong evidence that the IIA holds (Hausman & McFadden, 1984). All analyses were conducted in Stata 15 using 95% confidence intervals to determine significance.

Ethics

Approval to conduct this study was obtained from Makerere University School of Public Health Higher Degrees Research and Ethics Committee, Uganda National Council for Science and Technology, and the Medical University of South Carolina Institutional Review Board. Study participants were reimbursed 5 000 Ugandan shillings (~US$1.40) to compensate for their time and transport. Women and their male partners were free to decline study participation, or decline to answer any part of the questionnaire, for any reason.

Results

A total of 824 women completed the questionnaire, and 896 male partners. These 1 720 participants with complete data were included in the DCE analysis. Table 2 shows the demographic breakdown of the respondents.

| Table 2: Selected sociodemographic characteristics of respondents |
|---------------------------------------------------------------|
| Characteristic | n  | %    |
|----------------|----|------|
| Sex            |    |      |
| Female         | 824| 47.91|
| Male           | 896| 52.09|
| Marital status*|    |      |
| Married        | 265| 15.41|
| Cohabiting     | 1 389| 80.76|
| Never married  | 46 | 2.67 |
| Divorced/separated | 4 | 0.23 |
| Ever tested for HIV**|   |     |
| Yes            | 1 543| 89.71|
| No             | 176 | 10.23|
| Ever tested for HIV with a partner*|   |     |
| Yes            | 1 275| 74.13|
| No             | 429 | 24.94|
| Partner HIV status|   |     |
| HIV-positive   | 113 | 6.57 |
| HIV-negative   | 1 610| 93.60|
| In an age disparate relationship |    |      |
| Yes            | 615 | 35.76|
| No             | 1 105| 64.24|

*Data missing for 16 respondents; **Data missing for 1 participant
Main effects results

Table 3 shows the results of the main effects analysis, with odds ratios indicating the odds that a participant would choose an alternative in a choice set with any particular level against the baseline characteristic of that attribute (shown in brackets) if all other attributes were held constant.

Overall, respondents in this study had a preference for oral testing over finger prick testing (OR = 1.176; \( p < 0.001 \)) but were found to prefer a nurse administered test over a self-administered test (OR = 0.835; \( p < 0.001 \)). There was a small but significant preference among respondents for one-on-one counselling over written counselling (OR = 0.960; \( p = 0.018 \)). Respondents in this study preferred to test in the presence of a partner or a family member rather than to test alone (OR = 1.230; \( p < 0.001 \)) – the largest positive effect of any level change on the odds of a participant choosing one alternative over another. Respondents were not found to have strong preferences regarding the location of testing, with no significant difference between testing at a clinic near home or at a place of work, a small preference against testing at a clinic away from home versus testing at a clinic near their home (OR = 0.923; \( p = 0.008 \)), and a small preference for home testing over testing at a clinic near their home (OR = 1.067; \( p = 0.032 \)). Overall, participants preferred a 90-minute testing period over a 3-hour process, including waiting times, counselling, and conducting the test and receiving the results (OR = 0.846; \( p < 0.001 \)). There was a very small but somewhat significant preference for a 90-minute testing process over a 40-minute process (OR = 0.931; \( p = 0.04 \)), and overall, participants were indifferent between a 20-minute and a 90-minute testing process. Participants preferred free testing over having to pay a fee of 7,000 Ugandan shillings (~US$2.00; OR = 0.781; \( p < 0.001 \)) or a fee of 10,000 shillings (~US$2.90; OR = 0.67; \( p < 0.001 \)). Offering an incentive of 12,000 shillings (~US$3.40) did not significantly affect preferences.

Interaction effects and stratified analysis
To assess heterogeneity of HIV testing preferences, we fit several interaction models with a priori potential effect modifiers. In these interaction models, we found that our preference results were largely consistent across subgroups, with no significant differences in preferences according to marital status, cohabitation status, HIV serodiscordant status, or by age disparity within the couple. Levels of reported violence were very low in this sample and interaction analysis using violence measures did not reveal any significant differences in preference structures depending on experience of violence and attitudes towards violence among participants. We found a minor (but significant) strengthening of the preference for nurse-administered testing versus self-testing among those who had previously tested with a partner, versus those who had not. Moreover, interactions for sex (women = 0; men = 1) and overall HIV testing history (never tested for HIV = 0; ever tested for HIV = 1) indicated some divergence in preference structures for specific attribute levels. Table 4 summarises the results of the sex and HIV testing history interaction models. Rather than stratum-specific odds ratios (i.e. OR for women and the OR for men), in Table 4 we show odds ratios for the reference category (e.g. women) in the top half of the table, and the odds ratio comparing the two subgroups (e.g. men versus women) in the bottom half of the table.

Women and men in this study both had a highly significant preference for oral testing over finger prick testing (OR = 1.229; \( p < 0.001 \) and \( OR = 1.134; p < 0.001 \)) (Figure 1), although the interaction model showed that this preference was significantly weaker in men than in women (OR = 0.923; \( p = 0.023 \); Table 4). The results of the stratified analysis (Figure 1) also indicated that both women and men were significantly less likely to prefer self-testing in comparison to nurse-administered testing (OR = 0.832; \( p < 0.001 \) and OR = 0.835; \( p < 0.001 \)), respectively. While women had no significant preferences regarding location, men were found to be significantly less likely than women to choose testing at a clinic away from home compared to testing at a clinic close to home (OR = 0.811; \( p = 0.001 \)). The interaction analysis revealed that preferences among men and women diverged regarding total time for testing services. The stratified analysis suggested that while men were indifferent between a total time for testing and

Table 3: Main effects results

| Attribute                        | Level                                           | Odds ratio | p-value | 95% confidence interval |
|----------------------------------|-------------------------------------------------|------------|---------|-------------------------|
| Counselling                      | Written counselling (vs in-person/telephonic)** | 0.960      | 0.018   | 0.927 0.993             |
| Type of test                     | Oral testing (vs finger prick)**                | 1.176      | <0.001  | 1.136 1.217             |
| Who conducts the test            | Self-testing (vs nurse testing)**               | 0.835      | <0.001  | 0.807 0.865             |
| Support                          | With partner/family (vs alone)**                | 1.230      | <0.001  | 1.188 1.273             |
| Location                         | Clinic away from home (vs clinic near home)**   | 0.923      | 0.008   | 0.870 0.980             |
|                                 | Office (vs clinic near home)**                  | 0.938      | 0.068   | 0.876 1.005             |
|                                 | Home (vs clinic near home)**                    | 1.067      | 0.032   | 1.005 1.132             |
| Time                             | 20 min (vs 90 min)                             | 0.992      | 0.787   | 0.934 1.053             |
|                                 | 40 min (vs 90 min)**                           | 0.931      | 0.040   | 0.869 0.997             |
|                                 | 3 hours (vs 90 min)**                          | 0.846      | <0.001  | 0.797 0.898             |
| Cost                             | You pay 7,000 shillings (vs free)**             | 0.781      | <0.001  | 0.736 0.829             |
|                                 | You pay 10,000 shillings (vs free)**           | 0.670      | <0.001  | 0.626 0.718             |
|                                 | You receive 12,000 shillings (vs free)**       | 1.058      | 0.062   | 0.997 1.122             |
| Number of observations           | 10,706                                         |            |         |                         |
| Number of choice sets            | 5,353                                          |            |         |                         |
| Log-likelihood                   | −9.192.1368                                    |            |         |                         |

***99% level of significance; **95% level of significance
participants who had tested previously being significantly more likely than those who had never tested to choose an oral test over a finger prick test (OR = 1.231; p < 0.001) and to choose to test at a clinic away from home compared to a clinic close to home (OR = 1.287; p = 0.013). While participants who had tested previously had no significant differences in preferences regarding location, those who had not tested previously were significantly more likely to choose a testing service close to home than testing away from home (OR = 0.736; p = 0.001).

**Discussion**

In this study, we sought to determine HIV testing preferences among pregnant women in Uganda, and their male partners. Overall, our results show moderately strong and significant preferences for HIV testing with a partner or family member versus testing alone, nurse-administered test versus self-testing, and free testing services. We also observed small but significant preferences for testing at home, using an oral test over a finger prick, receiving in-person or telephonic counselling versus written counselling, and having the testing procedure take a total of 90 minutes or less. Findings varied by sex, and whether the participant had tested previously for HIV. Notably, women had a strong preference for a free test, and were 43% less likely to choose a test costing 10 000 shillings (~US$29.90) versus a free test; in contrast, men were 35% more likely than women to choose a test costing more than 10 000 shillings.

**Table 4: Conditional logit models with interactions for sex and HIV testing history**

| Attribute levels (reference category) | Sex interaction | HIV testing history interaction |
|--------------------------------------|------------------|---------------------------------|
|                                      | Odds ratio 95% CI | p-value | Odds ratio 95% CI | p-value |
| Written counselling (in-person/telephonic) | 0.957 0.911–1.006 0.084 | 0.940 0.843–1.047 0.262 |
| Oral testing (finger prick) | 1.229*** 1.169–1.291 <0.001 | 0.974 0.874–1.085 0.635 |
| Self-testing (nurse testing) | 0.832*** 0.791–0.874 <0.001 | 0.841*** 0.755–0.937 0.002 |
| With partner/family (alone) | 1.250*** 1.189–1.314 <0.001 | 1.239*** 1.112–1.380 <0.001 |
| Clinic away from home (clinic near home) | 1.030 0.944–1.123 0.505 | 0.736*** 0.610–0.889 0.001 |
| Office (clinic near home) | 0.992 0.898–1.096 0.880 | 0.901 0.725–1.120 0.347 |
| Home (clinic near home) | 1.029 0.944–1.121 0.520 | 1.149 0.954–1.385 0.143 |
| 20 min (90 min) | 0.911** 0.835–0.993 0.035 | 0.997 0.825–1.205 0.976 |
| 40 min (90 min) | 0.905** 0.819–1.000 0.049 | 0.875 0.705–1.087 0.227 |
| 3 hours (90 min) | 0.859*** 0.788–0.937 0.001 | 0.921 0.764–1.111 0.390 |
| You pay 7 000 shillings (free) | 0.722*** 0.663–0.787 <0.001 | 0.693*** 0.574–0.837 <0.001 |
| You pay 10 000 shillings (free) | 0.571*** 0.517–0.631 <0.001 | 0.605*** 0.487–0.751 <0.001 |
| You receive 12 000 shillings (free) | 0.946 0.868–1.030 0.202 | 1.070 0.890–1.287 0.473 |
| Interaction terms |                                      |        |
| Written counselling (in-person/telephonic) | 1.005 0.938–1.077 0.881 | 1.023 0.913–1.147 0.696 |
| Oral testing (finger prick) | 0.923*** 0.862–0.989 0.023 | 1.231*** 1.098–1.379 <0.001 |
| Self-testing (nurse testing) | 1.004 0.937–1.075 0.918 | 0.992 0.885–1.112 0.889 |
| With partner/family (alone) | 0.970 0.906–1.039 0.386 | 0.993 0.886–1.113 0.899 |
| Clinic away from home (clinic near home) | 0.811*** 0.720–0.914 0.001 | 1.287*** 1.055–1.570 0.013 |
| Office (clinic near home) | 0.895 0.780–1.027 0.113 | 1.046 0.832–1.315 0.701 |
| Home (clinic near home) | 1.068 0.949–1.203 0.275 | 0.920 0.756–1.200 0.408 |
| 20 min (90 min) | 1.178*** 1.045–1.327 0.007 | 0.995 0.814–1.215 0.957 |
| 40 min (90 min) | 1.058 0.922–1.214 0.424 | 1.071 0.853–1.346 0.554 |
| 3 hours (90 min) | 0.970 0.861–1.093 0.620 | 0.910 0.747–1.108 0.347 |
| You pay 7 000 shillings (free) | 1.158** 1.029–1.304 0.015 | 1.141 0.935–1.391 0.194 |
| You pay 10 000 shillings (free) | 1.353*** 1.179–1.553 <0.001 | 1.120 0.891–1.407 0.331 |
| You receive 12 000 shillings (free) | 1.235*** 1.097–1.390 <0.001 | 0.987 0.813–1.199 0.898 |

CI = confidence interval; Reference category attribute levels are shown in brackets

***highly significant (p < 0.01); **significant (p < 0.05)

counselling of 20 minutes, 40 minutes or 90 minutes, women most preferred a total time of 90 minutes compared to 20 minutes (OR = 0.911; p = 0.035) or 40 minutes (OR = 0.905; p = 0.049). Both women and men preferred a counselling and testing service taking 90 minutes compared to 3 hours (OR = 0.859; p = 0.001 and OR = 0.834; p < 0.001), respectively. Finally, the sex interaction model and sex stratified models show that while both men and women prefer free testing over a test costing 7 000 or 10 000 shillings, men were less averse to making these payments than women (7 000 shillings (OR = 1.158; p = 0.015) and 10 000 shillings (OR = 1.353; p < 0.001), respectively. While offering an incentive for testing had no significant effect on women’s preferences, men were significantly more likely than women to choose a test with a monetary incentive of 12 000 shillings compared to a free test (OR = 1.235; p < 0.001). Importantly, both women and men had a significant preference for testing in the presence of their partner or family, compared to testing alone (OR = 1.250; p < 0.001 and OR = 1.213; p < 0.001, respectively); and preferred nurse-administered testing over self-testing (OR = 0.832; p < 0.001 and OR = 0.835; p < 0.001), respectively.

In terms of HIV testing history, preferences were mostly well aligned among people who had tested previously with those who had not. However, the interaction analysis suggests that preferences diverge in two attributes, with participants who had tested previously being significantly more likely to choose a test costing 7 000 or 10 000 shillings (~US$29.90) versus a free test; in contrast, men were 35% more likely than women to choose a test costing more than 10 000 shillings.
10 000 shillings, indicating little preference between a free test vs one costing a small amount of money. In addition, we found that women were 23% more likely to choose oral testing versus a finger prick, but men were 8% less likely than women to prefer oral testing.

Women in our study indicated little preference between testing at home, at their workplace, at a clinic near home, or at a clinic away from home. In contrast, we found that men were 19% less likely to choose to test at a clinic away from home, suggesting that for men, reducing travel time and opportunity costs were an important consideration when choosing to test. These findings therefore partially echo results from other studies revealing that participants perceive saving time to be one benefit of HIV self-testing (Kelvin et al., 2016), with men in particular preferring self-testing, perhaps partially due to the perceived time-saving characteristic of this testing modality (Choko et al., 2017; Harichund, Moshabela, Kunene, & Abdool Karim, 2019). However, our findings also demonstrated that both men and women preferred a nurse-administered test, suggesting that the DCE design allowed us to separate this testing characteristic from the other characteristics usually associated with a nurse-administered test, including travel and waiting time at the clinic. Regarding the time required to test for HIV, we found that men were significantly more likely than women to prefer the shortest testing period (20 minutes) offered in the DCE, underscoring the greater value men in our study placed on a shorter testing process.

We found that study participants who had never tested for HIV indicated a clear preference for testing in a convenient location, with 26% lower odds of choosing a testing scenario at a clinic away from home. In contrast, those who had tested before showed little overall preference for any testing location. These results may partially reflect the inherent differences between those in our study who had tested before, compared to the minority who had never tested. Individuals who have never tested have by definition found substantial barriers to testing, which may include factors related to the convenience of accessing testing services. These findings underscore the need for strategies to increase the perceived convenience and importance of HIV testing for those who have not tested previously.

Interestingly, we found that men and women were both about 17% more likely to choose a scenario with nurse-administered testing versus self-testing. These results are not discordant with the findings from a previous DCE study among long distance truck drivers in Kenya (Strauss, George, Lansdell, et al., 2018; Strauss, George, Mantell, et al., 2018), in which there was a slight (but not statistically significant) preference for nurse-administered testing. However, our results stand in contrast to a number of previously published studies’ findings that self-testing was
broadly preferred to clinic-based testing (Carballo-Díéguez, Frasca, Baian, Ibitoye, & Dolezal, 2012; Choko et al., 2015; Gaydos et al., 2011, 2013; Kalibala et al., 2014; Kurth et al., 2016; Lippman et al., 2016; Marley et al., 2014; Nour et al., 2012; Pant Pai et al., 2014; Peck et al., 2014; Stevens, Vrana, Dlin, & Korte, 2018). This apparent contradiction may reflect the fact that by using the DCE, we were able to separate this attribute (self-testing versus nurse-administered testing) from other attributes that in practice are usually grouped together. For example, nurse-administered testing in practice is often associated with needing to travel to a clinic (contributing to time required, opportunity costs, and cost of obtaining testing services), and needing to wait at the clinic for testing services (contributing to time required and opportunity costs). Through the DCE design, therefore, we were able to establish that, all things being equal, participants did prefer nurse-administered testing. More research will be required to explore which specific components or characteristics of nurse-administered testing appeal to individuals; however, this preference could reflect a lack of self-efficacy for self-testing, or could be related to a desire for pre- and post-test counselling. Previous research has found that study participants thought counselling was necessary, even when conducting self-testing (Burke et al., 2017; Choko et al., 2015; Figueroa, Johnson, Verster, & Baggaley, 2015; Gumedeh & Sibiyi, 2018; Harichund et al., 2019; Kelvin et al., 2016; Lee et al., 2007; Ng et al., 2012; Stevens et al., 2018); however, in this study we did not observe any preference between written versus in-person or telephonic counselling. These finding have clear relevance for public health policy and strategies for the effective design of HIV testing programs in Uganda.

We found that among the relatively small group of participants who had not tested before, there was no clear preference for an oral versus a finger prick test. However, among the much larger group of participants who had previously tested for HIV, participants indicated a 23% higher odds of choosing an oral test. These results stand in contrast to the results of DCE work in Kenya, which found no preference between oral or finger prick tests among individuals who had tested before, but a clear preference for the oral test among those who had never tested (Strauss, George, Lansdell, et al., 2018). Furthermore, in previous DCE work in Kenya, situated in a randomised trial in which participants were offered supervised oral self-testing or nurse-administered blood-based testing (Kelvin et al., 2018a, 2018b), we found that participants opting to self-test indicated a preference for an oral test in the DCE, while participants opting for nurse-administered testing indicated a preference for a blood-based test (Strauss, George, Mantell, et al., 2018). The oral test currently has a higher cost than the rapid blood-based test, both on the commercial market and in subsidised settings. Therefore the apparent broad-based acceptability of the oral test, and the possible preference for it among those who have not tested before and/or those who prefer to self-test, must be weighed against the increased cost of the oral kit versus a standard blood-based kit.

A strength of this study was our large sample size, with 824 pregnant women and 896 male partners completing the DCE questionnaire items. Having statistical power allowed us to increase precision and demonstrate statistically significant preferences, including among subgroups, even in some cases where the preferences and subgroup differences were relatively small. We believe that appropriate interpretation of these results must therefore consider both the size of the effect (i.e. the strength of the preference) as well as the statistical significance. Our strongest main effects revealed that participants were 33% less likely to prefer paying 10,000 shillings (~US$2.90) versus having a free test, and 17% less likely to prefer self-testing versus nurse-administered testing. Many findings were more subtle than this, but still significant, with participants being 4% less likely to prefer written counselling vs in-person/telephonic counselling, and 7% more likely to prefer testing at home vs a clinic near home. The relatively weak or moderate preferences for some attributes in our study underscore the broad acceptability of different HIV testing modalities. Nevertheless, better understanding of subgroup preferences can inform the development of public health policies and strategies aimed at optimising HIV testing uptake.

Conclusion

Our findings among pregnant women and their male partners in Uganda provide valuable evidence around HIV testing preferences, demonstrating statistically significant overall preferences for an oral over a finger prick test, and a nurse-administered test over a self-test. We do not, however, interpret our finding of a preference for a nurse-administered test as running counter to the results of previous studies demonstrating high acceptability of HIV oral self-testing (Burke et al., 2017; Choko et al., 2017; Figueroa et al., 2015; Gumedeh & Sibiyi, 2018; Harichund et al., 2019; Mugo et al., 2017; Stevens et al., 2018). Indeed, in the intervention arm of our Uganda study, participants did demonstrate a high acceptability of HIV oral self-testing, with 93.5% of women passing the kit to their male partners, overall 77.2% of male partners testing for HIV, and 81.5% of these men choosing to test via the oral self-testing kit (Korte et al., n.d.). Our results therefore show that both nurse-administered testing and self-testing are broadly acceptable, but that given the choice, and all other factors being equal, our participants on average were more likely to prefer a nurse-administered test. However, we did not find any statistically significant preference for in-person or telephonic counselling rather than written counselling. Our findings therefore suggest that while many individuals may prefer testing for HIV using an oral rather than a blood-based test, they do not have a strong preference between testing at home versus at a clinic, while there is a preference for a nurse to administer the test. This preference, while statistically significant, showed that participants were only about 17% less likely to choose a testing scenario involving self-testing versus a scenario involving a nurse-administered test. The strongest driver of preferences in our study was cost, with men revealing 23% lower odds, and women 43% lower odds, of selecting a testing option costing 10,000 Ugandan shillings (~US$2.90) versus a free test.

Overall, the moderately strong preferences that we observed in this study suggest that many different scenarios were broadly acceptable to study participants. Furthermore,
it seems certain, given individual variation, that some participants may have indeed harboured a moderate or strong preference for self-testing versus nurse-administered testing. We believe that in order to achieve the first "90" goal for HIV testing, countries must implement multi-pronged strategies to allow tailored approaches to different individuals who may have different motivations and barriers to HIV testing. As we strive to combat the HIV/AIDS epidemic, an elucidation of the HIV testing preferences of individuals will allow for the continued development and refinement of public health strategies and policies aimed at optimising utilisation of HIV testing services.

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