HIVST acceptance and PrEP initiation among pregnant women at high risk of HIV in Homa Bay and Siaya counties, Kenya

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Abstract

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Background: Sub-Saharan Africa has the highest incidence of HIV worldwide with women having a higher incidence than men. Pregnancy increases risk for HIV acquisition which can increase the risk of vertical HIV transmission. Low rates of HIV testing in male partners is an important driver of incident HIV infection among pregnant women. Distribution of HIV self-tests (HIVST) for male partners can facilitate male partner HIV testing and help women make informed decisions about PrEP. This study aims to understand how acceptance of HIVST for male partner testing influences PrEP acceptance among pregnant women, identify cofactors of HIVST, PrEP, and of combined HIVST and PrEP, and influence of HIVST on knowledge of partner HIV status.

Methods: This study utilized longitudinal data from the targeted arm of the PrEP Implementation of Mothers in Antenatal care study, a cluster-randomized clinical trial evaluating two models of PrEP delivery in pregnant women conducted in Homa Bay and Siaya counties. Within the targeted arm, pregnant women were assessed using an objective HIV risk assessment tool. Women at high risk of HIV acquisition were systematically offered PrEP and were included in this analysis. Additionally, women in

this arm were offered HIVST for their male partners and were asked to report on the HIVST results of their partners at their next visit. Data including HIVST acceptance, PrEP acceptance, PrEP discontinuation, male partner HIVST acceptance and HIVST reported by the participants was captured. Presence of intimate partner violence (IPV) was assessed using the Hurt-Insult-Threaten-Scream (HITS) screening tool. Depression was assessed using the Patient Health Questionnaire-2 (PHQ2) while social support was evaluated using the 18-item Medical Outcomes Study Social Support Survey (MOS-SSS). Chi-squared tests were utilized to compare the association between HIVST acceptance for male partner and PrEP acceptance. Univariate logistic regression was used to compare participant demographics, pregnancy characteristics and male partner characteristics between women who accepted either intervention or accepted both interventions compared to those who declined both HIVST and PrEP (reference group).

Results: Of 2,197 women in the targeted arm**,** 1,008 (46%) women were determine to be at high risk of HIV acquisition and were included in the analysis. Median age of women was 25 years and 88.4% were married. Approximately 46.7% perceived themselves to be at high risk of HIV acquisition, 51.1% reported high social support, 12.8% reported experiencing IPV and 16.9% reported signs of depression. Male partners had a median age of 31 years, with 16.4% being >10 years older. Overall, 86.1% of women reported that they did not know their partner's HIV status.

Of 1,008 high-risk pregnant women, 50% accepted HIVST only, 13.9% accepted both HIVST and PrEP and 10.2% accepted PrEP only. Overall, 63.9% accepted HIVST, of whom 80.9% offered them to their male partners; 69.1% used the HIVST kits and 67.2% of the women tested together with their male partners. Overall, 68.7% of women became newly aware of their partners HIV status by 9 months postpartum with 1.9%

of these partners having a positive HIVST. Cofactors for accepting either PrEP or HIVST included HIV risk perception, social support, parity, male partner HIV status and marital status/type of partnership. Cofactors for accepting PrEP alone included the woman's age, the male partner's age and presence of IPV. Cofactors for accepting HIVST alone included the woman's level of education. Cofactors for accepting both HIVST and PrEP included social support, presence of IPV, depression and suspicion of male partners' having other sexual partners. Unawareness of male partner HIV status and high HIV risk perception were the facilitators of uptake of PrEP. The major barrier of accepting both HIVST and PrEP was need to consult the male partner. Other barriers of accepting PrEP included their need for more time to think, pill burden and low HIV risk perception

Conclusion: Distribution of HIVST for male partner testing was acceptable and useful to help high risk pregnant women navigate decisions about PrEP. Understanding the factors that foster high risk pregnant women to accept HIVST only, PrEP only or accept both HIVST and PrEP is key in informing and scaling up HIVST programming and PrEP counselling for pregnant women.

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INTRODUCTION

Sub-Saharan Africa has the highest incidence of HIV/AIDs worldwide and contributes to approximately 45% of all HIV infections[1]. Unfortunately, women in this region account for 63% of these new infections and are twice as likely to acquire HIV compared to men[2][3]. Kenya has a generalized HIV epidemic primarily driven by heterosexual transmission[4]. Its high HIV prevalence results in high HIV incidence with the number of new infections being approximately 36,000 annually among adults (15+ years)[4]. Siaya and Homa Bay counties have particularly high HIV prevalence (18.6% and 20.2% respectively) [5]

Pregnancy predisposes women to increased risk for HIV acquisition due to physiological and biological factors, partner characteristics, gender inequalities, and gender-based violence[6][7]. Currently, the estimated HIV incidence in pregnancy in Eastern Africa is 3.3 per 100 person-years[8] which is higher than the HIV incidence in the general population and above the WHO definition of substantial HIV risk[9]. Maternal acute HIV infection during this period results in higher rates of mother-to-child transmission of HIV compared to maternal chronic HIV infection[10][11]. Lack of awareness of male partner HIV status due to low male partner testing rates is the key driver of incident HIV infection among pregnant women[12]. This is due to unrecognized HIV serodiscordance[13]. Secondary distribution of HIV self-tests (HIVST) from women to their male partners can address gaps in male partner HIV testing[14][15]. This strategy is highly acceptable to pregnant women, leverages on the high antenatal clinic attendance among women and circumvents some of the barriers faced by men with regards to HIV testing, providing an entry into HIV prevention interventions [16][17].

Oral pre-exposure prophylaxis (PrEP) is an antiretroviral offered to HIV negative individuals at substantial ongoing risk of HIV infection for prevention of HIV infection.

It is highly effective with high adherence, and is safe during pregnancy and breastfeeding[18] In 2016, Kenya gave full regulatory approval on the use of PrEP including its use in pregnant women and PrEP was rolled out nationally in 2017[19]. The intervention has proven to be an attractive, woman-centered and highly acceptable HIV prevention strategy among pregnant women[20]. However, appropriate uptake of PrEP is critical among pregnant women to avoid unnecessary PrEP use among low-risk pregnant women and promote PrEP initiation and adherence among high-risk pregnant women. Offering HIVST within antenatal care clinics for secondary distribution to male partners may increase male partner HIV testing, aid women in knowing their HIV risk through male partner HIV status awareness[21] and facilitate appropriate PrEP decision-making by women.

Currently, both PrEP and HIVST for male partners HIV testing are strategies that are being scaled up within the antenatal (ANC) clinics. This study seeks to understand how acceptance of HIVST for male partners influences PrEP acceptance among pregnant women. The study also seeks to identify cofactors of HIVST, PrEP, and of combined HIVST and PrEP and influence of HIVST on knowledge of partner HIV status therefore informing HIVST programming and PrEP counselling for pregnant women.

METHODS

Study area and design

This study utilized longitudinal data from the targeted arm of the PrEP Implementation of Mothers in Antenatal care study (PrIMA), a cluster-randomized clinical trial evaluating two models of PrEP delivery in pregnant women(Clinical Trials.gov #NCT03070600)[22]. This arm was conducted in 10 randomly assigned clinics in Homa Bay and Siaya counties in Kenya. Women were enrolled if they were pregnant, HIV negative, age ≥15 years, tuberculosis negative and planned to receive postnatal and infant care at the study facility for at least one year postpartum. These women were then followed up using the Ministry of Health (MOH) maternal and child health (MCH) schedule for their routine ANC and postpartum/immunization clinic visits until 9 months postpartum. Each clinic enrolled a minimum of 200 pregnant, HIV negative women.

Within the targeted arm, all the pregnant women were assessed for HIV risk using an objective risk assessment tool proven to predict HIV risk among pregnant women. Within this risk assessment tool, unknown male partner HIV status was highly predictive of HIV acquisition and had a score of 6[23]. Women who scored greater than 6 on the risk assessment tool were identified as women at high risk of HIV acquisition. This analysis utilized data from these women determined to be at high risk of HIV because only this sub-group in the targeted arm was systematically offered PrEP. PrEP acceptance was defined as accepting PrEP on the day it was offered. Moreover, all the pregnant women within this arm were offered HIVST for their male partner to provide further information on partner HIV-status. HIVST acceptance was defined as taking HIVST kits for their male partners. Women were asked to report on the HIVST results of their partners at their next visit. Partners whose HIVST was positive were referred for HIV confirmatory testing and initiation of antiretroviral therapy at the facility's Comprehensive Care Centre.

Ethical Approval

This study was reviewed and obtained ethical approval from the Kenyatta National Hospital-University of Nairobi (KNH-UoN) Ethics and Research Committee (ERC) and the University of Washington (UW) Human Subjects Division (IRB).

Data Collection and Analysis

This study used previously collected data from the PrIMA study. A quantitative survey was administered to the participants to elicit the reasons for accepting/declining HIVST. HIVST acceptance was defined as taking HIVST kits for themselves and their male partners. PrEP acceptance was defined as accepting PrEP on the day it was offered

Subsequent data including HIVST acceptance, PrEP acceptance, PrEP discontinuation, male partner HIVST acceptance and results of HIVST reported by the participants was captured. The Hurt-Insult-Threaten-Scream (HITS) screening tool was used to assess for intimate partner violence (IPV) with those ≥ 10 being defined as experiencing IPV[24]. Depression was assessed using the Patient Health Questionnaire-2 (PHQ2) with those who had a score of ≥3 classified as having moderate-to-severe depressive symptoms[25]. Social support was evaluated using the 18-item Medical Outcomes Study Social Support Survey (MOS-SSS)[26]

Chi-squared tests were utilized to compare whether acceptance of HIVST for male partners was associated with higher PrEP acceptance among pregnant women. We then compared the participant demographics, pregnancy characteristics and male partner characteristics between pregnant women who accepted HIVST alone and not

PrEP, accepted PrEP alone and not HIVST, accepted neither intervention (reference group), or accepted both interventions using univariate logistic regression.

The reasons why participants accepted or declined either intervention were presented as proportions and the frequency of each was compared between each group. Among participants who did not know their male partner's HIV status at enrolment, the proportion of women who knew male partner HIV status at 9 months postpartum was compared between those who accepted HIVST and those who did not.

RESULTS

General characteristics

Between January 2018 and July 2019, 2,197 women were enrolled in the targeted arm of PrIMA, of whom 1,008 (46%) were determined to be at high risk for HIV based on the risk assessment approach and subsequently included in this analysis.

The median age of women included in the analysis was 25 years (interquartile range [IQR]: 21 - 30), 88.4% (886/1,002) were married, 79.0% were multiparous (796/1,008). Women had attended a median of 2 antenatal care visits (IQR 1 - 3) prior to enrollment in the study, with 56.6% (566/1,000) enrolled during their 2nd trimester at a median of 24 weeks gestational age (IQR 19 - 28 weeks). Despite these women being identified as high risk, only 46.7% of them perceived themselves to be at high risk of HIV acquisition. Approximately half (51.1%) of the women reported having high social support, 12.8% reported experiencing IPV and 16.9% reporting signs of depression (PHQ9 ≥3). Male partners had a median age of 31 years (IQR 26 - 36) and 16.4% were >10 years older than their female partner. Although 71.2% (645/906) of the women reported that they had talked with their male partner about his HIV status, only 23.1% (209/905) reported having been tested together with their partners. Overall, 86.1% of women (868/1,008) reported that they did not know their partner's HIV status.

Acceptance of HIVST for male partner

Of the 1,008 high-risk pregnant women, 50% (504/1,008) accepted HIVST only while 13.9% (140/1008) accepted both HIVST and PrEP and 10.2% took up PrEP only (103/1,008). Overall, 63.9% accepted HIVST when initially offered at enrolment. Among 644 women who accepted HIVST, a majority (80.9% [521/644]) offered it to their male partners. HIVST kits were used by 69.1% (445/644) of their male partners with 67.2% (433/644) of the women testing together with their male partners. Among

868 women who did not know their partner's HIV status at enrolment, 597 (68.7%) became newly aware of their partners HIV status by 9 months postpartum. Approximately 1.9% (12/644) of these partners had a reactive HIVST. Among 364 women who declined HIVST, the most frequently cited reason were the need to consult their partners (40.1%), awareness that their male partner was HIV positive (22.0%) and their male partners being away (18.7%).

Women who accepted HIVST for male partners at enrolment were significantly less likely to accept PrEP at enrolment (Relative Risk [RR]: 0.77, 95% confidence interval [CI] 0.62 - 0.96, p=0.02). In analyses of PrEP use at any time during study follow-up, any PrEP use remained lower for women who accepted HIVST at enrollment, but the association was no longer statistically significant (RR: 0.84, 95% CI. 0.69 - 1.03 p=0.107).

Acceptance of PrEP and its covariates

Overall, 24.1% (243/1008) of the women who were offered PrEP at enrolment accepted PrEP. The reasons given by women for accepting PrEP included lack of knowledge of the male partner HIV status (52.7%), high perceived risk of HIV (45.6%), knowledge that their male partner was HIV positive (32.9%), wanting to protect their babies from HIV (31.6%), and suspicion that their male partners have other partners (22.4%). Among women who declined PrEP, the need to consult their male partners (34.2%), the need for more time to think (26.4%), low perceived risk of HIV (26.0%) and pill burden (24.3%) were the most common reasons reported.

Both the woman's age and the male partner's age, type of partnership, social support, HIV risk perception, intimate partner violence, parity and partner HIV status were associated with accepting PrEP only compared to declining both HIVST and PrEP.

Women who were older (RR: 1.05, 95% CI. 1.02 - 1.07 p=0.001), with older partners (RR: 1.02, 95% CI. 1.01 - 1.04 p=0.003), multiparous (RR: 3.8, 95% CI 1.84 - 7.85 p <0.001), with longer partnership duration (p=0.001), perceived themselves to be at high risk of HIV acquisition (RR: 1.99, 95% CI. 1.35 - 2.93 p=0.001), knew that their male partners were HIV infected (RR: 5.72, 95% CI. 4.16 - 7.87 p<0.0001), suspected that their male partners had other sexual partners (RR: 1.97, 1.36 - 2.83 p=0.002) and experienced IPV (RR: 1.73 95% CI. 1.19 - 2.54 p=0.005) were more likely to accept PrEP. In contrast, women who reported higher social support (RR: 0.7, 95% CI 0.51 – 0.97 p=0.03) and in monogamous marriages (RR: 0.61, 95% CI 0.42 - 0.87 p=0.006) were less likely to accept PrEP compared to declining both HIVST and PrEP.

Covariates of accepting both HIVST and PrEP

Approximately 13.9% of the high-risk pregnant women in this analysis accepted both HIVST for male partner and PrEP at enrolment. Overall, social support, presence of intimate partner violence, depression and suspicion of male partners' having other sexual partners were covariates of accepting both HIVST and PrEP. Women who screened positive for IPV (RR: 1.91, 95% CI 1.46 - 2.51 p <0.001) and had markers of depression (RR: 1.69, 95% CI 1.24 - 2.31 p=0.001) were more likely to accept both PrEP and HIVST. High social support (RR: 0.62, 95% CI 0.47 - 0.81 p<0.001) and suspicion that their male partners did not have other sexual partners (RR: 0.56, 95% CI 0.35 – 0.90 p=0.02) was associated with accepting neither PrEP nor HIVST for their male partners. Perceived risk of HIV and male partner characteristics were not associated with likelihood of accepting both HIVST and PrEP.

Covariates of accepting HIVST alone (versus accepting neither HIVST nor PrEP)

Marital status, level of education, parity, HIV risk perception, social support, and male partner HIV status were associated with acceptance of HIVST alone. Women who

were married (RR: 1.38, 95% CI 1.11 - 1.72 p=0.004) and reported to be currently residing with their male partner (RR: 1.25, 95% CI 1.01 - 1.55 p=0.04) were more likely to accept HIVST alone. Women with a higher level of education (RR: 1.03, 95% CI 1.01 - 1.04 p=0.001) and those who were multiparous (RR: 1.15 95% CI 1.01 - 1.32 p=0.04) were more likely to accept HIVST. Women with high social support (RR: 0.85 95% CI 0.77 - 0.94 p=0.002), knew that their male partners were HIV infected (RR: 0.28, 95% CI. 0.12 – 0.68 p=0.005) and high HIV risk perception (RR 0.82, 95% CI 0.73 - 0.91 p <0.001) were less likely to accept HIVST.

DISCUSSION

In this study, we aimed to determine how the distribution of HIVST for male partner among pregnant women at high HIV risk influenced PrEP acceptance, and determined cofactors of HIVST acceptance, PrEP acceptance and combined HIVST/PrEP acceptance. We found the majority of women determined to be at high risk were married, in a monogamous partnership and had partners of unknown HIV status. Acceptance of HIVST for their male partner was 63.9%. Fewer women (24.1%) accepted PrEP and only 13.9% accepted both interventions. The common covariates for accepting either PrEP or HIVST included HIV risk perception, social support, parity, male partner HIV status and marital status/type of partnership. Additional covariates for accepting PrEP only included the woman's age, the male partner's age and presence of IPV while additional covariates for accepting HIVST only included the woman's level of education. The covariates for accepting both HIVST and PrEP included social support, presence of IPV, depression and suspicion of male partners' having other sexual partners.

Similar to other studies, less than half of pregnant women at high risk of HIV acquisition in our study perceived themselves to be at risk of HIV despite being unaware of their

male partners' HIV status[27][28]. This low risk perception may be driven by the reduction in sexual activities during this period and trust that their male partner has the same HIV serostatus as them(27) despite high levels of HIV serodiscordance that have been observed in SSA[29][30]. Education of pregnant women about HIV risk assessment during health talks or posttest counseling sessions will be important to improve accurate risk assessment. This in turn could increase the use of HIVST for partner testing and PrEP since women who perceived themselves to be at risk were more willing to accept these interventions[31].

HIVST for partner distribution addresses several barriers to male partner testing such as stigma, privacy concerns, time and expense involved with traveling to health facilities and the long waiting periods[32]. In this study, 63.9% of the women took up HIVST. Acceptance of HIVST was approximately 10 – 20% lower than in other studies[21][16]. This may be due to the fact that our analysis focused on women at high risk of HIV acquisition and included women with partners living with HIV (22%) who did not need to test again. The proportion of HIVST used (69.1%) and couple testing (67.2%) was also 10 – 20% lower than other studies[33]. This may be due to the gender-based power dynamics that exist among high HIV risk pregnant women. Despite the challenges of HIVST acceptance and couple testing, a large proportion of the women who accepted HIVST became newly aware of their partner's HIV status indicating that it is an effective strategy for identification of the male partners' HIV status. Currently, Kenyan HIVST guidelines includes ANC as a facility-based HIVST delivery point but HIVST for male partner testing has not been fully rolled out[34]. With approximately 96% of pregnant women in Kenya attending at least one ANC clinic[35], scaling up HIVST for male partner testing within ANC clinics could empower pregnant women to be aware of their male partner HIV status.

We found that women who accepted HIVST for male partners were significantly less likely to accept PrEP at enrolment. We speculate that women opted to take HIVST first to incorporate male partner HIV test results in their decision-making on PrEP. Pill burden which was cited as a challenge by 24% of the women who declined PrEP. This combined with concerns about drug use during pregnancy may have limited acceptance of PrEP. Most male partners who tested with HIVSTs were HIV negative and only 1.9% were HIV positive, consistent with other studies and with women's risk perception[16][33] EP. HIVST for male partner testing in ANC may be useful to reduce unnecessary PrEP exposure among pregnant women.

While some of the covariates for accepting HIVST only and PrEP only were similar, several covariates differed. Pregnant women who took up PrEP had older partners, were in a longer partnership duration, were more likely to experience IPV and perceived themselves to be at risk. These covariates are similar in other studies and suggest that these women may have challenges encouraging male partner HIV testing and therefore opted for PrEP alone without HIVST[36][37].

We found that pregnant women who had markers of moderate-to-severe depressive symptoms were more likely to take up both HIVST and PrEP which differs from other studies[38]. It is unclear why women with moderate-to-severe depression in our study were more likely to accept both interventions. Prior studies suggest that women with depressive symptoms may lack self-efficacy to initiate PrEP or navigate partner HIVST[39]. Our findings suggest that women with moderate-to-severe depressive symptoms in pregnancy were engaged in HIV prevention and it is possible that providing options like HIVST and PrEP may help women who felt little control over their risk. Qualitative research and longitudinal research to assess whether depressive

symptoms decreased following negative male HIVST could shed light on these associations.

Although all women in the study were determined to be at high risk of HIV, many declined HIVST or PrEP, citing the need to consult their partners. This indicates the critical role of male partners in decision-making about health interventions. Although PrEP is a female controlled HIV prevention intervention that can be taken discretely without consent of male partners, reluctance of women to accept PrEP without consent of their partners suggests need for innovative strategies targeting to educate men within the community, workplace or recreation on HIV prevention interventions including HIV testing and disclosure to their female partners[40]. Moreover, further studies to help women navigate their own protection without needing to consult partners would be useful.

CONCLUSION

Distribution of HIVST for male partner testing was useful to help high risk pregnant women navigate decisions about PrEP by allowing women to know their male partner HIV status. Understanding the factors that foster high risk pregnant women to accept HIVST only, PrEP only or accept both HIVST and PrEP is key in informing and scaling up HIVST programming and PrEP counselling for pregnant women. Lastly, male partners play a critical role in decision making about PrEP and HIVST and engaging men in HIV prevention interventions is crucial.

TABLES AND FIGURES

Table 1: Characteristics of pregnant women enrolled in the study with high risk of HIV

Characteristics	N	n (%) or median (IQR)
Sociodemographic		
Age	974	24.8 (21 - 29.6)
Married	1002	886 (88.4%)
Monogamous	868	741 (85.4%)
Years of education	955	10 (8 -12)
Has regular employment	977	137 (14.0%)
High social support	1002	512 (51.1%)
High HIV risk perception (Vargas scale)	992	463 (46.7%)
High HITS score ≥10	1000	128 (12.8%)
PHQ-2 score ≥3	922	156 (16.9%)
Gestational characteristics		
Gestational age at enrolment (weeks)	1007	24 (19 - 28)
Trimester at enrolment	1000	
1st trimester		98 (9.8%)
2nd trimester		566 (56.6%)
3rd trimester		336 (33.6%)
Primigravida	1008	212 (21.0%)
Pregnancies (including current pregnancy)	1003	3 (2 - 4)
Live births	999	1 (0 - 3)
Prior pregnancy loss	998	127 (12.7%)
Antenatal care visits (including current visit)	1000	2 (1 - 3)
Partner characteristics		
Partner age (years)	785	31 (26 - 36)
Partner age difference > 10 years	763	125 (16.4%)
Partner's education	873	

Primary school and lower		339 (39.1%)
Secondary school		368 (42.2%)
College or university		164 (18.8%)
Currently residing with partner	901	788 (87.5%)
Partnership duration (months)	906	48 (24 - 96)
Partner HIV status	1008	
Negative		43 (4.3%)
Positive		96 (9.5%)
Unknown		868 (86.1%)
No partner		1 (0.1%)
Discussed partner’s HIV status	906	645 (71.2%)
Tested for HIV together	905	209 (23.1%)

Table 2: Covariates of accepting both HIVST and PrEP among pregnant women compared to those who did not					
Characteristics	No PrEP/HIVST (ref)	Both PrEP & HIVST			
N	261 (25.9%)	140 (13.9%)			
	n (%) or median (IQR)	**n (%) or median (IQR)**	**RR**	**95% CI**	**p-value**
Sociodemographic					
Age (years) (n = 245, 136)	24.7 (20.9 - 29.3)	24.9 (20.5 - 28.9)	1.00	0.98 - 1.03	0.89
Married	211 (83.1%)	120 (86.3%)	1.18	0.79 - 1.77	0.41
Monogamous	178 (85.2%)	97 (81.5%)	0.85	0.59 - 1.21	0.37
Years of education (n= 249, 125)	8 (8 -12)	9 (8 - 12)	1.00	0.95 - 1.05	0.91
Regular employment (n= 253, 13)	30 (11.9%)	23 (16.8%)	1.28	0.91 - 1.81	0.15
Distance to clinic (minutes)	30 (25 - 45)	30 (25 - 45)	1.00	1.00 - 1.01	0.47
Taking any medications	32 (12.3%)	25 (17.9%)	1.31	0.94 - 1.82	0.11
High Social Support Score	**159 (60.9%)**	**59 (42.4%)**	**0.62**	**0.47 - 0.81**	**<0.001**
High HIV risk perception (Vargas scale) (n=258, 139)	134 (51.9%)	68 (48.9%)	0.92	0.71 - 1.20	0.57
High HITS score ≥10 (n= 261, 139)	**23 (8.8%)**	**33 (23.7%)**	**1.91**	**1.46 - 2.51**	**<0.001**

PHQ-2 score ≥3 (n= 241, 118)	**29 (12.0%)**	**29 (24.6%)**	**1.69**	**1.24 - 2.31**	**0.001**
Gestational characteristics					
Gestational age at enrolment (weeks) (n = 260, 138)	24 (18 -28)	24 (20 -28)	1.01	0.99 - 1.03	0.61
Trimester at enrolment (n=260, 138)					
1st trimester	26 (10.0%)	12 (8.7%)	Ref	Ref	Ref
2nd trimester	156 (60.0%)	79 (57.2%)	1.06	0.64 - 1.76	0.81
3rd trimester	78 (30.0%)	47 (34.1%)	1.19	0.71 - 2.00	0.51
Live births (n = 260, 139)	1 (0 - 3)	1 (0 - 3)	1.03	0.94 - 1.11	0.54
Multiparous	189 (72.4%)	110 (78.6%)	1.25	0.89 - 1.75	0.19
Pregnancies (including current pregnancy) (n = 261, 140)	2 (1 - 4)	3 (2 - 4)	1.01	0.94 - 1.09	0.74
Partner characteristics					
Partner age (years) (n = 183, 107)	31 (26 - 37)	31 (25 - 35)	0.99	0.97 - 1.01	0.45
Partner age difference >10 years (n = 173, 104)	33 (19.1%)	19 (18.3%)	0.97	0.65 - 1.44	0.87
Partner initial HIV status Unknown	231 (88.5%)	119 (85.0%)	Ref	Ref	Ref
Negative	13 (5.0%)	11 (7.9%)	1.34	0.85 - 2.13	0.21
Positive	17 (6.5%)	10 (7.1%)	1.09	0.65 - 1.81	0.75

Currently residing with partner (n = 225, 122)	191 (84.9%)	102 (83.6%)	0.94	0.64 - 1.38	0.75
Partnership duration (months) (n = 189, 102)	60 (25 - 96)	48 (18 - 108)	1.00	0.99 - 1.00	0.71
Partner level of education (n = 217, 118)					
Secondary school	101 (46.5%)	55 (46.6%)	Ref	Ref	Ref
Primary school or lower	82 (37.8%)	54 (45.8%)	1.13	0.84 - 1.52	0.43
College or University	**34 (15.7%)**	**9 (7.6%)**	**0.59**	**0.32 - 1.10**	**0.01**
Discussed partner's HIV status (n = 225, 122)	153 (68.0%)	89 (73.0%)	1.13	0.81 - 1.57	0.48
Tested for HIV together (n = 223, 122)	48 (21.5%)	30 (24.6%)	1.10	0.79 - 1.52	0.57
On ART (n = 163, 99)	16 (9.8%)	10 (10.1%)	1.02	0.61 - 1.70	0.94
Suspicion of other sex partners (n = 218, 117)					
Unknown	**106 (47.1%)**	**62 (52.5%)**	**Ref**	**Ref**	**Ref**
No	**65 (28.9%)**	**17 (13.9%)**	**0.56**	**0.35 - 0.90**	**0.02**
Yes	**46 (20.4%)**	**39 (32.0%)**	**1.24**	**0.92 - 1.68**	**0.16**

Table 3: Covariates of accepting PrEP only versus declining both HIVST for male partner and PrEP					
Characteristics	No PrEP/HIVST	PrEP only			
N	261 (25.9%)	103 (10.2%)			

	n (%) or median (IQR)	n (%) or median (IQR)	RR	95% CI	p-value
Sociodemographic					
Age (years) (n = 245, 101)	**24.7 (20.9 - 29.3)**	**28.0 (22.8 - 31.6)**	**1.05**	**1.02 - 1.07**	**0.001**
Married (n = 254, 101)	211 (83.1%)	91 (90.1%)	1.60	0.89 - 2.86	0.12
Monogamous	**178 (85.2%)**	**66 (72.5%)**	**0.61**	**0.42 - 0.87**	**0.006**
Years of education (n = 249, 99)	8 (8 - 12)	8 (7 - 12)	1.01	0.95 - 1.07	0.79
Regular employment (n = 253, 98)	30 (11.9%)	8 (8.2%)	0.73	0.39 - 1.39	0.34
Distance to clinic (minutes) (n = 254, 102)	**30 (25 - 45)**	**37.5 (30 - 60)**	**1.01**	**1.00 - 1.01**	**0.008**
Taking any medications (n = 261, 103)	32 (12.3%)	20 (19.4%)	1.45	0.98 - 2.14	0.06
High Social Support Score (n = 261, 103)	**159 (60.9%)**	**50 (48.5%)**	**0.70**	**0.51 - 0.97**	**0.03**
High HIV risk perception (Vargas scale) (n = 258, 101)	**134 (51.9%)**	**74 (73.3%)**	**1.99**	**1.35 - 2.93**	**0.001**
High HITS score ≥10 (n = 261, 103)	**23 (8.8%)**	**19 (18.4%)**	**1.73**	**1.19 - 2.54**	**0.005**
PHQ-2 score ≥3 (n = 241, 87)	29 (12.0%)	16 (18.4%)	1.42	0.91 - 2.20	0.12
Gestational characteristics					
Gestational age at enrolment (weeks) (n = 260, 103)	24 (18 -28)	24 (17 - 28)	1.00	0.98 - 1.03	0.81
Trimester at enrolment (n = 260, 103)					

1st trimester	26 (10.0%)	14 (13.6%)	Ref	Ref	Ref
2nd trimester	156 (60.0%)	52 (50.5%)	0.71	0.44 - 1.16	0.17
3rd trimester	78 (30.0%)	37 (35.9%)	0.92	0.56 - 1.51	0.74
Live births (n = 260, 103)	**1 (0 - 3)**	**2 (1 - 3)**	**1.14**	**1.06 - 1.22**	**<0.001**
Multiparous (n= 261, 103)	**189 (72.4%)**	**96 (93.2 %)**	**3.80**	**1.84 - 7.85**	**<0.001**
Pregnancies (including current pregnancy) (n = 261, 103)	**2 (1 - 4)**	**3 (2 - 4)**	**1.15**	**1.08 - 1.22**	**<0.001**
Partner characteristics					
Partner age (years) (n = 183, 73)	**31 (26 - 37)**	**36 (31 - 40)**	**1.02**	**1.01 - 1.04**	**0.003**
Partner age difference >10 years (n = 173, 71)	33 (19.1%)	17 (23.9%)	1.22	0.78 - 1.91	0.38
Partner initial HIV status (n = 261, 103)					Ref
Unknown	231 (88.1%)	37 (35.9 %)	Ref	Ref	
Negative	13 (5.0%)	1 (1.0%)	0.52	0.08 - 3.49	0.50
Positive	**17 (6.5%)**	**65 (63.1%)**	**5.72**	**4.16 - 7.87**	**<0.0001**
Currently residing with partner (n = 225, 97)	191 (84.9%)	79 (81.4%)	0.85	0.56 - 1.28	0.43
Partnership duration (months) (n = 189, 79)	**60 (25 - 96)**	**84 (48 - 132)**	**1.00**	**1.00 - 1.01**	**0.001**
Partner level of education (n = 217, 93)					

Secondary school	101 (46.5%)	34 (36.6%)	Ref	Ref	Ref
Primary school or lower	82 (37.8%)	46 (49.5%)	1.43	0.98 - 2.07	0.06
College or University	34 (15.7%)	13 (14.0%)	1.10	0.64 - 1.90	0.34
Discussed partner's HIV status (n = 225, 98)	**153 (68.0%)**	**85 (86.7%)**	**2.26**	**1.31 - 3.91**	**0.003**
Tested for HIV together (n = 223, 98)	**48 (21.5%)**	**42 (42.9%)**	**1.88**	**1.37 - 2.57**	**<0.001**
On ART (n = 163, 84)	**16 (9.8%)**	**63 (75.0%)**	**6.38**	**4.21 - 9.66**	**<0.001**
Suspicion of other sex partners (n = 218, 117)					
Unknown	106 (47.1%)	34 (34.7%)	Ref	Ref	Ref
No	65 (28.9%)	21 (21.4%)	1.01	0.63 - 1.61	0.98
Yes	46 (20.4%)	42 (42.9%)	1.97	1.36 - 2.83	**<0.001**

Table 4: Covariates of accepting HIVST versus declining both HIVST for male partner and PrEP					
Characteristics	No PrEP/HIVST	HIVST only			
N	261 (25.9%)	504 (50.0%)			
	n (%) or median (IQR)	**n (%) or median (IQR)**	**RR**	**95% CI**	**p-value**
Sociodemographic					

Age (years) (n = 245, 492)	24.7 (20.9 - 29.3)	24.4 (21.4 - 28.9)	1.00	0.99 - 1.01	0.78
Married (n = 254, 493)	**211 (83.1%)**	**451 (91.5%)**	**1.38**	**1.11 - 1.72**	**0.004**
Monogamous	178 (85.2%)	400 (89.1%)	1.13	0.94 - 1.36	0.19
Years of education (n= 249, 482)	**8 (8 - 12)**	**10 (8 - 12)**	**1.03**	**1.01 - 1.04**	**0.001**
Regular employment (n= 253, 489)	30 (11.9%)	76 (15.5%)	1.10	0.97 - 1.26	0.14
Distance to clinic (minutes) (n = 254, 495)	30 (25 - 45)	30 (20 - 45)	1.00	1.00 - 1.00	0.51
Taking any medications (n= 261, 499)	32 (12.3%)	67 (13.4%)	1.04	0.89 - 1.20	0.64
High Social Support Score (n= 261, 499)	**159 (60.9%)**	**244 (48.9%)**	**0.85**	**0.77 - 0.94**	**0.002**
High HIV risk perception (Vargas scale) (n=258, 494)	**134 (51.9%)**	**187 (37.9%)**	**0.82**	**0.73 - 0.91**	**<0.001**
High HITS score ≥10 (n= 261, 497)	23 (8.8%)	53 (10.7%)	1.07	0.91 - 1.25	0.39
PHQ-2 score ≥3 (n= 241, 476)	**29 (12.0%)**	**82 (17.2%)**	**1.14**	**1.00 - 1.29**	**0.05**
Gestational characteristics					
Gestational age at enrolment (weeks) (n = 260, 499)	24 (18 -28)	24 (19 -29)	1.01	1.00 - 1.01	0.20
Trimester at enrolment (n=260, 499)					0.69
1st trimester	26 (10.0%)	46 (9.2%)	Ref	Ref	Ref
2nd trimester	156 (60.0%)	279 (55.9%)	1.00	0.83 - 1.21	0.97
3rd trimester	78 (30.0%)	174 (34.9%)	1.08	0.89 - 1.31	0.43

Live births (n = 260, 497)	1 (0 - 3)	1 (0 - 2)	0.98	0.94 - 1.01	0.25
Multiparous	**189 (72.4%)**	**401 (79.6%)**	**1.15**	**1.01 - 1.32**	**0.04**
Pregnancies (including current pregnancy) (n = 261, 499)	2 (1 - 4)	2 (2 - 4)	0.99	0.96 - 1.02	0.50
Partner characteristics					
Partner age (years) (n = 183, 422)	31 (26 - 37)	30 (26 – 36)	1.00	0.99 - 1.00	0.21
Partner age difference >10 years (n = 173, 415)	33 (19.1%)	56 (13.5%)	0.87	0.74 – 1.04	0.12
Partner initial HIV status (n= 261, 504)					Ref
Unknown	231 (88.5%)	482 (95.6%)	Ref	Ref	
Negative	13 (5.0%)	18 (3.6%)	0.86	0.63 - 1.16	0.32
Positive	**17 (6.5%)**	**4 (0.8%)**	**0.28**	**0.12 - 0.68**	**0.005**
Currently residing with partner (n = 225, 457)	**191 (84.9%)**	**416 (91.0%)**	**1.25**	**1.01 - 1.55**	**0.04**
Partnership duration (months) (n = 189, 417)	60 (25 - 96)	48 (18 - 96)	1.00	0.99 - 1.00	0.22
Partner level of education (n = 217, 445)					
Secondary school	101 (46.5%)	178 (40.0%)	Ref	Ref	Ref
Primary school or lower	82 (37.8%)	159 (35.7%)	1.03	0.91 - 1.17	0.60
College or University	**34 (15.7%)**	**108 (24.3%)**	**1.19**	**1.05 - 1.35**	**0.007**

Discussed partner's HIV status (n= 225, 461)	153 (68.0%)	318 (69.0%)	1.00	0.89 - 1.12	0.94
Tested for HIV together (n= 223, 462)	48 (21.5%)	89 (19.3%)	0.95	0.83 - 1.08	0.43
On ART (n = 163, 384)	**16 (9.8%)**	**3 (0.8%)**	**0.22**	**0.08 - 0.62**	**0.04**
Suspicion of other sex partners (n = 218, 117)					
No	65 (28.9%)	132 (28.6%)	Ref	Ref	Ref
Yes	46 (20.4%)	84 (18.2%)	0.97	0.86 - 1.09	0.60
Unknown	106 (47.1%)	238 (51.5%)	0.93	0.81 - 1.08	0.36

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