Marriage and the Risk of Incident HIV infection in Rakai, Uganda

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Abstract

Objective—Studies suggest that the prevalence of HIV is higher among long term marital/consensual relationships than in the unmarried. We assessed the risk of incident HIV infection by marital status in rural Rakai, Uganda.

Design—Longitudinal data from the Rakai Community Cohort Study (RCCS) between 1999 - 2011

Methods—We estimated HIV incidence per 100 person years (py) in sexually active individuals aged 15-49 with a total of 44,179.6 person years (py) who were never married (females 2,929py, males 4,261py), currently married or in long-term consensual relationships ("currently married females 29,823py, males 21,299py) and previously married (females 3,563py, males 1,475). Poisson multivariable regression was used to estimate the unadjusted and adjusted incident rate ratios (IRRs) and 95% confidence intervals (95% CI) of HIV acquisition.

Results—HIV incidence among currently married persons was 0.93/100py, which was lower than the never married (1.51/100py) and previously married (2.85/100py). The risk of HIV acquisition was significantly lower in the currently married compared to the never married among women (Adj IRR=0.26, 95% CI: 0.16-0.42), but not men (Adj IRR=0.69, 95% CI: 0.31-1.52). HIV incidence was lower among first marriages (0.73/100py) compared to second or higher order marriages (1.38/100py). Multiple sex partners significantly increased the risk of HIV acquisition in both women (Adj IRR=2.53, 95% CI: 1.6, 3.97) and men (Adj IRR=1.77, 95% CI: 1.20-2.60).

Conclusion—Current marriage especially first order marriage was associated with reduced risk of HIV acquisition in women, but not in men, and multiple sex partnerships increased HIV risk for both sexes.

Introduction

It is estimated that over 2.3 million people are newly infected with HIV per year [1, 2], and most new infections occur in Sub-Saharan Africa, mainly as a result of unprotected heterosexual intercourse. A large proportion of prevalent HIV infections are among people in long-term marital or consensual relationships, and several studies suggest that marriage is associated with the risk of prevalent HIV, especially in women [3-11]. However, it is unclear whether HIV infection precedes entry into marriage or whether it is a consequence of marriage since differences in the duration of exposures between the unmarried and married states affect the estimated risk of prevalent infection associated with marriage. One Ugandan study found that the risk of incident HIV did not differ between never married and currently married women, but was increased in the previously married [12, 13]. We are not aware of other studies that assessed incident HIV by marital status.

Therefore, we investigated the rates of incident HIV infection among never, currently and previously married individuals; and determined whether entry into marriage affected the risk of new HIV infections in rural Rakai district, southwestern Uganda.

Methods

Rakai district in southwestern Uganda bordering Tanzania and Lake Victoria, is a rural area with a population of approximately 470,000, and marriage or long-term cohabitation is almost universal among adults. Marriage is patrilineal since children belong to the father's family and patrilocal because wives move to their husband's place of residence [25]

Data collected by the Rakai Community Cohort Study (RCCS) between 1999 and 2011 were used for this analysis. The RCCS is an open cohort with approximately annual surveys of 14,000 consenting persons aged 15-49 years, resident in 50 communities, and has been ongoing since 1994 and has been described elsewhere [26, 27]. In brief, census prior to each survey round identify eligible participants who are then contacted in their homes or invited to attend at central locations ("hubs") for interview and provision of blood for HIV diagnosis. Interviews ascertain information on socio demographic characteristics, sexual behaviors and health every 12 to 18 months using structured questionnaires administered in private by same sex interviewers. Approximately 95% of persons resident at the time of survey complete interviews and sample collection. Participants were asked whether they had ever married or were in a long-term consensual relationship (henceforth referred to as "married"), and for those who responded affirmatively, their current and previous marital status was ascertained. Persons at the time of interview who were separated, divorced or widowed were classified as "previously married". Thus, marital status was categorized as never, currently and previously married at enrollment at the beginning of each time period. Employment status was classified as agriculture, skilled/professional, non-skilled and other. Data were stratified into three study periods each comprised of three study rounds with varying duration; 2000-2002; 2003-2006 and 2007-2011 to assess temporal trends. Data on marital order (i.e., the number of times a person had married) were collected since 2006 and were used to determine the effect of re-marriage on HIV infection.

In separate analyses to assess the effects of entry into a first marriage (newly married), never married persons identified at the beginning of the interval were followed over time to determine whether they became newly married/entered into a first marriage or initiated a long-term consensual relationship during follow up. We then determined HIV incidence among newly and never married individuals during the interval of exposure among newly married and never married individuals.

HIV diagnosis used two enzyme immunoassays (EIAs) confirmed by Western Blot for seroincident cases. HIV incidence was estimated per 100 person years (py) of observation in initially uninfected persons assuming that infection occurred at the midpoint between the last negative and first positive HIV test. Poisson multivariable regression with person years as an offset was used to estimate the incidence rate ratios (IRR) and 95% confidence intervals (95%CI) of HIV acquisition stratified by gender. Age and education were adjusted for and since there was no significant change in the results they remained in the model due to the epidemiological importance of these covariates to the outcome. And since marital status is likely to be influenced by age, education, and residence, interaction terms between marital status and these covariates were assessed but no interactions were statistically significant and were excluded from the final analysis. Analyses were conducted in STATA™, version 9 (College Station Texas)

Results

Table 1 shows the distribution of participants by sex, marital status categories and socio-behavioral factors. The majority of participants were currently married, both among females (82.0%) and males (78.7%), and the population was predominantly rural (35518/38441, 92.4%). There were marked differences in the distribution of socio demographic and behavioral characteristics between never, currently and previously married persons. The mean interval between survey rounds was ~1.5 years, and the retention rate was ~75%.

Table 2 shows new HIV cases, person-years and HIV incidence rates stratified by gender, marital status and socio-demographic covariates. The majority of incident HIV infections in both women (60.7%) and men (71.0%) occurred during follow up of currently married persons who constituted the majority of observation time (76.1% for women and 74.2% for men). In women, the incidence of HIV among the currently married was 0.86/100py, which was lower than in the never married (2.29/100py) and previously married (2.86/100py). The incidence of HIV in currently married women was lower than in the never and previously married regardless of time periods, place of residence, age and educational groups. Among men, HIV incidence was similar in the never (1.08/100 py) and currently married (0.99/100 py), and both were lower than in the previously married (2.71/100 py), but differentials in male incidence by marital status were not consistent across socio-demographic covariates. For example, among men during the time period 2002-06 and those aged 20-24, incidence was lower in the never than the currently married, although these differences were not statistically significant (p=0.12 and p=0.23, respectively). HIV incidence among persons in monogamous union was lower and similar for both females (200/25470.65, 0.79/100py) and males (202/20506.23, 0.99/100py) compared to those in polygamous relationships (106/8915.86, 1.19/100pyo in women; 57/3992.24, 1.43/100pyo in men). However, HIV incidence in women who reported multiple sex partners was twice as high (2.35/100pyo) as those who were in polygamous unions and was not different by union type among men (table 3).

Table 3 shows HIV incidence stratified by marital status and risk behaviors. Currently married women had lower HIV incidence than the never married and previously married women irrespective of age at sexual debut, age at marriage, numbers of sexual partners and

alcohol use before sex. The marital status differentials in HIV incidence were less consistent when stratified by condom use and age differentials between partners. Among men, those currently married had lower HIV incidence than the previously married for all strata of covariates, and in most cases never married men had incidence rates similar to those of currently married men.

The univariate and multivariable analyses are presented in table 4. Currently married women were at significantly lower risk of HIV infection compared to the never married (Adj IRR=0.26, 95% CI: 0.16, 0.42), but there was no statistically significant difference in risk of incident HIV between the never and previously married women. Among men, there were no statistically significant differences in risk of incident HIV between the currently married and never married (Adj IRR 0.70, 95%CI 0.31-1.59), but previously married men were at significantly higher risk of HIV acquisition than never married men (Adj IRR 2.62, 95%CI 1.13-6.13). Multiple sex partners significantly increased HIV risk in both men (Adj IRR=1.79, 95% CI: 1.20, 2.65) and women (Adj IRR=2.30, 95% CI: 1.45, 3.63). Urban residence was a significant predictor of HIV risk in men (Adj IRR 1.87, 95% CI: 1.20, 2.92), but not in women (Adj IRR=1.11, 95% CI: 0.76, 1.63).

Effect of Entry into First Marriage and risk of HIV infection

HIV prevalence among those women entering into a first marriage was 11.6% (98/848) which was higher than in women who remained unmarried 7.5%, (969/12888, p<0.001). Similarly, men entering into a first marriage had higher HIV prevalence 5.6% (82/1472) than men who remained unmarried, 2.1% (341/16266, p<0.001). Newly married women had a lower incidence of HIV infection (1.67/100py, 13/780.5 py) compared to women who remained unmarried (2.17/100py, 73/3369.9 py), but this difference was not statistically significant (Adj IRR 0.77, 95%CI 0.42-1.39). HIV incidence among newly married men (1.59/100py, 22/1382.7 py) was higher than in men who remained unmarried (1.07/100py, 51/4779 py), but this was not statistically significant (Adj IRR=1.22, 95%CI 0.72-2.07).

Effect of prior marriage on risk of HIV infection

HIV incidence among women in their first marriage (0.73/100py, 111/15187 py) was lower than in those who reported second or higher order marriages (1.38/100py, 32/2318.7 py, p=0.002). In men, incidence was 0.67/100py (46/6867.4 py) in first order marriages and 1.06/100py (57/5383.4 py) in men with two or more marriages (p=0.013). In reference to never married, first marriage was significantly protective against HIV infection in women (Adj IRR=0.32, 95% CI: 0.23-0.45) compared to men (Adj IRR=0.67, 95% CI: 0.39-1.17) and persons in second order or higher (Adj IRR=0.65, 95% CI: 0.42-1.01 in women and Adj IRR=1.23, 95% CI:0.69-2.21 among men). Irrespective of marital order, the incidence of HIV among married women was lower than in women who remained unmarried 2.16/100 py, 73/3373.8 py). Relative to women who had never married, the risk of HIV acquisition was lower in first marriages (Adj IRR=0.32, 95% CI: 0.23 0.45) and in higher order female marriages (AdjIRR 0.65, 95%CI 0.42-1.01). However, in men HIV risk did not differ significantly by marital order when compared to the never married.

Discussion

We found that the incidence of HIV was significantly lower in currently married women relative to the never married, and entry into a first marriage did not significantly affect HIV incidence relative to women who remained unmarried. For men, HIV incidence was comparable in the currently married and never married groups. HIV incidence was highest for both men and women who had experienced marital dissolution, although the risk for women was attenuated after adjustment for risk behaviors.

These findings are consistent with previous Rakai data that the incidence of HIV is higher among persons who were not currently married [21], but they are in contrast with previous reports suggesting that marriage constitutes a risk for prevalent HIV [3, 7-10]. However, HIV prevalence is a cumulative measure and cannot account for the differentials in the duration of exposure to risk of HIV in each marital state. Since the interval between sexual debut and marriage is relatively short in Rakai (∼ 2.1 years for women and 5.2 years for men), compared to the mean duration of marriage in this population (approximately 9.0 years for women and 9.4 years for men), cumulative HIV prevalence is invariably lower prior to marriage than during marriage due to the shorter duration of exposure. Nevertheless, because of the longer duration of marital state, 60.7% of female incident infections and 71.0% of male infections occurred among the currently married. The mechanism whereby marriage may be protective from incident HIV for women are unknown, but it is noteworthy that fewer married women reported two or more sex partners in the prior year (2.7%), whereas two or more partners were frequently reported by the never (8.7%) and previously married women (10.6%). In contracts, among men, multiple partnerships were frequent and comparable among the never, currently and previously married (43.5%, 44.7% and 48.6%, respectively, Table 3). Thus, differentials in the number of sex partners by marital status may protect married women, but there were no comparable differentials observed among males.

However, HIV prevalence was higher among men and women who had entered into a first marriage than those remaining unmarried, which possibly reflects previous high risk behaviors among the newly married prior to initiation of observation. However, the incidence of HIV was not-significantly different between those entering a first marriage and those who remained unmarried suggesting that entry into marriage per se did not increase risk. Other risk factors for HIV such as multiple sex partners, alcohol consumption and urban residence were consistent with prior findings [10, 13, 28 - 30]. In addition, the finding of higher HIV incidence among persons in second or higher order marriages than those in their first marriages is consistent with the higher incidence observed in persons who experienced marital dissolution prior to remarriage.

The strategy of ABC (Abstinence, Be faithful and use of condoms) may be difficult to practice within marriage, since a woman's status often depends on childbearing, making abstinence and condom use in marriage culturally inappropriate [7]. In many societies, multiple sexual partners are condoned for men, while women are expected to remain faithful [14, 15], and unprotected sex with extramarital partners is a risk factor for HIV infection [16-22]. Wide age disparities between spouses (e.g >10 years age difference) could contribute to risk if younger women marry older men who are more likely to be infected, and age disparities could reduce a woman's ability to negotiate safer sex behaviors such as condom use increasing risk of HIV infection [23-25]. It is programmatically important to determine subgroups of the population most at risk in order to target intervention.

These findings have implications for targeting of HIV prevention initiatives. If as suggested by these and other data [22], HIIV incidence is highest in never married women and previously married persons of both genders, interventions should be targeted on these subpopulations most at risk of acquisition.

In summary, in this rural Ugandan society currently married women were at decreased risk of incident HIV compared to the never married or those who had experienced marital dissolution.

Acknowledgments

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Table 1

Percent distribution of number of participants by marital status, gender and socio-behavior characteristics

Characteristics	Female						Male					
	Never Married		Currently Married		Previously married		Never Married		Currently Married		Previously married	
	No exposed	%	No exposed	%	No exposed	%	No exposed	%	No exposed	%	No exposed	%
All	2033/24944	8.15	20464/24944	82.04	2447/24944	9.81	2850/17946	15.88	14122/17946	78.7	974/17946	5.4
Study Period												
2000-2002	535/5829	9.18	4785/5829	82.09	509/5829	8.73	741/4571	16.21	3633/4571	79.48	197/4571	4.31
2003-2006	727/8253	8.80	6699/8253	81.17	827/8253	10.02	964/5689	16.94	4428/5689	77.83	297/5689	5.22
2007-2011	771/10862	7.10	8980/10862	82.67	1111/10862	1023	1145/7686	14.90	6061/7686	78.86	480/7686	6.25
Place of residence												
Rural	1546/20495	7.54	17040/20495	83.14	1909/20495	9.31	2277/15023	15.16	11951/15023	79.55	795/15023	5.29
Semi-urban	487/4449	10.95	3424/4449	72.92	538/4449	12.09	573/2923	19.60	2171/2923	74.27	179/2923	6.12
Age in years												
15-19	497/1403	35.42	876/1403	62.44	30/1403	2.14	760/811	93.71	48/811	5.92	3/811	0.37
20-24	626/5488	11.41	4661/5488	84.93	201/5488	3.66	1292/2761	46.79	1371/2761	49.66	98/2761	3.55
25-29	455/6193	7.35	5293/6193	85.47	445/6193	7.35	537/3979	13.50	3191/3979	80.20	251/3979	6.31
30+	455/11860	3.84	9634/11860	81.23	1771/11860	14.93	261/10395	2.51	9512/10395	91.51	622/10395	5.98
Education												
None	49/1826	2.68	1545/1826	84.61	232/1826	12.71	63/617	10.21	493/617	79.90	61/617	9.89
Primary	828/16095	5.14	13504/16095	83.90	1523/11189	10.95	8964/11189	13.61	702/11189	80.11	6.27	
Sec and above	1156/7023	16.46	5415/7023	77.10	452/7023	6.44	1264/6140	20.59	4665/6140	75.98	211/6140	3.44
Age at sex debut												
<15 years	522/6341	8.23	4995/6341	78.77	824/6341	12.99	1033/3014	34.27	1798/3014	59.65	183/3014	6.07
15-17 years	991/13486	7.35	11263/13486	83.52	1232/13486	9.14	1238/7767	15.94	6097/7767	78.50	432/7767	5.56
18+	520/5117	10.16	4206/5117	82.20	391/5117	7.64	579/7345	7.88	6227/7345	84.78	359/7345	4.89
Age at Marriage *												
<15 years	N/A		1295/1536	84.31	241/1536	15.69	N/A		9/9	100.00 0	0.00	
15-17 years	N/A		8460/9450	89.52	990/9450	10.48	N/A		476/505	92.48	29/505	5.74
18+	N/A		9873/11004	89.72	1131/11004	10.28	N/A		12997/13889	93.58	892/13889	6.42
Number of partners in past year												

Characteristics	Female						Male					
	Never Married		Currently Married		Previously married		Never Married		Currently Married		Previously married	
	No exposed	%	No exposed	%	No exposed	%	No exposed	%	No exposed	%	No exposed	%
One	1852/23994	7.72	19934/23994	83.08	2208/23994	9.20	1542/9876	15.61	7837/9876	79.35	497/9876	5.03
2 or More	181/950	19.05	530/950	55.79	239/950	25.16	1308/8070	16.21	6285/8070	77.88	477/8070	5.91
Alcohol use in past year												
Yes	392/5081	7.72	3998/5081	78.69	691/5081	13.60	593/6431	9.22	5431/6431	84.45	407/6431	6.33
No	1641/19863	8.26	16466/19863	82.90	1756/19863	8.84	2257/11515	19.60	8691/11515	75.48	567/11515	4.92
Condom use in past year **												
Never	94/1942		1716/1942	88.36	132/1942	6.80	22/747	2.95	704/747	92.24	17/747	2.28
Inconsistent	351/6789		5840/6789	86.02	598/6789	8.81	545/4907	11.11	4362/4907	88.90	287/4907	5.85
Consistent	133/469		182/469	38.81	154/469	32.84	313/496	63.10	102/496	20.56	81/496	16.33
Age difference in partners												
Same Age	1489/20500		16933/20500	82.60	2078/20500	10.14	2143/14682	14.60	11733/14682	79.91	806/14682	5.49
1-4 years	451/3072		2377/3072	77.38	244/3072	7.94	679/2904	23.38	2071/2904	71.32	154/2904	5.30
5+ years	93/1372		1154/1372	84.11	125/1372	9.11	28/360	7.78	318/360	88.33	14/360	3.89

*
Data on baseline participants only;

**
For those who ever used;

Table 2

HIV incidence stratified by marital status and sex, by time period and socio-demographic characteristics

Characteristics	Female Never Married Cases/py	rate	Currently Married cases/py	rate	Previously Married Cases/py	rate	Male Never Married cases/py	rate	Currently Married cases/py	rate	Previously Married cases/py	rate
All	67/2928.96	2.29	261/29822.63	0.86	102/3562.67	2.86	46/4260.73	1.08	211/21298.52	0.99	40/1475.10	2.71
Study Period												
2000-2002	9/609.55	1.48	48/5288.63	0.91	18/565.64	3.18	11/861.76	1.28	36/4110.91	0.88	8/224.91	3.56
2003-2006	24/994.93	2.41	94/9051.76	1.04	29/1120.87	2.59	12/1357.88	0.88	92/6292.66	1.46	8/416.49	1.92
2007-2011	34/1324.48	2.57	119/15482.23	0.77	55/1876.17	2.93	23/2041.08	1.11	83/10893.96	0.76	24/833.70	2.88
Place of residence												
Rural	49/2224.39	2.20	203/24686.11	0.82	75/2762.07	2.72	38/3402.51	1.12	160/17978.15	0.89	27/1210.71	2.23
Semi-urban	18/704.57	2.55	58/5136.51	1.13	27/800.60	3.37	8/858.22	0.93	51/3320.38	1.55	13/264.40	4.92
Age in years												
15-19	10/706.79	1.41	11/1135.25	0.97	2/40.75	4.91	6/1094.46	0.55	0/64.56	0.00	0/5.41	0.00
20-24	25/878.60	2.85	67/6516.55	1.03	19/296.16	6.41	18/1954.75	0.92	27/1963.48	1.38	9/141.92	6.34
25-29	23/656.16	3.51	78/7801.69	1.00	23/637.10	3.61	16/809.95	1.98	65/4701.95	1.38	8/372.16	2.15
30+	9/687.40	1.31	105/14369.14	0.73	58/2588.66	2.24	6/401.56	1.49	119/14565.05	0.82	23/955.61	2.41
Education												
None	1/70.02	1.43	20/2230.23	0.90	12/332.02	3.61	0/91.43	0.00	13/728.73	1.78	1/95.36	1.12
Primary	29/1186.91	2.44	166/19501.54	0.85	77/2536.14	3.04	32/2302.86	1.39	154/13452.36	1.14	33/1074.37	3.07
Sec and above	37/1672.03	2.21	75/8090.86	0.93	13/694.51	1.87	14/1866.39	0.75	44/7117.47	0.62	6/305.37	1.96

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$P<0.05$

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$P<0.01$

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$P<0.001$

Table 3

HIV incidence stratified by marital status and gender, by risk behaviors

Characteristics	Female						Male					
	Never Married		Currently Married		Previously Married		Never Married		Currently Married		Previously Married	
	cases/py	rate	cases/py	rate	Cases/py	rate	cases/py	rate	cases/py	rate	cases/py	rate
All	67/2928.96	2.29	261/29822.63	0.86	102/3562.67	2.86	46/4260.73	1.08	211/21298.52	0.99	40/1475.10	2.71
Age at sex debut												
<15 years	17/792.36	2.15	91/7163.46	1.27	36/1184.78	3.04	14/1591.40	0.88	29/2774.87	1.04	9/274.36	3.28
15-17 years	35/1407.37	2.49	134/16371.87	0.82	52/1801.61	2.89	19/1840.07	1.03	115/9179.62	1.25	20/655.69	3.05
18+	15/729.23	2.06	36/6287.30	0.57	14/576.28	2.43	13/829.25	1.57	67/9334.04	0.72	11/545.05	2.02
Age at marriage **												
<15 years	N/A		30/1845.32	1.62	10/347.00	2.88	N/A		0/11.95	0.00	0/0.00	NA
15-17 years	N/A		95/12151.91	0.78	39/1426.13	2.73	N/A		12/714.54	1.68	1/43.73	2.29
18+	N/A		127/14427.96	0.88	51/1648.14	3.09	N/A		188/19495.64	0.19	36/1345.93	2.67
Number of partners in past year												
One	56/2674.05	2.09	242/29014.60	0.83	77/3221.36	2.39	18/2307.33	0.78	78/11768.31	0.66	17/758.20	2.24
2 or More	11/254.91	4.32	19/808.03	2.35	25/341.31	7.32	28/1953.40	1.43	133/9530.22	1.40	23/716.91	3.21
Alcohol use in past year												
Yes	14/514.91	2.72	55/5314.83	1.03	27/924.59	2.92	17/813.60	2.09	98/7490.53	1.31	16/561.35	2.85
No	53/2414.06	2.20	206/24507.79	0.84	75/2638.08	2.84	29/3447.12	0.84	113/13807.99	0.82	24/913.75	2.63
Condom use in past year *												
Never	3/166.50	1.80	15/2942.01	0.63	3/226.64	1.32	1/42.01	2.38	8/1264.86	0.63	1/30.05	3.33
Inconsistent	24/597.12	4.02	84/10050.81	0.83	34/1012.50	3.56	11/981.39	1.12	66/7813.43	0.84	17/493.89	3.44
Consistent	1/231.69	0.43	4/315.26	1.27	3/256.48	1.17	4/551.90	0.72	2/179.75	1.11	3/143.78	2.09
Age difference in partners												
Same Age	48/2075.01	2.31	210/24393.49	0.86	79/2985.38	2.65	31/3121.23	0.99	176/17689.34	0.99	33/1217.21	2.78
1-4 years	18/703.43	2.56	33/3679.01	0.90	16/373.28	4.29	13/1100.01	1.18	32/3144.89	1.02	7/238.96	2.93
5+ years	1/150.52	0.66	18/1750.13	1.03	7/204.01	3.43	2/39.48	5.07	34/464.30	0.65	0/18.93	0.00

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For those who ever used;

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Data on baseline participants only

Table 4

Unadjusted and Adjusted HIV incident rate ratios stratified by gender

	Female		Male	
	Unadjusted IRR (95% CI)	Adjusted IRR (95% CI)	Unadjusted IRR (95% CI)	Adjusted IRR (95% CI)
Marital Status				
Never Married	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Currently Married	0.43*** (0.33 0.55)	0.26*** (0.16 0.42)	0.96 (0.71 1.30)	0.70 (0.31 1.59)
Previously married	1.37* (1.02 1.84)	0.85 (0.50 1.44)	2.52*** (1.68 3.78)	2.62* (1.13 6.13)
Age years				
15-19	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
20-24	0.93 (0.64 1.37)	1.61 (0.66 3.93)	2.17* (1.04 4.54)	2.89 (0.67 12.36)
25-29	0.94 (0.64 1.37)	2.04 (0.84 5.00)	2.6.0** (1.27 5.34)	2.45 (0.53 11.42)
30+	0.67* (0.46 0.97)	1.45 (0.60 3.50)	1.52 (0.75 3.09)	2.61 (0.57 11.89)
Education				
Never	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Primary	0.95 (0.68 1.34)	1.09 (0.59 2.02)	0.89 (0.53 1.51)	2.42 (0.59 9.99)
Secondary and above	0.94 (0.66 1.36)	1.07 (0.54 2.12)	0.51* (0.29 0.88)	1.30 (0.30 5.65)
Age at sexual debut				
Less than 15	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
15-17	0.69*** (0.57 0.83)	0.77 (0.54 1.10)	1.16 (0.86 1.56)	1.48 (0.88 2.48)
18+	0.53*** (0.41 0.70)	0.69 (0.44 1.09)	0.73 (0.53 1.01)	1.07 (0.60 1.94)
Number of partners				
One	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
2 or More	3.54*** (2.72 4.62)	2.30*** (1.45 3.63)	2.05*** (1.64 2.56)	1.79** (1.20 2.65)
Alcohol Consumption				
Yes	1.30* (1.05 1.61)	1.47 (0.81 2.64)	1.65*** (1.33 2.05)	0.67 (0.30 1.49)
No	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Condom use				
Never	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Inconsistent	1.78** (1.18 2.69)	1.70* (1.07 2.70)	1.20 (0.68 2.14)	0.96 (0.49 1.89)

	Female		Male	
	Unadjusted IRR (95% CI)	Adjusted IRR (95% CI)	Unadjusted IRR (95% CI)	Adjusted IRR (95% CI)
Consistent	1.60 (0.77 3.20)	0.82 (0.34 1.96)	1.31 (0.59 2.92)	0.84 (0.31 2.25)
Age diff in partners				
Same age	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
1-4 years	1.23 (0.94 1.60)	1.47 (0.99 2.20)	1.06 (0.79 1.44)	1.22 (0.79 1.88)
5+ Years	1.08 (0.72 1.61)	1.13 (0.65 1.95)	0.88 (0.36 2.13)	0.40 (0.05 2.95)
Area of residence				
Rural	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Semi-Urban	1.38** (1.12 1.70)	1.11 (0.76 1.63)	1.61*** (1.25 2.07)	1.87** (1.20 2.92)

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$P<0.05$

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$P<0.01$

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$P<0.001$