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Periconception HIV risk behavior among men and women reporting HIV-serodiscordant partners in KwaZulu-Natal, South Africa

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Abstract

HIV-infected men and women who choose to conceive risk infecting their partners. To inform safer conception programs we surveyed HIV risk behavior prior to recent pregnancy amongst South African, HIV-infected women (209) and men (82) recruited from antenatal and antiretroviral clinics, respectively, and reporting an uninfected or unknown-HIV-serostatus pregnancy partner. All participants knew their HIV-positive serostatus prior to the referent pregnancy.

Only 11% of women and 5% of men had planned the pregnancy; 40% of women and 27% of men reported serostatus disclosure to their partner before conception. Knowledge of safer conception strategies was low. Around two-thirds reported consistent condom use, 41% of women and 88% of men reported antiretroviral therapy, and a third of women reported male partner circumcision prior

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to the referent pregnancy. Seven women (3%) and two men (2%) reported limiting sex without condoms to peak fertility. None reported sperm washing or manual insemination. Safer conception behaviors including HIV-serostatus disclosure, condom use, and ART at the time of conception were not associated with desired pregnancy.

In light of low pregnancy planning and HIV-serostatus disclosure, interventions to improve understandings of serodiscordance and motivate mutual HIV-serostatus disclosure and pregnancy planning are necessary first steps before couples or individuals can implement specific safer conception strategies.

Introduction

Many South African men and women living with HIV want to have children (1–6). The contribution of intended conception to incident HIV infection is likely significant given the high prevalence of stable, heterosexual HIV-serodiscordant couples (1,7–14) and an absence of programs that address periconception transmission.

Several HIV-risk reduction strategies are available for HIV-serodiscordant couples who choose to conceive. Antiretroviral therapy (ART) for the HIV-infected partner regardless of CD4 cell count or clinical stage has been shown to reduce the risk of sexual transmission by as much as 96% (15,16). Antiretroviral pre-exposure prophylaxis (PrEP) for the uninfected partner (17–21) reduced HIV acquisition risk by as much as 90% within HIV-serodiscordant couples when adherence was high (22). Limiting sex without condoms to peak fertility may reduce the risk of transmission by reducing the number of exposures required for conception (23–26). In addition, manual insemination (e.g. insemination without sex without condoms) and/or medical male circumcision (MMC) may reduce periconception HIV transmission risk for female-infected couples (27–31). Sperm processing for male-infected serodiscordant couples where spermatozoa (which do not harbor HIV) are separated from the remainder of the seminal fluid and the woman is impregnated via in vitro fertilization or intracytoplasmic sperm injection is becoming standard-of-care in higher-income countries, yet costs and limited availability make this inaccessible for most (32–35). South Africa's national clinical guidelines on fertility planning recommend these risk-reduction strategies (except for PrEP, which is not yet available in the public sector) for serodiscordant couples who want to conceive their own children (36,37). Recent data suggest that these strategies are, however, not widely recommended by South African providers (38) but uptake was high in an implementation project (39).

In our formative qualitative work with HIV-infected individuals reporting uninfected or unknown-serostatus partners in KwaZulu-Natal, South Africa, men and women reported desires to have children, but did not receive safer conception advice, and risked HIV transmission in order to conceive (4,40). Furthermore a spectrum of pregnancy planning was observed, from explicitly planned to explicitly unintended, with many narratives falling somewhere in between these extremes (41). These data informed a conceptual framework for considering safer conception behavior for HIV-serodiscordant couples (42). We report here on a survey subsequently conducted to quantify periconception risk behavior among a larger sample of individual men and women living with HIV and reporting serodiscordant

partners, in order to identify the level of demand and key points of intervention for safer conception programs. To our knowledge, this is the first study to quantify risk behavior for HIV-affected couples during the periconception period.

Methods

Study setting and participant recruitment

Participants were recruited from antenatal care (ANC) or ART clinics at a large, public sector hospital in an urban township outside of Durban, South Africa. ANC clinic HIV prevalence is estimated at 38% for this district within the province of KwaZulu-Natal (43). Women were eligible if they reported HIV-positive serostatus, age 18-45 years and current pregnancy or pregnancy within the past year with a known partner with negative or unknown serostatus. Men were eligible if they were partnered with an enrolled woman, or reported HIV-positive serostatus, age 18 years and over, and pregnancy in the last 3-years of a seronegative or unknown serostatus partner. Due to low reporting of partner pregnancy, timing of partner pregnancy was extended to 3 years for men. To meet eligibility, both men and women must have known their HIV-positive serostatus prior to the referent pregnancy. All eligible participants spoke fluent English or isiZulu, were interested in the study, and provided informed consent. Although we attempted to recruit HIV-negative participants with known HIV-positive partners, we identified only 5 men and 35 women who met these criteria. Due to this small sample, analyses presented here are limited to HIV-positive individuals with partners whose serostatus was reported as negative or unknown. Because only one woman screened referred her male partner, almost all men were recruited from an ART clinic site. Notably, all serostatus data (participant and pregnancy partner) are based on study participant report.

Instruments and procedures

Between May 2011 and June 2012, study participants completed a face-to-face structured interview in a private setting with a research assistant fluent in English and isiZulu. Questionnaire items to address individual determinants of safer conception behavior included sociodemographic variables, HIV history, reproductive history, and HIV knowledge. In order to assess couple-level determinants of safer conception behavior, we administered a measure of sexual relationship power within intimate relationships with decision-making dominance (7 items) and relationship control (15 items) subscales (sexual relationship power scale (SRPS)) (44), and assessed partnership characteristics.

Periconception planning behaviors were defined based on our conceptual framework for safer conception behavior (42) and assessed for the referent pregnancy. We assessed communication with the pregnancy partner about having children and HIV; discussions with health care providers about safer conception; and personal and partner fertility desires and intentions at the time of conception (45,46).

Safer conception behaviors were explored by asking participants to reflect back to their HIV transmission risk behaviors *“before you/your partner became pregnant.”* Most safer conception recommendations are directed towards mutually-disclosed serodiscordant

couples. We assessed HIV-serostatus disclosure as a safer conception behavior given that this is a necessary first step to implementing most safer conception strategies and has been associated with reductions in HIV transmission (47,48). Direct questions were asked about HIV serostatus disclosure to pregnancy partner, knowledge of pregnancy partner HIV serostatus, condom use, MMC, limiting sex without condoms to peak fertility, ART use by the infected partner, sperm washing, and manual insemination. If the participant reported an unknown serostatus partner on the screening questionnaire, but an HIV-positive or HIV-negative partner in the full questionnaire, research assistants attempted to resolve any discrepancies. If this was not resolved during the survey administration, the full questionnaire data were accepted. HIV-serostatus disclosure data reported here are from the full questionnaire, not the screening data form.

Knowledge of HIV transmission risk and risk reduction in the context of having children was assessed by asking participants to answer true or false in response to ten statements developed for this survey. These covered prevention of mother to child transmission, HIV prevention strategies for serodiscordant couples, and HIV prevention strategies specific to safer conception. Items were developed based on formative work with a similar population. Items were pilot tested with local men and women of reproductive age irrespective of HIV-serostatus or partner serostatus in order to insure clarity, relevance, comprehension.

Completion of the interview took just under an hour and participants were reimbursed for their time with 70 South African Rand (approximately US\$7 at that time). Enrollment duplication was avoided by collecting unique South African identity numbers and deleting data from repeated questionnaires (n=1).

Analysis

We used descriptive statistics to summarize baseline demographics, partnership characteristics, and proportion of men and women reporting periconception planning and safer conception behaviors.

Multivariate logistic regression was used to evaluate factors associated with each of five safer conception behaviors reported by at least 10% of participants, namely disclosure of HIV serostatus to partner, knowledge of partner HIV serostatus, ART use, condom use most or all of the time, and MMC for female-infected couples. The remaining safer conception behaviors in our conceptual framework such as sperm washing, timing sex to peak fertility, and manual insemination were not reported or reported by too few participants to identify associations. Because the various safer conception behaviors were not independent (e.g. someone who disclosed HIV serostatus to partner was more likely to use condoms), we could not create a simple safer conception score and evaluate the factors associated with carrying out multiple safer conception behaviors. Therefore, we looked at factors associated with each safer conception behavior.

We evaluated the unadjusted relationship between the covariates of interest including individual factors (age, education, income, number of living children, desire for children, years since HIV diagnosis, HIV knowledge score, safer conception knowledge score) and dyadic factors (partnership type, sexual relationship power scale) with each safer conception

behavior. Analyses appropriately accounted for the nested outcomes per individual using multivariate logistic regression with estimation via generalized estimating equations. Since the two HIV serostatus disclosure variables (disclosure of HIV serostatus to partner, knowledge of partner HIV serostatus) had effect sizes of similar magnitude for HIV-infected women (no evidence of heterogeneity) we evaluated covariate effects pooled across the HIV-serostatus disclosure outcomes. For the other outcomes for HIV-infected women and all outcomes for HIV-infected men, directions of effect were variable. Factors significant at a p -value $< .05$ were included in adjusted models. Analyses were completed using SAS 9.3 (SAS Institute, Cary, NC).

Ethics

Ethics approvals were obtained from the Human Research Ethics Committee at the University of the Witwatersrand (Johannesburg, South Africa) and the Institutional Review Board at Partners Healthcare (Boston, USA). Permissions to conduct the research were also obtained from the district, provincial and study site authorities.

Results

1. Enrollment

Of 2620 women and 1166 men screened for eligibility, we recruited 209 HIV-positive women and 83 HIV-positive men. Screening data are reported elsewhere (49).

2. Demographics and partnership characteristics

Demographic data are shown in Table 1. Median age of women was 29 years (IQR 25, 33), 86 (41%) had completed grade 12 or beyond, and 56 (27%) were employed (formal or informal). Median number of living children was 1 (IQR 1,2) and years since HIV diagnosis was 3 (IQR 1,5). 159 women (76%) reported that the father of the referent pregnancy was a main partner, 161 (77%) reported that the relationship was ongoing, and 168 (80%) reported that their partner had unknown HIV-serostatus. All but one woman was pregnant at the time of the interview.

Men had a median age of 34 years (IQR 31,37), 55 (67%) had completed grade 12 or above, and 61 (74%) were employed. Median number of living children was 2 (IQR 2,3) and years since HIV diagnosis was 4 (IQR 2,6). 53 men (65%) reported that the pregnancy partner was a casual partner, 75 (91%) reported that the relationship was ongoing, and 57 (70%) reported that their partner had unknown HIV-serostatus. 57% reported a current partner pregnancy. Among those who did not report a current partner pregnancy, the median age of the youngest child was 1 (IQR 0.6-2) years.

3. Safer conception behavior: periconception planning (individual and couple determinants)

Among women, 24 (11%) reported planning the referent pregnancy whereas 67 (32%) reported wanting to be pregnant (the pregnancy was unintended yet desired once confirmed). 108 women (52%) reported that her partner had wanted her to be pregnant. 126 women

(60%) discussed having children with her partner sometimes or often whereas 116 (56%) discussed HIV prevention with the pregnancy partner.

Among men, pregnancy planning was also rare ($n=4$, 5%) whereas 20 (24%) reported wanting the referent pregnancy. Few men ($n=9$, 11%) reported that their partner wanted the pregnancy. Men were more likely to discuss having children with pregnancy partner ($n=42$, 51%) than to have a discussion with pregnancy partner about HIV ($n=29$, 35%).

Only 45 women (22%) and 10 men (12%) reported having ever discussed having children with a health care provider (Figure 1).

4. Safer conception behavior: HIV transmission risk behavior

Disclosure of HIV serostatus to the serodiscordant pregnancy partner prior to conception was reported by 83 women (40%) and 22 men (27%). 20% of women ($n = 41$) and 30% of men ($n = 25$) reported knowing their partner's HIV serostatus. 41% of women ($n = 86$) and 88% of men ($n = 72$) were on ART prior to conception (men were recruited from an ART clinic). 59% of women ($n = 124$) and 65% of men ($n=53$) reported condom use most or all of the time prior to pregnancy. 46% of men ($n = 38$) and 31% of women ($n= 65$) reported that they or their partner were circumcised (Figure 2). Seven women (3%) and 2 men (2%) reported limiting sex without condoms to the period of peak fertility. No participants reported additional safer conception strategies, such as manual insemination, sperm washing, processing, or any other assisted reproductive technology.

5. Safer conception knowledge and understandings

In terms of HIV prevention strategies for serodiscordant couples (for safer conception or otherwise), over two thirds of women and men answered items about the protection offered to men by MMC correctly, however 47% of women ($n=98$) answered incorrectly that a woman would be fully protected from HIV if her male partner were circumcised. Around one third of women and men answered an item about ART as prevention correctly. Most men answered incorrectly about the timing of peak fertility, less than half the men and women answered correctly about manual insemination and few answered correctly about sperm washing. Notably, 36% of women ($n=75$) and 43% of men ($n=35$) thought that a serodiscordant test result between sexual partners was a mistake, which has implications for motivations to implement any HIV transmission risk reduction strategies (Figure 3).

6. Factors associated with safer conception behaviors

Among women, having a main versus casual partner was associated with 2.88 greater odds of disclosing to their partner (95% CI 1.10-7.53) in adjusted models. Older age (aOR 1.08, 95% CI 1.02-1.14) and more time since HIV diagnosis (aOR 1.13, 95% CI 1.01-1.26) were associated with increased likelihood of ART use. More time since HIV diagnosis was associated with a reduced odds of consistent condom use during sex (0.88 (0.79, 0.98), $p = .018$). No associations with male partner circumcision were detected (Table 2).

Among men, having a main versus casual partner type resulted in 19 times greater odds of disclosure to partner (95% CI 4.28-80.67) and 11 times greater odds of knowing the

partner's HIV-serostatus (95% CI 2.48- 51.83) in adjusted models. Higher safer conception knowledge was associated with increased odds of knowing partner's serostatus for men (aOR 1.63, 95% CI 1.11-2.40)). Completing high school (aOR 7.49, 95% CI 1.28-43.74) and older age (aOR 1.26, 1.03-1.55) were associated with an increased likelihood of ART use. No factors were significantly associated with condom use (Table 3).

Discussion

In order for serodiscordant couples to reduce periconception risk, partners must understand their mutual HIV serostatus, plan pregnancy, and have knowledge of and access to safer conception strategies (36,42,50). In this sample of HIV-infected men and women with at-risk partners in an HIV-endemic setting, HIV-serostatus disclosure was reported by a minority, most pregnancies were unintended, and understanding of serodiscordance and periconception risk reduction was low. Accordingly, few participants employed safer conception strategies.

The finding that only 40% of women and 27% of men reported disclosure to a pregnancy partner prior to conception is consistent with previous South African research (47,51–54). Bearing in mind that all of our participants knew their HIV-serostatus prior to the referent pregnancy, this level of non-disclosure is noteworthy in a setting where an estimated 20-30% of stable couples are serodiscordant (7,8,55) and where mutual disclosure may lead to reductions in sexual risk behavior (47,48). Disclosure is a complex process mediated by fear of stigma and discrimination (47,48,54,56,57), fears of intimate partner violence (58–60), engagement with HIV care (51,53), concepts of masculinity (61), and relationship communication (57). Promoting positive disclosure beliefs and providing adequate support to couples is an important first step in HIV risk reduction regardless of fertility desires, but is also a critical component of safer conception programming (36). Qualitative data from healthcare providers in this same district describes the challenges non-disclosure creates for providers asked to provide safer conception counseling (62). Initiatives to increase awareness of HIV serostatus and mutual disclosure between sexual partners include provider-initiated HIV counseling and testing (HCT) (63,64), couples HCT (15,65–69) and couples-orientated HCT (70,71). Challenges we faced in recruiting partners to this study may portend limited uptake of couples-based HCT and thus non-couples-based strategies to promote testing and disclosure should remain a priority (58–60). In addition, while most women reported that her pregnancy partner was a spouse or main partner, only a third of men reported that his recent pregnancy was with a spouse or main partner (65% reported with a casual partner.) In our models of factors associated with safer conception behaviors, women and men were more likely to disclose HIV-serostatus to or know the HIV-serostatus of a main or spousal partner compared to a casual partner. Promoting HIV-serostatus disclosure within casual partnerships is an additional challenge.

The prevalence of unintended pregnancy in our sample (reported by 89% of women and 95% of men) was much higher than estimates for the general population (72) and HIV-infected women in South Africa (73,74). This may partially reflect the effect of social desirability bias on expression of fertility desires, which are perceived as incompatible with social expectation (75) or condom-based prevention messages (38,62,76). However data

suggest that persons living with HIV experience poor access to contraceptive and other sexual and reproductive health services (5,73,77–79). Improved access to non-judgmental contraceptive counseling and promotion of dual protection (barrier plus other contraceptive method) for the large proportion of HIV-infected men and women who do not desire children is critical to reducing high incidence of unintended pregnancy in this group. These data also highlight the strong presence of male pregnancy desires that were not necessarily compatible with female partner pregnancy desires: 52% of women reported that her partner wanted the referent pregnancy. Increased efforts to engage men in planning for pregnancies with partners are an important piece of optimizing sexual and reproductive health (4,80–82). Efforts to improve women's reproductive autonomy are crucial to reducing unwanted pregnancies as well as HIV acquisition.

Over a third of men and women indicated that a serodiscordant test result between sexual partners must be a mistake. Misconceptions around serodiscordance are well-documented in South Africa (83,84), and commonly lead to the practice of testing by proxy (85), which precludes opportunities to reduce sexual risk-taking that accompanies awareness of serodiscordant status (86). Other concerning knowledge gaps identified included that almost half of women reported that a woman is protected from HIV if her partner is circumcised. This dangerous myth has been reported in qualitative studies in the Western Cape and Tanzania (87–89). Interestingly, a study with university students in KwaZulu-Natal did not observe the same mis-information suggesting that education may overcome this misperception (89). Participants also demonstrated low knowledge of safer conception strategies such as sperm washing, timing sex to peak fertility, manual insemination, and treatment as prevention, thus explaining infrequent safer conception practices. Although our model suggested associations between certain demographic variables and uptake of ART and/or more consistent condom use, the low incidence of planned pregnancy suggests that these factors are incidental, rather than predictors of deliberate safer conception behavior.

ART for the infected partner is recommended by the World Health Organization (16) and arguably the most feasible safer conception strategy for serodiscordant couples in this setting, particularly since it does not rely on serostatus disclosure to an at-risk partner. Since ART requires a prescription, health care providers may be regarded as gatekeepers to both the knowledge and means for treatment as prevention. Yet, in concordance with existing research (2,5,40,90), only 22% of women and 12% men in our sample had ever spoken to a provider about having children. Given the barriers to client-initiated discussions about having children (40), it is incumbent upon providers to pre-emptively assess clients' fertility intentions. However, despite the existence of national safer conception guidelines (36,37), many providers remain unfamiliar with periconception risk reduction (91) and struggle to balance responsibilities to prevent unnecessary risk exposure and support a client's desire to have a child (48).

This study has several limitations. First, social desirability bias may have influenced responses: all of the data are based on participant report. Second, since our instrument for assessing safer conception knowledge was not previously tested, resultant data may not accurately represent reality; however we feel that the true/false items were more likely to overestimate knowledge, which was low overall. Thirdly, since we recruited men and

women from ART and ANC clinics, respectively, demographic and behavioral differences were likely influenced by differential sampling, and not just sex. Fourth, recruitment challenges prevented us from assessing knowledge and behaviors of at-risk seronegative individuals; given that safer conception practices protect the *uninfected* partner in serodiscordant relationships, the perspective of this population is critical to informing safer conception programs and should be sought in future research. Fifth, some of the confidence intervals for the relationships in our model with men are wide and reflect a lack of precision of the point estimates, largely due to the small sample size.

In conclusion, the high-risk periconception behaviors and low knowledge of safer conception in our sample suggest that public health campaigns are needed in South Africa to help at-risk individuals and couples understand the rationale for safer conception processes, including mutual HIV-serostatus disclosure and pregnancy planning before we can expect uptake of specific safer conception strategies. Our data echo many prior studies describing challenges to HIV-serostatus disclosure and pregnancy planning within sexual partnerships. Our participants had low knowledge of safer conception strategies, but even with excellent knowledge, the same gender norms and stigma factors that impact communication about disclosure and pregnancy planning are expected to influence communication about safer conception practices. Research on safer conception programs must explore how to offer safer conception opportunities to individuals and couples given these challenges. It is possible that once couples understand that serodiscordance is possible, and that a partner can be protected from HIV while allowing for conception, safer conception programs will provide opportunities to promote disclosure and pregnancy planning. However, this remains to be determined. Work in this field tends to focus on safer conception strategies that couples can implement to reduce periconception risk behavior (27,50,62,92–97). However, this paper and work by others (6,40,62,94) suggest that disclosure, pregnancy planning, and communication with partner are critical first steps that must be supported before successful implementation of specific safer conceptions strategies can take place on a broad scale. Mutually-disclosed HIV-serodiscordant couples with well-articulated fertility goals are an important but minority population in South Africa (39,98). There is an evidence-based imperative to integrate comprehensive safer conception counseling into a diverse range of services accessed by persons living with HIV and their partners to improve accessibility of this information (37,99,100) and explore how to maximize acceptability and feasibility.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Periconception planning behaviors

This figure shows the percentage of HIV-positive men and women reporting an uninfected or unknown serostatus partner who reported each planning behavior prior to the referent pregnancy.

Figure 2. Safer conception behavior

* Condom use at least most of the time.

This figure shows the percentage of HIV-positive men and women reporting an uninfected or unknown serostatus partner who reported each safer conception behavior prior to the referent pregnancy.

Figure 3. Knowledge of periconception risks and risk reduction strategies

This figure shows the percentage of HIV-positive men and women reporting an uninfected or unknown serostatus partner who correctly answered true/false items on HIV risk reduction practices.

Table 1

Demographic data and partnership characteristics for participants

	HIV-positive women n = 209 Number (%/IQR)	HIV-positive men n = 82 Number (%/IQR)
Age	29 (25,33)	34 (31,37)
Black South African	206 (99%)	82 (99%)
Education		
Some Primary	8 (4%)	1(1%)
Some secondary	114 (55%)	26(32%)
Completed secondary school	81 (39%)	44(54%)
Post-secondary school	5 (2%)	11(13%)
Employed	56 (27%)	61 (74%)
Monthly income		
0-999 ZAR	59(28%)	--
1000-1999 ZAR	69(33%)	3 (4%)
2000 ZAR	77(37%)	60 (73%)
Missing	4 (2%)	19 (23%)
Marital status [*]		
Married/engaged	43 (21%)	14 (17%)
Long-term partner	87 (42%)	43 (52%)
Boyfriend/girlfriend	80 (38%)	47 (57%)
Casual partner	3 (1%)	22 (27%)
Number of living children	1 (1,2)	2 (2,3)
Years since HIV diagnosis	3 (1,5)	4 (2,6)
Pregnancy partner type [^]		
Spouse	34 (16%)	6 (7%)
Main partner	159 (76%)	22 (27%)
Casual partner	4 (2%)	53 (64%)
One-time partner	11 (5%)	2 (2%)
Partner HIV serostatus ^{**}		
HIV-uninfected	41 (20%)	25 (30%)
Unknown	168 (80%)	57 (70%)
Timing of referent pregnancy [#]		
Current pregnancy	208 (99%)	47 (57%)
If not current, age of youngest child (years)	0.3	1 (0.6,2)

	HIV-positive women n = 209 Number (%/IQR)	HIV-positive men n = 82 Number (%/ IQR)
Relationship on-going	161 (77%)	75 (91%)

* >1 partner type identified in the marital status question for 15 women (7%) and 38 men (46%).

^ Main partner – non-spouse, primary partner, committed relationship. Casual partner – neither main partner, spouse nor one-off partner, not a committed relationship.

** Distribution dictated by participant inclusion criteria: infected participants were eligible upon reporting a negative or unknown serostatus partner.

Personal pregnancy for the women, partner pregnancy for the men

Table 2

Factors associated with safer conception behaviors reported by women

	HIV-serostatus disclosure *		ART use		Condom use		Male partner circumcised	
	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value
Age (years)	1.00 (.95, 1.04)	0.89	1.08 (1.02, 1.14)	0.01	1.05 (0.99, 1.11)	0.10	0.97 (0.91 - 1.03)	0.30
Completed secondary school	.80 (0.48, 1.33)	0.39	1.19 (0.64, 2.21)	0.58	1.43 (0.79, 2.59)	0.24	1.23 (0.66-2.28)	0.52
Pregnancy desired	1.64 (0.99, 2.69)	0.05	.98 (.51, 1.88)	0.96	0.71 (0.38, 1.31)	0.27	.85 (.44, 1.66)	0.64
Pregnancy partner type (Ref. Casual)								
Spouse	1.60 (0.71, 3.61)	0.26	1.53 (.46, 5.04)	0.48	1.36 (0.45-4.15)	0.58	0.78 (0.24-2.48)	0.67
Main	2.88 (1.10, 7.53)	0.03	3.37 (.87, 13.08)	0.08	1.24 (0.34, 4.52)	0.74	1.19 (.31, 4.52)	0.80
Years since HIV diagnosis	1.02 (0.94, 1.12)	0.62	1.13 (1.01, 1.26)	0.03	0.88 (0.79, 0.98)	0.02	1.09 (0.98, 1.22)	0.12
Safer conception knowledge score	1.05 (0.91, 1.21)	0.50	1.03 (.84, 1.25)	0.79	1.08 (0.89, 1.31)	0.44	1.14 (.93, 1.40)	0.20

Covariates that were not significantly associated with behaviors in unadjusted analyses include income, HIV knowledge score, and sexual relationship power.

* Participant report of disclosure of HIV serostatus to partner and knowledge of partner HIV serostatus. A positive outcome is report of disclosure to partner and knowledge of partner HIV-serostatus.

Table 3

Factors associated with safer conception behaviors reported by men

	HIV-serostatus disclosure to partner		HIV-serostatus disclosure from partner		ART use		Condom use	
	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value
Age (years)	1.13 (0.93, 1.38)	0.20	.89 (.75, 1.07)	0.21	1.26 (1.03, 1.55)	0.03	1.09 (0.96, 1.24)	0.18
Completed secondary school	1.50 (0.27, 8.50)	0.64	.46 (.09, 2.26)	0.34	7.49 (1.28, 43.74)	0.03	2.25 (0.66, 7.60)	0.19
Pregnancy desired	1.13 (.24, 5.35)	0.88	1.14 (0.24, 5.39)	0.87	.71 (.11, 4.70)	0.72	1.37 (0.37, 5.02)	0.63
Pregnancy partner type (Ref. Casual) Spouse or Main *	18.59 (4.28, 80.67)	<.001	11.33 (2.48, 51.83)	.002	1.51 (.22, 10.25)	0.67	1.44 (0.43, 4.83)	0.55
Years since HIV diagnosis	1.16 (0.91, 1.49)	0.24	1.45 (1.10, 1.92)	0.01	1.22 (0.82, 1.82)	0.33	0.91 (0.75, 1.11)	0.36
Safer conception knowledge score	1.39 (0.95, 2.03)	0.09	1.63 (1.11, 2.40)	0.01	.79 (.51, 1.21)	0.28	0.92 (0.71, 1.18)	0.50

Covariates that were not significantly associated with behaviors in unadjusted analyses include income, HIV knowledge score, and sexual relationship power.

* Only 6 men reported a spouse. Main partner and spouse were therefore combined into 1 category.