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Acceptability and outcomes of distributing HIV self-tests for male partner testing in Kenyan maternal child health and family planning clinics

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Abstract

Background: Providing HIV self-tests to women for distribution to male partners may provide a unique opportunity to increase male partner and couples testing among women in HIV high-burden settings.

Methods: Between November 2017 and June 2018, we offered self-tests for at-home couples or partner HIV-testing to HIV-uninfected women seeking routine maternal child health (MCH) and family planning (FP) services at 8 facilities in Kisumu, Kenya. Women accepting self-tests were offered 2 self-tests (OraQuick) to take to their partner(s) with instructions on use. HIV self-testing (HIVST) outcomes were evaluated using available programmatic data.

Results: Overall, 3620 women were offered self-tests for at-home male partner HIV testing. The median age was 24 years (IQR 21–28) and 81% were in monogamous marriages. Overall, 1422 (39%) women reported having a partner of unknown HIV status, of whom 755 (53%) accepted self-tests. Among women with partners of unknown HIV status who declined self-tests (n=667), 49% reported needing to consult their partner. Pregnant women were more likely to accept HIVST than non-pregnant women (prevalence ratio=1.2, 95% CI 1.0–1.4, p=0.013). Self-testing outcomes were ascertained for 389 (44%) women who accepted self-tests. Among these women, 93%

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offered HIVSTs to their male partner; of these, 95% reported their male partners used the self-test and 99% used a self-test with their partner.

Conclusions: Among women attending routine MCH and FP services who had male partners of unknown HIV status, over half accepted self-tests for partner testing. Most women with outcomes ascertained reported that male partners accepted and used self-tests and that couples testing occurred.

Keywords

HIV self-testing; HIV testing; Africa; women; Implementation Science

INTRODUCTION

HIV incidence among young African women remains high.^{1–3} Having a partner of unknown HIV status is associated with HIV acquisition among young women in HIV high-burden settings⁴ and increasing knowledge of male partner HIV status is one combination HIV prevention approach with high potential effectiveness.⁵ HIV self-testing (HIVST) is an innovative strategy to improve knowledge of HIV status that addresses barriers associated with clinic-based HIV testing services.^{6,7} Oral-fluid-based HIV self-tests have high sensitivity and specificity^{7,8} and have high acceptability among African study populations.^{9,10} Implementation policies in support of HIVST have been developed by the World Health Organization (WHO) and several African countries, including Kenya.^{11,12}

Recent studies have also demonstrated the acceptability and feasibility of a secondary distribution strategy to promote male partner HIV testing through provision of multiple self-tests to women seeking health services.^{13,14} Provision of self-tests to women seeking routine maternal and child health (MCH) services was successful in one study promoting male partner and couples testing among pregnant and postpartum Kenyan women.¹⁴ Male partner testing was reported among 90% of women in the HIVST group and couples testing was more than twice as likely among women who received multiple self-tests.¹⁴ Evaluation of secondary distribution of self-tests for male partner testing within programmatic settings could inform development of policies that expand self-test delivery.⁷

PrEP Implementation for Young Women and Adolescents (PrIYA) is a program that delivers pre-exposure prophylaxis (PrEP) to women within MCH and family planning (FP) settings at 16 facilities in Kisumu County, Kenya.¹⁵ At 8 PrIYA sites, self-tests for at-home male partner and couples HIV testing are offered to all HIV-uninfected women seeking routine MCH and FP services. We evaluated acceptability of self-tests within MCH/FP systems. In a subset of self-test acceptors, we also evaluated HIVST outcomes using available programmatic data.

METHODS

PrIYA Program and setting

The PrIYA Program is a two-year implementation project to reach adolescents and young women at high risk for HIV acquisition through integrated delivery of PrEP and self-tests

within routine MCH and FP systems.¹⁵ PrIYA is part of the DREAMS Innovation Challenge funded by PEPFAR managed by JSI Research & Training Institute, Inc. in collaboration with the Department of Health and Sanitation, Kisumu County and the National AIDS and STI Control Programme (NASCOP). PrIYA's primary objective is to deliver PrEP to adolescents and young women and evaluate efficient models of delivery. PrIYA is implemented in 16 facilities (11 public, 4 faith-based, 1 private) in Kisumu County, Kenya, a region with adult HIV prevalence of 19.9% (up to 28% among pregnant women).^{16–18} The 16 highest volume (based on monthly number of new ANC clients) facilities in Kisumu County were selected to be in the PrIYA Program. Sites were purposively assigned to two PrEP delivery models—PrEP alone or PrEP along with HIVST—to ensure balance of the two models across facility characteristics including volume, rural/urban environment, and distance from Kisumu city. The current evaluation focuses on HIVST acceptability and outcomes at the 8 purposively selected PrIYA sites where MCH and FP clients seeking routine services are offered multiple HIVSTs for at-home male partner and couples HIV testing.

Within the PrIYA Program, 40 program-supported nurses were trained on PrEP and HIVST delivery per national guidelines and assigned a work station at a public or private sector MCH or FP clinic as previously described.¹⁹ Prior to dispensing PrEP and/or self-tests, program nurses provided clinic-based blood HIV testing to women to confirm that they were HIV-negative. Nurses screened HIV-uninfected women for behavioral risk factors, including male partner HIV status, and willingness to consider PrEP. Behavioral risk factors, including intimate partner violence (IPV), were assessed using a standardized risk assessment tool.²⁰ Women who wanted to initiate PrEP and were medically eligible received same-day PrEP.¹⁵ All HIV-uninfected women were counseled on and offered self-tests, regardless of their self-reported male partner's HIV status, experience or IPV, and whether they chose to initiate PrEP. Self-tests and PrEP services were delivered by nurses within the MCH or FP clinic at no additional cost to clients.

HIV self-test distribution

Women who accepted self-tests received a minimum of 2 oral-fluid-based rapid HIV tests (OraQuick Rapid HIV-1/2 Antibody Test, OraSure Technologies). Women could take up to 4 self-tests if they reported >1 sexual partner. Nurses provided a brief demonstration of how to use the self-test and clients were urged to ask clarifying questions. Participants were encouraged to offer an HIVST to their male partner and to use self-tests together as a couple if they felt comfortable doing so.²¹ Nurses also counseled on how to discuss self-test results with partners and the possibility of adverse outcomes from partners, including IPV. Women were instructed to tell partners who tested HIV-positive to seek clinic-based confirmatory HIV testing. Women received the free national self-test hotline number and information on where to seek assistance for cases of IPV. They were also given a PrIYA Program phone number to call in case they needed advice about self-tests or other concerns.

HIVST outcome assessment

The PrIYA Program was not designed to systematically assess HIVST outcomes. HIVST outcomes were available from 3 data sources: 1) in-person PrEP follow-up visits, 2) a pilot

SMS-based HIVST follow-up survey, and 3) routine postnatal care (PNC) visits. All data sources captured the same panel of HIVST outcomes, including whether a woman had distributed a self-test to her partner, whether the partner had used the self-test, whether they tested as a couple, and partner HIV test result. If women did not distribute the self-test to their partner, they were asked to provide reasons during in-person PrEP and PNC follow-up visits. Additionally, women were asked if they experienced any harm because of the self-tests, including physical, sexual, verbal or emotional abuse, or withholding of resources. All outcomes were self-reported by women.

Women who initiated PrEP were scheduled for a one-month follow-up visit after PrEP initiation. Women who did not initiate PrEP and accepted HIVST were not scheduled for a PrIYA follow-up visit. During in-person PrEP follow-up visits, nurses ascertained HIVST outcome information using a standardized tool. Only women who initiated PrEP were scheduled for an in-person follow-up visit per the PrIYA Program, regardless of whether they had accepted HIVST. In a subset of women who accepted HIVSTs, we piloted an SMS-based survey to assess HIVST outcomes, (mSurvey Inc., Nairobi, Kenya). The pilot aimed to ascertain HIVST outcomes from women who would not otherwise return to clinic. Women were offered enrollment into the pilot upon acceptance of HIVST if they had a functional phone with them at the clinic visit that operated on the Safaricom mobile network, regardless of PrEP initiation. Participants responded to the survey via SMS at no cost and received no financial incentive for completing the survey. HIVST outcomes were also collected during routine PNC visits using the same standardized tool as PrEP follow-up visits.

Statistical analyses

We included data from women who were offered HIVST under the PrIYA Program from November 2017 through June 2018. We used descriptive statistics to summarize characteristics of the population and to describe frequencies of HIVST acceptance and reasons for non-acceptance. We identified correlates of HIVST acceptance among women who had partners of unknown HIV status using Chi-squared tests for binary and categorical measures, Kruskal-Wallis tests for continuous measures, and univariate Poisson regression models, an approach used when the outcome prevalence is high.^{22,23} All correlates associated with HIVST acceptance in univariate analyses ($p < 0.10$) were included in multivariate models. Pregnancy status, age, and marital status were considered *a priori* to have substantial influence on HIVST acceptance and were subsequently included in the multivariate analyses. We used robust standard errors and applied clinic-level clustering adjustments to all models. For evaluation of HIVST outcomes for each woman, data from only one source was included based on a hierarchy: data from in-person PrEP follow-up visits were used first. If not available, then SMS, and if SMS was not available then data from the PNC survey was used. In-person PrEP follow-up visits were the first choice for HIVST outcome data because they were the most frequent source of HIVST outcomes. Overall, 66% had HIVST outcome data from an in-person PrEP follow-up visit, 31% from the SMS-based survey, and 21% from in-person PNC visits; 17% of women had data from more than one source with <7% disagreement between sources. We used Stata 15.1/SE (Stata Corporation, College Station, TX) to perform all statistical analyses.

Time-and-motion data collection and analysis

To quantify time required to provide HIVST counseling we conducted time-and-motion studies at 5 facilities. At the time of assessment, nurses had delivered self-tests to clients at PrIYA clinics daily for the previous 6 months. Facilities were selected based on their proximity to Kisumu city (<30 minutes driving time.) Trained observers timed HIVST counseling sessions using a stopwatch and a semi-structured recording sheet. During observations, the observer talked with nurses when necessary, but did not provide any feedback and did not interact with clients. We calculated summary statistics (mean, median, and interquartile range [IQR]) for time spent conducting HIVST counseling for each client.

RESULTS

Overall, 3620 women were offered self-tests for at-home male partner HIV testing (Figure 1); 1587 (44%) within ANC, 1645 (45%) during PNC, and 388 (11%) at FP clinics. The median age of women offered HIVST was 24 years (IQR 21–28). Most women were in monogamous marriages (81%); 4% were in polygamous marriages and 14% were single (Table 1). Over half (57%) of women reported having an HIV-uninfected male partner, 39% a partner of unknown HIV status, and 4% a known HIV-infected male partner. Among women in ANC (n=1587), the median gestational age at HIVST offer was 24 weeks (IQR 20–28) and 6% had previously received couples HIV testing during ANC. Among women from FP and PNC clinics using contraception (n=1005); nearly half (48%) used injectable contraception, 39% used implants, 5% used oral contraceptive pills (OCPs), 4% had intrauterine devices (IUDs), and 4% used condoms alone.

Most women (96%) reported having sex without a condom in the last 6 months. Other behavioral risk factors for HIV were infrequently (<5%) reported (Table 1), including IPV (4%). Overall, 1222 (34%) of women offered self-tests also initiated PrEP at the same visit.

Acceptance of multiple self-tests by women

Approximately one-quarter (24%) of all women offered self-tests accepted (Figure 2) and women took a median of 2 HIVST kits (IQR 2–2). Acceptance of multiple self-tests was highest among women with partners of unknown HIV status (53%) and lower among women with partners who were reported to be HIV-infected (6%) or HIV-uninfected (6%) ($p<0.001$). While reasons for self-test acceptance among women whose partner's HIV status was purportedly known were not systematically captured, program nurses noted the following reasons: not trusting male partners, wanting confirmation of partner-reported status, or assuming a co-wife was HIV-infected.

Overall, 2734 (76%) of all women offered self-tests declined, a majority (76%) of whom reported knowing their partner's HIV status. Among women declining self-tests who had partners of unknown HIV status (n=667), nearly half (49%) reported needing to consult their partner. About one-third (187/667, 28%) reported that their partner was away as reasons for declining self-tests: fearing IPV and low HIV risk perception were reported as reasons for declining HIVST (8% and 2%, respectively).

Correlates of self-test acceptance among women with partners of unknown HIV status

Among women with partners of unknown HIV status, frequency of self-test acceptance was similar between MCH and FP clients (54% vs 49%, $p=0.294$, Table 2). Pregnant women more frequently accepted self-tests than non-pregnant women (prevalence ratio [PR]=1.2, 95% Confidence Interval [CI] 1.0–1.4, $p=0.013$). Women <24 years less frequently accepted self-tests compared with older women (PR=0.7, 95% CI 0.7–0.8, $p<0.001$). The frequency of accepting self-tests was 2.4-fold higher among married/cohabiting than women who were not married/cohabiting (PR=2.4, 95% CI 1.8–3.2, $p<0.001$). Among married women, self-test acceptance was lower among those in polygamous versus monogamous marriages (52% vs 61%, PR=0.9, 95% CI 0.8–1.0, $p=0.034$).

Self-test acceptance was higher among women who had condomless sex in the last 6 months than those who had not (55% vs 17%, PR=3.2, 95% CI 2.3–4.3, $p<0.001$). Among FP users, women using hormonal contraception (injectables, implants, OCPs) or IUDs more frequently accepted self-tests than women using condoms alone (54% vs 31%, PR=1.8, 95% CI 1.1–2.9, $p=0.027$). Acceptance of self-tests was not associated with PrEP uptake (PR=1.1, 95% CI 0.8–1.3, $p=0.641$) or any other behavioral HIV risk factor. After adjustment for marital status, age <24 years, and pregnancy status, all correlates from univariate models remains significantly associated with HIVST acceptance with the exception of PEP use >2 times in the last 6 months (Table 2). Among FP users ($n=387$), hormonal contraception did not remain significantly associated with HIVST acceptance, though the sample size was small (aPR=1.5, 95% CI 0.9–2.4, $p=0.149$).

Male partner and couples testing outcomes

Among 886 self-test acceptors, 389 women (44%) had data available on HIVST outcomes: 257 (66%) from in-person PrEP follow up visits, 99 (25%) from the SMS-based HIVST follow-up survey, and 33 (8%) from routine PNC visits. Overall, 362/389 (93%) women offered an HIVST to their male partner. Among women who did not offer partners a self-test who had information ($n=17$), the most common reasons for not offering included fear of their partner's reaction ($n=3$, 18%) and not seeing their partner since taking the HIVST ($n=3$, 18%); 6 (35%) had tried to discuss HIVST, but their partner reacted negatively.

Among 362 women who offered HIVST to their male partner for whom outcomes were available, 343 (95%) reported that their male partner used a self-test. Almost all (99%) women used a HIVST together with their partner. Among partners who used self-tests ($n=343$), 4 (1%) were reported to have tested HIV-positive and 98% tested HIV-negative (2% reported unknown results). Overall, experience of harm because of the self-tests was reported by 28/389 (7%) women and 15/28 (54%) had information on the type of harm experienced; 8 (53%) women reported partners being upset or not speaking to them, 5 (33%) reported verbal abuse, and 1 reported their partner withholding resources.

Counseling time on HIVSTs within routine MCH/FP visits

We observed nurses counseling 44 clients on HIVSTs. Median duration of HIVST counseling was 3 minutes (IQR 3–4, absolute range 1–9 minutes). Counseling time did not differ by acceptance of HIVST, PrEP initiation, or site (data not shown).

DISCUSSION

Within this large PrEP implementation program in a high HIV burden setting, nearly one-quarter of women seeking routine MCH and FP services accepted self-tests for at-home male partner HIV testing. Over half of women who did not know the HIV status of their male partner accepted self-tests. Acceptance of self-tests was associated with being pregnant and having condomless sex after adjustment for other factors, which may indicate groups who are especially motivated to know their male partner's HIV status. We found that 95% of partners offered HIVST used it, 99% of whom tested together as a couple, although follow-up data were based on data from a non-random subset. Counseling on self-tests added <5 minutes to routine MCH and FP visits. Our results suggest that offering self-tests within programmatic MCH and FP clinics for at-home male partner HIV testing is an acceptable approach for increasing knowledge of male partner HIV status. Further data on self-tests outcomes and cost-effectiveness of integrating self-tests into MCH and FP programs will be important to inform program implementers and policy makers.

HIV prevention strategies that include increasing knowledge of male partner HIV status and are acceptable within the context of women's lives are urgently needed. In our population of young women within a high HIV burden setting, 39% reported not knowing their male partner's HIV status. We found a very low rate of IPV in this HIVST program; however, we did not use a validated instrument to assess IPV and overall IPV prevalence was low (4%) compared to other HIVST studies among pregnant/postpartum women in Kenya (up to 37%).^{14,24} Women did report the need to consult partners and fear of partners' reactions, including IPV, as reasons for declining and/or not offering self-tests. We observed low reported frequency of experiencing harm by male partners due to HIVST (7%) and one case of physical harm, similar to other studies in Kenya evaluating secondary distribution of self-tests.¹³ We found that married women were more likely to accept self-tests, though the magnitude of effect weakened after adjustment for other variables. This suggests that stable relationships may facilitate secondary self-tests distribution. These results emphasize the importance of addressing gender power dynamics as HIV prevention programs among young women incorporate self-tests.^{25–27} Women who recently had condomless sex or were using an FP method other than condoms also more frequently accepted self-tests. This may suggest that secondary distribution of self-tests for male partner testing is a potential HIV risk mitigation approach for women whom consistent condom use is not acceptable or feasible.

Despite ongoing efforts to scale-up couples HIV testing within routine ANC, only 6% of pregnant women reported previously receiving couples HIV testing, similar to other recent programmatic evaluations in Kenya.²⁸ Pregnant and postpartum women may be especially motivated to utilize HIV prevention services, such as male partner HIV testing, to protect their infants²⁹ and innovations are needed to facilitate partner and couples testing beyond clinic-based approaches that have logistical challenges.^{13,14} Women using long-acting contraceptives may be less likely to use condoms and therefore motivated to know their male partners' HIV status.³⁰ A previous cohort study in Western Kenya found that HIV-uninfected ANC/PNC clients and female sex workers (FSWs) who were dispensed self-tests for at-home male partner HIV testing frequently offered self-tests to partners (91% ANC, 86%

PNC, and 75% FSWs) and tested as a couple (51% ANC, 68% PNC, and 83% FSWs).¹³ A more recent randomized controlled trial (RCT) in Kenya also found that provision of self-tests kits to pregnant and postpartum women promotes partner and couples testing.¹⁴ The RCT found high use of self-tests among male partners (91%) and frequent couples testing via HIVST (86%)¹⁴, similar to our results in a fully programmatic setting. Several qualitative studies from Eastern and Southern Africa have also reported high acceptability of self-tests for at-home HIV testing among ANC clients and their male partners and favored over facility-based approaches.^{6,31,32} Our findings suggest that offering self-tests to women for at-home male partner HIV testing can be successful within routine care MCH and FP settings and could potentially help close the gap on partner and couples testing.

While counseling clients on self-tests within routine MCH and FP clinics requires a minimal amount of additional time per client in this program, any additional time per client could translate to several more hours of work each week for providers in already heavily burdened MCH and FP systems^{33–36}. Group counseling or self-administered patient education approaches could be strategies that might mitigate this additional time to provide counseling on self-tests. Self-administered tablet-based approaches have successfully educated patients on a broad range of health topics, including self-tests.^{37,38} Leveraging group counseling activities or automated patient education approaches to provide information on self-tests is another approach that could help streamline self-test delivery within routine settings. The PrIYA Program offered free HIVST to women at no cost to the health system. As health programs consider integrating HIVST, cost-effectiveness evaluations that incorporate the cost of self-test commodities and counseling will be helpful for guiding policy decisions.

Our programmatic evaluation has limitations. Our evaluation focuses on self-test acceptance and outcomes within the context of a PrEP delivery program integrated with MCH and FP systems. There were few male HIV infections detected, perhaps because the riskiest male partners were not offered self-tests or declined to share results with their partner. We used all available data to evaluate HIVST outcomes, yet ~50% of self-test acceptors did not have outcome information. Additionally, we were unable to confirm accuracy of male HIVST outcomes reported by women. The PrIYA Program was not designed to capture HIVST outcome data on all women who accepted self-tests and only women who initiated PrEP were scheduled for an in-person follow-up visit. Our available data may not be representative of all self-test acceptors. However, we used multiple sources maximize the number of women with outcomes data on HIVST. Time-and-motion studies are labor-intensive and are commonly done with small samples such as ours (which included 44 time-and-motion evaluations).^{39,40} With wider awareness of HIVST and introduction of group or self-administered informational counseling, the time required for one-on-one counseling may decrease. We did not ascertain timing of male partners' most recent HIV test and found low self-test acceptance among women who reported having HIV-uninfected partners. Future evaluations of self-test acceptance should consider timing of most recent HIV test for male partners when defining male partner HIV status.

CONCLUSIONS

We observed that over half of women who had male partners of unknown HIV status accepted self-tests for partner testing in routine MCH and FP settings with minimal additional time required for counseling clients on HIVST. Among those with HIVST outcomes ascertained, women reported that their male partners frequently used self-tests when offered and couples often tested together. Offering self-tests was acceptable to women within programmatic MCH and FP settings and may increase awareness of male partner HIV status in areas with high HIV burden.

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JK, JMB, and GJS conceived and designed the parent study. JP, JMB, and GJS conceived and designed the current analysis. JK, FA, KKM, JD, JP, and HL conducted data collection. JP and EB analyzed the data. JP and GJS drafted the paper. All authors critically reviewed the manuscript.

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Figure 1.

Flow diagram of women with information on self-test acceptance and outcomes in the PrIYA Program from November 2017–June 2018

Figure 2.
Acceptance of self-tests, by male partner HIV status and client recruitment clinic¹

Table 1.

Characteristics of women offered HIVST under the PrIYA Program

	n (%) or median (IQR)
Demographic characteristics	Overall (N=3620)¹
Client recruitment clinic	
ANC	1587 (43.8)
PNC	1645 (45.4)
FP	388 (10.7)
Age (years)	24 (21–28)
Age category (years)	
<18	140 (3.9)
18–24	1748 (48.3)
25–29	1024 (28.3)
30–34	480 (13.3)
35	228 (6.3)
HIV status of sexual partner(s)	
Negative	2051 (56.7)
Unknown	1422 (39.3)
Positive	147 (4.1)
Marital status	
Married monogamous	2902 (80.8)
Married polygamous	152 (4.2)
Cohabiting	19 (0.5)
Single	496 (13.8)
Divorced/Separated/Widowed	25 (0.7)
Clinical characteristics	
Gestational age in weeks ²	24 (20–28)
Syphilis status ^{2,3}	
Reactive	6 (0.4)
Nonreactive	1191 (77.2)
Not done/unknown	345 (22.4)
HIV tested as couple during ANC ²	92 (6.0)
Contraceptive type ⁴	
Injectable	483 (48.1)
Implant	394 (39.2)
OCP	53 (5.3)
IUD	38 (3.8)
Condoms only	37 (3.7)

	n (%) or median (IQR)
Demographic characteristics	Overall (N=3620)¹
Initiated PrEP at same visit	1222 (33.8)
<i>Behavioral risk factors in the last 6 months</i>	
Ever had sex without a condom	3480 (96.1)
Engaged in sex in exchange for money/favors	26 (0.7)
Diagnosed with or treated for an STI	22 (0.6)
Forced to have sex	52 (1.4)
Experienced IPV	142 (3.9)
Shared needles while engaging in IVD	9 (0.3)
Used PEP >2 times	8 (0.2)

ANC=antenatal care; PNC=postnatal care; FP=family planning; OCP=oral contraceptive pills; IUD=intrauterine device; PrEP=pre-exposure prophylaxis; STI=sexually transmitted infection; IPV=intimidate partner violence; IVD=intravenous drug use; PEP=post-exposure prophylaxis

¹Missing data not shown

²Only among ANC clients

³Syphilis status assessed using rapid plasmin reagin (RPR) results abstracted from maternal child health booklets

⁴Only among PNC or FP clients currently using a FP method

Table 2.

Correlates of HIVST acceptance among women with partners of unknown HIV status

	Unknown male partner HIV status (n=1422)					
	Accepted HIV self-tests		Univariate analysis		Multivariate analysis ⁴	
	No (N=667)	Yes (N=755)	PR (95% CI)	p-value	aPR (95% CI)	p-value
Demographic characteristics						
Client recruitment clinic						
MCH	597 (46.4)	689 (53.6)	1.1 (0.9–1.3)	0.294		
FP	70 (51.5)	66 (48.5)	ref			
Currently pregnant						
Yes	230 (40.9)	333 (59.2)	1.2 (1.0–1.4)	0.013	2.2 (1.7–2.9)	<0.001
No	437 (50.9)	422 (49.1)	ref		ref	
Age (years)						
<24	347 (55.3)	280 (44.7)	0.7 (0.7–0.8)	<0.001	0.9 (0.8–0.9)	<0.001
24	320 (40.3)	475 (59.8)	ref		ref	
Marital status						
Married/Cohabiting	441 (39.6)	673 (60.4)	2.4 (1.8–3.2)	<0.001	1.2 (1.0–1.3)	0.006
Not married/cohabiting	224 (74.7)	76 (25.3)	ref		ref	
Marriage type (n=1096)						
Polygamous	43 (47.8)	47 (52.2)	0.9 (0.8–1.0)	0.034	0.9 (0.7–1.0)	0.045
Monogamous	391 (38.9)	615 (61.1)	ref		ref	
Clinical characteristics						
Gestational age (weeks) ²						
<24	93 (42.5)	126 (57.5)	1.0 (0.8–1.1)	0.638		
24	134 (40.6)	196 (59.4)	ref			
HIV tested as couple during ANC ²						
Yes	0 (0.0)	3 (100.0)	-			
No	235 (41.5)	332 (58.6)	ref			
Contraceptive type ³ (n=387)						
Hormonal method or IUD	170 (45.6)	203 (54.4)	1.8 (1.1–2.9)	0.027	1.5 (0.9–2.4)	0.149
Condoms only	9 (69.2)	4 (30.8)	ref		ref	
Initiated PrEP at same visit						
Yes	303 (45.4)	364 (54.6)	1.1 (0.8–1.3)	0.641		
No	364 (48.2)	391 (51.8)	ref			
Behavioral risk factors (last 6 months)						
Condomless sex						
Yes	619 (45.4)	745 (54.6)	3.2 (2.3–4.3)	<0.001	2.0 (1.5–2.7)	<0.001
No	48 (82.8)	10 (17.2)	ref		ref	

	Unknown male partner HIV status (n=1422)					
	Accepted HIV self-tests		Univariate analysis		Multivariate analysis ⁴	
	No (N=667)	Yes (N=755)	PR (95% CI)	p-value	aPR (95% CI)	p-value
<i>Demographic characteristics</i>						
Transactional sex						
Yes	11 (64.7)	6 (35.3)	0.7 (0.3–1.3)	0.213		
No	656 (46.7)	749 (53.3)	ref			
STI diagnosis						
Yes	7 (58.3)	5 (41.7)	0.8 (0.4–1.5)	0.455		
No	660 (46.8)	750 (53.2)	ref			
Forced to have sex						
Yes	8 (30.8)	18 (69.2)	1.3 (1.0–1.8)	0.084	1.3 (1.0–1.7)	0.099
No	659 (47.2)	737 (52.8)	ref		ref	
Experienced IPV						
Yes	40 (50.6)	39 (49.4)	0.9 (0.8–1.1)	0.430		
No	627 (46.7)	716 (53.3)	ref			
Shared needles while engaging in IVD						
Yes	3 (42.9)	4 (57.1)	1.1 (0.7–1.7)	0.743		
No	664 (46.9)	751 (53.1)	ref			
Used PEP >2 times						
Yes	1 (25.0)	3 (75.0)	1.4 (1.0–2.0)	0.041	1.8 (0.9–3.3)	0.076
No	666 (47.0)	751 (53.0)	ref		ref	

PR=Prevalence ratio; aPR=Adjusted prevalence ratio; MCH=maternal child health; ANC=antenatal care; PNC=postnatal care; FP=family planning; IUD=intrauterine device; PrEP=pre-exposure prophylaxis; STI=sexually transmitted infection; IPV=intimidate partner violence; IVD=intravenous drug use; PEP=post-exposure prophylaxis

¹Missing data not shown

²Only among ANC clients

³Only among PNC or FP clients currently using a FP method; Hormonal methods include injectables, implants and oral contraceptive pills.

⁴Multivariate models adjusted for pregnancy status, age, and marital status.