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Extra-spousal partnerships in a community in rural Uganda with high HIV prevalence: a cross-sectional population-based study using linked spousal data

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Keywords

HIV; Concurrent sexual partners; marriage; Uganda

Background

An estimated 33 million people worldwide are HIV-infected, of whom two-thirds live in sub-Saharan Africa where most new infections occur from unprotected heterosexual intercourse.¹ HIV prevalence is greater among married individuals than never-married counterparts.^{2, 3} There is heterogeneity in HIV risk among married individuals, determined in part by the age differences between partners³, as well as each individual's duration between sexual debut and marriage.⁴ HIV within marriage may result from infection by one's spousal partner, or due to non-spousal exposure. Introduction of HIV into a partnership from outside accounted for 1/3 of transmissions to the HIV-negative partner among initially serodiscordant couples in a recent study in Eastern and Southern Africa.⁵ This suggests that extra-spousal partnerships are an important pathway in introducing HIV-infection into a marriage if both spouses are HIV-negative, or if they are serodiscordant.

Extra-spousal partnerships are a form of sexual concurrency, defined as overlap between two or more sexual partners, with intercourse with one partner occurring between two acts of intercourse with another partner.⁶ This definition encompasses many partner types and duration of partnerships.^{6,7} Measurement of concurrent partnerships should make a distinction, where possible, between a single long-term partnership with intermittent short-term sexual partners, and two or more sustained, overlapping sexual partnerships. Concurrency is hypothesized to contribute to the spread of HIV through increasing the probability of transmitting HIV to one's partners. Having two sequential versus two concurrent partners carries the same risk for the index individual: the added risk of concurrency is through the increased probability that the index person transmits the virus to one or both their partners.^{8–10} High viral load and infectiousness during recent HIV infection contributes to increased risk of HIV transmission to any partner.^{11, 12} There is debate as to the importance of concurrency as a driving factor in the HIV epidemic in sub-Saharan Africa.^{7–9, 13–16} While mathematical modelling suggests an important role,^{11, 17} the

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assumptions of the models are contested in the literature¹⁸, and there remains limited empirical data.

A population-based cohort established in rural southwest Uganda in 1989 to investigate HIV epidemiology¹⁹ provided the opportunity to conduct an empirical examination of the association between concurrency and HIV transmission.

Methods

Setting

The study cohort comprises approximately 20,000 residents of 25 neighbouring villages in southwestern Uganda. There are no tarmac roads and access may be difficult during the rainy season. The main income-earning activities are growing bananas, coffee and beans, and trading fish.²⁰ The community is mostly from the Baganda tribe (73%), with 15% being of Rwandese origin. Religious affiliation is predominantly Christian, with a significant Muslim minority (28%). HIV prevalence was 6.2% in 2000 and 7.7% in 2005.²¹

Annual general population cohort survey

Details of the study design have been published previously.^{21–23} In brief, household surveys of socio-demographic and behavioural characteristics, and HIV sero-status of consenting participants aged 13 years have been conducted annually since 1989, with all residents eligible for inclusion. The average annual participation rate is about 60%–65%, although an estimated 84% have ever participated. All households are visited and consenting residents are interviewed at home in the local language by trained survey staff and provide a blood sample for HIV testing.

Collection of data on extra-spousal partnerships

Since marriage in Baganda society can take many forms, including customary, religious, civil and informal,²⁴ participants were asked if they had ever been married and if they considered themselves to be currently married or to have someone they considered a spouse. Data on sexual behaviour included the characteristics of current and most recent sexual partners, including type of partnership and condom use. Assuming that married couples are engaging in continued coitus, we define concurrent extra-spousal partnerships as the occurrence of sexual intercourse with a non-spousal partner within the last 12 months. Our measure assumes that extra-spousal partnerships overlapped with sexual intercourse with a spousal partner, although this may not have been the case. Concurrent partnerships could not be directly determined because the questions on partnership included the time of occurrence of last sex with an extra-spousal partner but not the duration of the partnership. Partners identified as extra-spousal were classified as “ex-spouse”, “regular” or “casual”. For polygynous men, extra-spousal partnerships were defined as sexual partners who were not considered to be wives.

Survey participants eligible for this study were aged 15 years or older, who reported a main (spousal) partner with whom sex had occurred in the past year, and for whom we confirmed the spouse’s unique identification number. The unique identification number of each survey participant allowed us to determine the HIV-status concordance of the marital union. Spousal identification numbers were also used to link up characteristics of women whose husbands engage in extra-spousal partnerships.

Statistical methods

We tabulated the prevalence of extra-spousal partnerships, distribution of participant characteristics and responses to questions on HIV testing by sex. We calculated median age

at first sex (AFS) and age at first marriage (AFM) for those who had ever been married. AFS and AFM were left-censored at 10 years of age. Logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals (CI) for the association of demographic and behavioural characteristics with the prevalence of extra-spousal partnerships in 2008, the survey with the most detailed sexual behaviour data collected. Variables were then adjusted by other variables associated with extra-spousal partnerships at $p < 0.15$ in univariate analyses. The reported prevalence of extra-spousal partners was too low among women to permit multivariable analysis. Among men who were not in polygynous marriage, we investigated the association between the prevalence of extra-spousal partnerships and the characteristics of their wives. Polygynous unions were excluded from this analysis due to difficulties in linking up all spousal identification numbers for each wife. The examination of linked partner data allows us to assess whether an women whose partner is engaged in an extra-spousal partnership is at an increased risk of HIV infection, as the concurrency hypothesis would suggest.

Results

Table 1 shows characteristics of the adult population in 2008. Approximately 45% of men and 51% of women reported being married, and further analyses focus on these 879 married males and 1380 married females. Data from 2002, 2004 and 2006 survey rounds indicate similar demographic and behavioural characteristics of married participants.

Married men and women had similar median AFS (18 years for men; 17 for women), but median AFM was 22 years for men and 18 years for women. Polygynous marriages were reported by 15% of men and 22% of women. Data from 2006 (not presented) found a median of 5 lifetime partners for men and 2 for women. HIV prevalence among married respondents was 7.0% for men and 8.0% for women, compared with an overall adult prevalence of 5.3% for men and 8.2% for women in 2008.

Overall, about 17% of men and 2% of women reported having had an extra-spousal partnership within the past year, which were most often characterized as “regular” rather than “casual” partnerships.

Extra-spousal partnerships were more common among younger and polygynous men and those who first had sex below age 18; these associations persisted after adjusting for age, condom use within marriage and knowledge of spouse’s HIV-status (Table 2). Men reporting extra-spousal partnerships were also more likely to report ever having used a condom with a spouse (adjusted OR (aOR)=1.85; 95%CI 1.24–2.75). There was no evidence that men reporting extra-spousal relationships were associated with increased risk of HIV (aOR=0.98; 95%CI 0.48–2.01), although they were more likely to have unknown HIV-status (i.e. not participated in the sero-survey) (aOR=1.76; 95%CI 0.97–3.18) and to not know their partner’s HIV-status (aOR=1.63; 95%CI 1.10–2.42).

Among women, reporting not knowing their partner’s HIV-status was the only variable found to be strongly associated with reporting an extra-spousal partnership (OR=2.97; 95%CI 1.04–8.54). However, the power to detect associations between women’s characteristics and behaviours with reporting an extra-spousal partnership was limited by the low numbers of women reporting extra-spousal partners.

Men not in polygynous unions who participated in the 2008 survey were linked with their wives using spousal identification numbers; 734 (98%) wives also participated in 2008, and 645 (87%) had known HIV status. Table 3 shows the relationship between women’s characteristics and their husbands reporting an extra-spousal partnership. There was no evidence of an association between a women’s HIV-status and her husband reporting an

extra-spousal partnership, with 14% of HIV-positive and 17% of HIV-negative women having husbands who reported extra-spousal partnerships (OR=0.82; 95% CI 0.36–1.87). Women who reported not knowing their husband's HIV-status were more likely to have husbands reporting an extra-spousal partnership (aOR=1.76; 95% CI 1.13–2.75).

Discussion

In a 2008 survey, extra-spousal partnerships within the past year were reported by 17% of married men, in contrast to 2% of married women. The majority of extra-spousal partnerships were with a “regular” partner, indicating that they are likely to be concurrent with marital relationships. Direct comparisons of concurrency prevalence are difficult due to discrepancies in measurements of concurrency, data sources, and our sample being limited to only married individuals. However, our findings of prevalence of extra-spousal partnerships among men is similar to concurrency rates found in Demographic Health Survey's in sub-Saharan Africa, but below prevalence estimates from Asia and the USA.¹⁸ Women's prevalence, on the other hand, is slightly higher than other concurrency estimates from sub-Saharan Africa, but smaller than concurrency estimates from the USA and Europe.¹⁸

Married people have reported higher rates of concurrency than unmarried people in Zambia and Tanzania.^{5, 25, 26} A study from the same population-cohort data in this paper found that when both partners are HIV-negative at the time of marriage, men were twice as likely as women to be the partner bringing HIV into the marriage.²² Our results indicate, however, that there is no evidence of an association between men's HIV-status and reporting an extra-spousal partnership.

In this study, polygynous unions were associated with increased odds of reporting an extra-spousal partnership. There are limitations in determining extra-spousal (rather than concurrent) partnerships for polygynous men using cross-sectional data, as it is unknown whether the partners later become spouses. Making a distinction between spousal and non-spousal partners may therefore be an artefact based on the time of observation, suggesting that simple classification schemes of concurrency may sometimes be too crude to address the reality of concurrency and non-spousal partners in polygynous unions.

Previous studies examining concurrency have had limited ability to look at partner data. Research in this area has only been able to look at characteristics of those who assume their partners are having concurrent partnerships.^{8, 27, 28} This study adds to the literature by using spousal identification numbers to link characteristics of women to those whose husbands report extra-spousal partnerships. Despite the hypothesis that concurrency would lead to a greater likelihood of transmission to sexual partners, we do not find evidence that women whose husbands report having extra-spousal partnerships are at greater risk of HIV-infection,

Individual-level protective behaviours may be counterbalancing the potential increased risk associated with concurrency, leading to the observed lack of association between women's HIV-status and their husbands reporting extra-spousal partnerships.¹⁰ For example, reported condom use with spousal partners was greater among men who had engaged in an extra-spousal partnership. It is possible that individuals perceive their extra-spousal partnerships as risky, and therefore use condoms to protect themselves or their spouse. There is some evidence of consistent condom use with extra-spousal partners, with 41% of men and 50% of women reporting condom use at last sex with an extra-spousal partner. The observed differential condom use with spouses and extra-spousal partners could have a protective effect that is offsetting the potential risk associated with concurrency. Data from a nationally

representative cross-sectional household survey in Uganda found that using condoms with a partner outside of marriage is protective, with a similar odds of HIV as among those who don't have any extra-spousal partners (adjusted OR, 1.0; 95% CI, 0.3–2.7).²⁹

Knowing one's partner's HIV-status was associated with a lower odds of engaging in extra-spousal partnerships. Relationships where partners communicate about HIV-status are also partnerships where extra-spousal partners are less likely. This finding supports previous research on HIV prevention among married couples, and the importance of developing open communication between partners and increasing uptake of couples counseling and testing.³⁰

Our study had several strengths. First, we provide estimates of the prevalence of extra-spousal partnerships from a large population cohort in a rural community in sub-Saharan Africa. For participants with a spouse resident in the study area, we were able to obtain linked information on their spouse's HIV-status using a unique spousal identification number. Few studies have been able to explore index case concurrency and their partner's HIV-status because of the difficulty of enrolling both partners in a sexual relationship.

There are limits to fully assessing concurrency among married people in this study. The definition we used of extra-spousal partners assumes an overlap between marital and other partners if one is currently married and had an extra-spousal partner in the last 12 months. This does not take into account that a spouse may have been away from their marital partner when they were with their other partner. As well, respondents who were not married for the full duration of the year prior to survey could overestimate concurrency. While a broader definition of concurrency among polygynous men would include overlapping sex with more than one wife, we limited our definition to partnerships occurring with a non-spousal partner, which may underestimate overall concurrency levels. Furthermore, we did not assess coital frequency, duration of extra-spousal partnerships, or the occurrence of multiple extra-spousal partnerships. In addition, the classification of extra-spousal partnerships into "regular" and "casual" may not fully capture the distinction respondents make between these two partnership types. The findings presented are also constrained by lack of information on multiple extra-spousal partners; it is assumed that reports of behaviour with extra-spousal partners refer to either the same partner across questions or that behaviour is consistent across different partners.

An additional limitation to our study is that the average annual survey participation is 60%–65%. Maintaining a high participation rate is a challenge in long established community-based annual HIV sero-survey's.²⁰ Some participants may decline participation in the sero-survey because they have previously had a blood test for HIV, know their result, and decide against a repeat test. Finally, all of our findings are based on cross-sectional data, which constrains any analysis between time of extra-spousal partnership and time of HIV infection. Further analysis should assess previous extra-spousal relationships as a determinant of current HIV incidence.

Conclusion

Among married men, we found no evidence of an association of reported extra-spousal partnerships and HIV-status. Furthermore, using linked partner data, we found no evidence of an association between men's extra-spousal partnerships and the HIV-status of their wives. We did find that men's extra-spousal partnerships were associated with early age of sexual debut, ever using a condom within marriage, and not knowing their partner's HIV status. While this study was able to use unique linked partner data, our measurements of concurrency among married individuals were not without limitation. Future studies should attempt more precise measurements of concurrency that include exact time overlap and

coital frequency, in order expand upon our findings. Future research should be directed towards understanding how individual behaviours could be offsetting potential risks associated with concurrency.

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Table I

Socio-demographic and behavioural characteristics of married participants aged 15 years and above, by sex in 2008

All married participants*	Reported an extra-spousal partner in the past year			
	Males	Females	Males	Females
N	879	1380	150 (17%)	32 (2%)
Type of extra-spousal partner				
Ex-spouse	--	--	12 (8%)	2 (6%)
Regular	--	--	103 (69%)	21 (66%)
Casual	--	--	35 (23%)	9 (28%)
Age				
15–29	131 (15%)	555 (40%)	35 (23%)	17 (53%)
30–39	274 (31%)	421 (31%)	59 (39%)	8 (25%)
40–49	193 (22%)	250 (18%)	37 (25%)	4 (13%)
50–59	145 (17%)	114 (8%)	13 (9%)	3 (9%)
60+	136 (15%)	40 (3%)	6 (4%)	0 (0%)
Age at first sex				
<15	47 (5%)	163 (12%)	15 (10%)	5 (16%)
15–16	139 (16%)	474 (34%)	33 (22%)	16 (50%)
17–18	313 (36%)	491 (36%)	52 (35%)	10 (31%)
19+	244 (28%)	173 (13%)	27 (18%)	1 (3%)
Don't remember	136 (15%)	79 (6%)	23 (15%)	-
Median (years) age at first sex (IQR)^a	18 (17–19)	17 (15–18)	17 (16–18)	16 (15–19)
Median age (years) at first marriage (IQR)	22 (20–25)	18 (16–19)	21 (20–24)	18 (16–19)
Polygynous marriages\Age difference with spouse	129 (15%)	301 (22%)	28 (19%)	9 (28%)
Spouse within 5 years	275 (31%)	445 (32%)	55 (37%)	9 (28%)
Spouse >5 years younger	440 (50%)	71 (5%)	67 (45%)	1 (3%)
Spouse >5 years older	78 (9%)	685 (50%)	14 (9%)	17 (16%)
Don't know	86 (10%)	179 (13%)	14 (9%)	5 (16%)
Ever used condom with spouse	205 (23%)	359(26%)	56 (37%)	14 (44%)
Used condom at first sex with spouse	99 (11%)	216 (16%)	28 (19%)	7 (22%)
Used condom at most recent sex with spouse	8 (1%)	25 (2%)	3 (2%)	0 (0%)
Ever used condom with extra-spousal partner	--	--	91 (61%)	20 (63%)
Used condom at first sex with extra-spousal partner	--	--	86 (57%)	17 (53%)
Used condom at most recent sex with extra-spousal partner	--	--	62 (41%)	16 (50%)
Report knowing spouse's HIV status	324 (37%)	406 (29%)	47 (31%)	4 (13%)
Report knowing extra-spousal partner's HIV status	--	--	47 (31%)	4 (13%)
HIV Status				
Negative	752(86%)	1209 (87%)	120 (80%)	27 (84%)
Positive	57 (7%)	105 (8%)	11 (7%)	4 (13%)
Unknown	70 (8%)	66 (5%)	19 (13%)	1 (3%)

* Married participants reporting sex in the last year with a confirmed spousal identification number

^a Excluding participants who can't remember or age unknown

Table II

Factors associated with extra-spousal partnerships in 2008 among married participants aged 15+ years with confirmed spousal ID number, by sex

	Men (N=879)				Women (N=1380)			
	N	Extra-spousal partner (%)	Unadjusted OR (95%CI)	Adjusted OR ^a (95%CI)	N	Extra-spousal partner (%)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Age								
15–29	131	35 (27%)	1	1	555	17 (3%)	1	1
30–39	274	59 (22%)	0.75 (0.46–1.22)	0.69 (0.42,1.14)	421	8 (2%)	0.61 (0.26,1.43)	
40–49	193	37 (19%)	0.65 (0.38–1.10)	0.60 (0.35–1.04)	250	4 (2%)	0.51 (0.17–1.55)	
50–59	145	13 (6%)	0.27 (0.14–0.54)	0.29 (0.14,0.59)	114	3 (3%)	0.86 (0.25,2.97)	
60+	136	6 (4%)	0.13 (0.05–0.31)	0.14 (0.06,0.35)	40	0 (0%)	-	
Age at first sex								
>=18 (m); >=17 (f)	580	80 (14%)	1	1	743	11 (2%)	1	1
<18 (m); <17 (f)	299	70 (23%)	1.91 (1.34,2.73)	1.65 (1.14,2.39)	637	21 (3%)	2.27 (1.09,4.74)	
Age at first marriage								
>=22 (m); >=18 (f)	455	73 (16%)	1	1	794	20 (3%)	1	1
<22 (m); <18 (f)	421	77 (18%)	1.17 (0.82,1.67)	1.12 (0.76,1.64)	580	12 (2%)	0.82 (0.40,1.67)	
Not reported	3	0(0%)			6	0 (0%)		
Polygynous marriage								
No	750	122 (16%)	1	1	1079	23 (2%)	1	1
Yes	129	28 (22%)	1.43 (0.90,2.26)	1.61 (0.98,2.63)	301	9 (3%)	1.42 (0.65,3.09)	
Age difference with spouse								
Within 5 years	275	55 (20%)	1	1	445	9 (2%)	1	1
>5 years younger	440	67 (15%)	0.72 (0.48,1.07)	0.94 (0.61,1.43)	71	1 (1%)	0.69 (0.09,5.55)	
>5 years older	78	14 (18%)	0.88 (0.46,1.68)	1.15 (0.57,2.30)	685	17 (3%)	1.23 (0.54,2.79)	
Don't know	86	14 (16%)	0.78 (0.41,1.48)	1.05 (0.51,2.05)	179	5 (3%)	1.39 (0.46,4.21)	
Ever used condom with spouse								
No	674	94 (14%)	1	1	1021	18 (2%)	1	1
Yes	205	56 (27%)	2.32 (1.59,3.38)	1.85 (1.24,2.75)	359	14 (4%)	2.26 (1.11,4.59)	

	Men (N=879)				Women (N=1380)			
	N	Extra-spousal partner (%)	Unadjusted OR (95%CI)	Adjusted OR ^a (95%CI)	N	Extra-spousal partner (%)	Unadjusted OR (95%CI)	
Used condom at 1st sex with spouse								
No	780	122 (16%)	1	1	1164	25 (2%)		P=0.34
Yes	99	28 (28%)	2.13 (1.32,3.43)	0.82 (0.43,1.56)	216	7 (3%)	1.53 (0.65,3.57)	1
Reports knowing spouse's HIV status								
Yes	324	47 (15%)	1	1	406	4 (1%)		P=0.02
No	555	103 (19%)	1.34 (0.92,1.96)	1.63 (1.10,2.42)	974	28 (3%)	2.97 (1.04,8.54)	1
Got own HIV test results within last year								
Yes	234	42 (18%)	1	1	519	13 (3%)		P=0.72
No	645	108 (17%)	0.92 (0.62,1.36)	0.93 (0.60,1.44)	861	19 (2%)	0.88 (0.43,1.79)	1
HIV status								
Negative	752	120 (16%)	1	1	1209	27 (2%)		P=0.57
Positive	57	11 (19%)	1.26 (0.63,2.50)	0.98 (0.48,2.01)	105	4 (4%)	1.73 (0.59,5.05)	1
Unknown ^b	70	19 (27%)	1.96 (1.12,3.44)	1.76 (0.97,3.18)	66	1 (2%)	0.67 (0.09,5.03)	
HIV status of couple^c								
Concordant negative	665	113 (17%)	1	1	860	16 (2%)		P=0.51
Discordant	43	5 (12%)	0.64 (0.25,1.67)	0.37 (0.11,1.29)	65	2 (3%)	1.67 (0.38,7.44)	1
Concordant positive	31	7 (23%)	1.42 (0.60,3.39)	0.76 (0.14,4.16)	47	2 (4%)	2.34 (0.52,10.51)	
Unknown	140	25 (18%)	1.06 (0.66,1.71)	0.36 (0.14,0.90)	408	12 (3%)	1.60 (0.75,3.41)	

* P-value's are provided for each variable from a likelihood-ratio test

^a Adjusted for age, age of first sex, in polygynous marriage, ever used a condom with main partner, HIV status, and knowing spouse's HIV status. Variables were selected for adjustment based on a p-value 0.15 in the univariate model, in addition to the adjusting for age as a confounding factor. The adjusted model was excluded for women due to low numbers of reported extra-spousal partnerships.

^b Those with unknown HIV status participated in the questionnaire, but had never participated in the sero-survey.

^c In polygynous unions, if all wives shared the same status as the husband, then the union was considered concordant. If one wife had a sero-status different from that of the husband, then the whole polygynous union was considered discordant.

Table III

Characteristics of wives of men aged 15+ surveyed in 2008 in non-polygamous marriages who participated in the survey

	N	Husband has an extra-spousal partner (%)	Unadjusted OR (95%CI)	Adjusted OR ^a (95%CI)
Total	734	123 (17%)		
Wife's age			P<0.01	P=0.01
15–29	281	64 (23%)	1	1
30–39	206	34 (17%)	0.67 (0.42,1.06)	0.69 (0.43,1.10)
40–49	136	19 (14%)	0.55 (0.31–0.96)	0.58 (0.33–1.02)
50–59	81	6 (7%)	0.27 (0.11, 0.65)	0.30 (0.12,0.72)
60+	30	0 (0%)	-	-
Wife's age at first sex			P=0.91	P=0.66
≥17 (f)	540	91 (17%)	1	1
<17 (f)	194	32 (16%)	0.97 (0.63,1.51)	1.11 (0.70,1.75)
Wife's age at first marriage			P=0.95	P=0.47
≥18	404	65 (16%)	1	1
<18	320	52 (16%)	1.01 (0.68,1.50)	1.16 (0.77,1.76)
Not reported	10	6 (60%)		
Ever used a condom with husband			P<0.01	P=0.07
No	558	80 (14%)	1	1
Yes	176	43 (24%)	1.93 (1.27,2.93)	1.75 (0.98,3.13)
Used condom at 1st sex with husband			P=0.02	P=0.72
No	639	99 (15%)	1	1
Yes	95	24 (25%)	1.84 (1.12,3.07)	0.88 (0.43,1.79)
Wife's HIV Status^b			P=0.88	P=0.63
Negative	596	101 (17%)	1	1
Positive	49	7 (14%)	0.82 (0.36,1.87)	0.68 (0.29,1.57)
Unknown	89	15 (17%)	0.99 (0.55,1.80)	0.93 (0.50,1.71)
Husband's HIV status			P=0.16	P=0.26

	N	Husband has an extra-spousal partner (%)	Unadjusted OR (95%CI)	Adjusted OR ^a (95%CI)
Total	734	123 (17%)		
Negative	631	99 (16%)	1	1
Positive	43	9 (21%)	1.42 (0.66,3.06)	1.15 (0.52,2.52)
Unknown	60	15 (25%)	1.79 (0.96,3.34)	1.75 (0.91,3.35)
Reports knowing husband's HIV status				
			P=0.03	P=0.01
Yes	482	91 (19%)	1	1
No	252	32 (13%)	1.60 (1.04,2.47)	1.76 (1.13,2.75)

^a Adjusted for knowing husband's HIV status. Variables were selected for adjustment based on a p-value 0.15 in the univariate model