Published in final edited form as:

Int J STD AIDS. 2012 July ; 23(7): 468–474. doi:10.1258/ijsa.2012.011361.

HIV infection and sexual partnerships and behaviour among adolescent girls in Nairobi, Kenya

AF Rositch, PhD, MSPH^{*}, P Cherutich, MBChB, MPH[†], P Brentlinger, MD[‡], JNM Kiarie, MBChB MMed[§], R Nduati, MBChB MMed^{**}, and C Farquhar, MD, MPH^{††}

^{*}Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA

[†]National AIDS/STD Control Programme, Ministry of Health-Kenya, Nairobi, Kenya

[‡]Department of Global Health, University of Washington, Seattle, WA, USA

[§]Department of Obstetrics and Gynaecology, University of Nairobi, Nairobi, Kenya

^{**}Department of Paediatrics, University of Nairobi, Nairobi, Kenya

^{††}Departments of Medicine, Epidemiology, and Global Health, University of Washington, Seattle, WA, USA

Summary

Early sexual partnerships place young women in sub-Saharan Africa at high risk for HIV. Few studies have examined both individual- and partnership-level characteristics of sexual relationships among adolescent girls. A cross-sectional survey of sexual history and partnerships was conducted among 761 adolescent girls aged 15–19 years in Nairobi, Kenya. Rapid HIV testing was conducted and correlates of HIV infection were determined using multivariate logistic regression. The HIV prevalence was 7% and seropositive adolescents had a younger age at sexual debut ($P < 0.01$), more sexual partners in 12 months ($P = 0.03$), and were more likely to report transactional or non-consensual sex ($P < 0.01$). Girls who reported not knowing their partner's HIV status were 14 times as likely to be HIV-seropositive than girls who knew their partner's status (adjusted odds ratio: 14.2 [1.8, 109.3]). Public health messages to promote HIV testing and disclosure within partnerships could reduce sexual risk behaviours and HIV transmission among adolescents.

Keywords

HIV; adolescents; risk factors; sexual behaviour; partnerships; sub-Saharan Africa; young women

Correspondence to: A F Rositch arositch@jhsph.edu.

Competing interest and declarations: The authors have no competing interests to disclose.

Author's contribution: AFR conducted the data analysis and was the primary author of this manuscript; PC designed the study, acquired the data and was involved in the drafting and review of this manuscript; PB was involved in the conception and design of the study, and drafting and reviewing the manuscript; JNK was involved in the conception and design of the study, and drafting and reviewing the manuscript; RN was involved in the design of the study, data collection and reviewing the manuscript; CF was involved in the conception, design and data collection of the study and drafting and reviewing the manuscript. All authors have read and approved the final manuscript.

BACKGROUND

Young people in sub-Saharan Africa continue to be one of the populations at greatest risk for HIV infection, and the risk is particularly high among young women.^{1,2} In Kenya, the 2008 Demographic and Health Survey (DHS) reported the median age of sexual debut among Kenyan women was approximately 18 years.² The prevalence of HIV among girls 15–19 years old was 3%, which was four times the HIV prevalence among boys of the same age.² In Africa, individual sexual risk behaviours such as young age at sexual debut, multiple partners and commercial sex work have been associated with increased risk of HIV acquisition among young adults.^{3–10} However, partnership-level characteristics among young people and their association with HIV infection are less clearly understood in sub-Saharan Africa.^{11,12} The few studies on adult and adolescent sexual partnerships have found characteristics, such as concurrency^{13–17} and age discrepancies between partners,^{3,10,18–21} to be important factors for HIV risk and transmission. Because early sexual partnerships may influence adolescent risk of HIV acquisition, a more comprehensive understanding of partnerships and sexual risk behaviours is needed.

In 2005–2006 we conducted a large cross-sectional survey of adolescent girls seeking reproductive health services and found that only 21% of sexually active female adolescents had ever used a condom.²² In the current study, we used data from this survey to examine additional details of sexual behaviours and male partners that expose adolescent girls to HIV. This was done to better understand factors associated with the high risk of HIV among adolescent girls and guide HIV prevention interventions.

METHODS

Study sites and population

A detailed description of the recruitment procedures and study sites were previously described.²² Briefly, the study was carried out in three health facilities in Nairobi, Kenya. The Kariobangi and Lunga Lunga Health Centers are two of 10 municipal clinics that offer voluntary HIV counselling and testing (VCT), screening for sexually transmitted infections (STI) and maternal and child health-care services. Over 30% of all women presenting at these health centres were adolescents seeking reproductive health care. The third site was the adolescent health clinic at Kenyatta National Hospital (KNH), the only public referral hospital in Nairobi. The KNH adolescent clinic offers VCT, post-abortion care and antenatal care.

All adolescent girls presenting to the study sites between August 2005 and May 2006 seeking reproductive health care, defined as ante- or postnatal care, family planning and treatment for STIs, were screened for participation in this cross-sectional study. To be eligible for inclusion, a woman had to be 15–19 years of age, sexually active, able to communicate in Swahili or English and able and willing to provide informed consent. Written informed consent was obtained from all study participants. According to national guidelines on reproductive health and HIV testing and counselling mature minors, such as those in this population who were married, pregnant or seeking STI or reproductive health services, are not required to get consent from their guardians or give assent.

This study received ethical approval from the institutional review boards of the University of Washington and the University of Nairobi. The focus of the main study was to examine dual contraception among adolescents, thus adolescents were excluded if they had not initiated sexual activity, or if they had a previous hysterectomy or tubal ligation.²² After administration of the five-part questionnaire, consenting girls were offered group or

individual HIV counselling and testing using the opt-out approach as per Kenyan Ministry of Health Guidelines.

Measures and analysis

The study questionnaire was based on standardized questions developed and validated by Monitoring and Evaluation to Assess and Use Results-DHS and the Kenya Central Bureau of Statistics. The questionnaire was administered by study nurses to obtain individual-level information such as sociodemographic status, pregnancy and gravidity, perception of risk for HIV infection and sexual behaviour. Partnership-level information included the duration and type of relationship with the partner, age difference, perceived faithfulness, knowledge of partner's HIV status and whether sexual relationships were concurrent or serial. Partner- and partnership-related variables were based on the girls' reports without partner verification. Most variables pertained to the 'current' partner (the main partner with whom the girl was having a sexual relationship with at the time of the questionnaire), however a subset pertained to the 'other' sexual partner (previous or other current sexual partner in the last 12 months, if any). The primary outcome measure was the HIV status of the female adolescents, as indicated by the results of their HIV testing at the time of the study. HIV testing was performed after the administration of the questionnaire so as not to bias HIV risk perception. HIV-1 testing was conducted on site using the Determine HIV-1/HIV-2 (Abbott Laboratories, Abbott Park, IL, USA) or the Bioline HIV-1/2 (Standard Diagnostics, Yonginsi, Korea) rapid tests. Positive tests were confirmed using the Uni-Gold Recombigen rapid HIV test (Trinity Biotech Plc, Bray, Co Wicklow, Ireland). Girls were classified as HIV-1 seropositive if either Determine or Bioline were positive and confirmed with a positive Unigold test, and as HIV-1 seronegative if the Determine or Bioline was negative. Girls were classified as HIV-1 seropositive if either Determine or Bioline were positive and confirmed with a positive Unigold test, and as HIV-1 seronegative if the Determine or Bioline was negative. If either the Determine or Bioline test was positive and the confirmatory Unigold test was negative, this was considered to be an indeterminate result and the participant was not included in this analysis ($n=1$).

To describe the differences and compare the self-reported sexual history and characteristics of sexual partnerships among adolescent girls who were HIV-seropositive compared with HIV-seronegative, Pearson chi-squared and Fisher's exact tests were used for categorical variables and the Mann-Whitney rank-sum test was used for continuous covariates. Unadjusted and adjusted odds ratios (AOR) with robust 95% confidence intervals (CI) for the associations between female adolescent HIV infection and sociodemographic characteristics and sexual behaviours and partnerships were calculated. The multivariate logistic regression model included all covariates found to be significant in bivariate analyses ($P < 0.05$), in addition to study clinic which was included *a priori* as a potential confounder; no interactions between the covariates were found ($P < 0.10$). All analyses were conducted in SAS version 9.2 (SAS Institute, Cary, NC, USA).

RESULTS

Description of study population

The final study population included 761 of 866 eligible female adolescents (88% participation rate) (Figure 1) of whom 55 (7%) were HIV-infected. The median age of adolescents in the study population was 18 years (interquartile range [IQR]):^{17,18} The majority of girls were recruited from the Kariobangi Health Center (56%), were seeking ante- or postnatal care (81%), or were married or cohabiting (68%) (Table 1). Most adolescents had a primary education or less (73%) and were no longer attending school

(94%). Only 14% reported earning a monthly income, with a median of approximately \$32 US dollars per month (IQR: \$20–53).

Adolescent sexual behaviours

The median age at sexual debut was 16 years (IQR: 15–17) and most girls were pregnant at the time of the study (76%) and reported no previous pregnancies (67%) (Table 1). In the previous 12 months, 14% of girls reported two or more sexual partners, 9% self-reported STI and 20% reported any condom use. Over their lifetime, 3% of the adolescents reported exchanging sex for favours or money and 12% reported having been forced to have non-consensual sexual intercourse. The majority of the girls had not had a previous HIV test (60%). In a series of questions to understand their perception of HIV risk, 24% of adolescent girls responded strongly that they were too young to get HIV, 8% thought that they had had sex with someone at risk for HIV and 13% strongly believed that they were at risk for HIV, although it is unknown which girls knew they were HIV-seropositive prior to the study (Table 1).

Adolescent sexual partnerships

In this population of sexually active adolescent girls, 66% of current sexual partnerships were with spouses or cohabitating partners, and most partnerships were at least one year in duration (63%) (Table 2). Nearly all current sexual partners were older men (97%), with a median age difference of five years older (IQR: 3–7). Most girls felt their current partner had been unfaithful (66%) at some point in the partnership. Five percent of adolescents reported the use of drugs or alcohol at the last sexual experience with their current partner. Less than one-quarter of adolescent girls reported knowing their current partner's HIV status (23%); most had partners who had not been tested or did not share their HIV status. A minority of adolescents (10%) reported having other sexual partners in the last 12 months: 27% of these overlapped in time with a primary sexual partner (i.e. concurrent sexual partnerships). The majority of other partners were also older, and girls were more likely to use a condom with their other partner than with their current partner (42% versus 27%; $P=0.01$).

Risk factors for HIV among adolescent girls

Differences were noted in the type of care being sought, as HIV-seropositive adolescents were more likely to seek STI and VCT services compared with HIV-seronegative adolescent girls (Table 1). There was no difference in the proportion of HIV-seropositive compared with HIV-seronegative girls with an older partner ($P=0.60$) nor in the age difference of older partners ($P=0.68$) (Table 2). There was no difference in reported use of condoms by HIV-seropositive compared with HIV-seronegative adolescent girls ($P=0.77$). Other partnership characteristics, including use of drugs or alcohol prior to sex ($P=0.78$) and concurrent partnerships (0.08) did not differ between HIV-seropositive and HIV-seronegative girls.

Using univariate logistic regression models (Table 3), we determined that adolescent girls who were earning an income had a two-fold increased risk of being HIV-seropositive as compared with those without an income (odds ratio [OR] =2.0; 95% CI =1.0, 3.9). In addition, each year increase in the age at sexual debut (OR =0.8; 95% CI =0.6, 0.9) was associated with a 25% decrease in the odds of HIV infection (Table 3). Each additional year since sexual debut (OR =1.5; 95% CI =1.2, 1.7) and additional lifetime sexual partner (OR =1.4; 95% CI =1.0, 2.0) increased the odds of HIV infection among adolescent girls. The odds of HIV infection were also increased among adolescents who reported having an STI in the previous year (OR =4.6; 95% CI =2.4, 8.9), ever exchanging sex for money (OR =5.6; 95% CI =2.2, 14.1) and ever having non-consensual sex (OR =2.86; 95% CI =1.5, 5.5).

Adolescent girls who reported not knowing their partner's HIV status or having partners who had not been tested had higher odds of HIV infection (OR =17.7; 95% CI =2.4, 128.5).

In multivariate logistic regression models, the strongest independent correlate of HIV infection among adolescent girls was not knowing their sexual partner's HIV status (AOR =14.2; 95% CI =1.8, 109.3) (Table 3). In addition, girls with more years since sexual debut (AOR =1.3; 95% CI =1.1, 1.6), who reported an STI (AOR =2.8; 95% CI =1.2, 7.6) and who had ever given birth (AOR =2.0; 95% CI =1.1, 4.1) were significantly more likely to be HIV-seropositive.

DISCUSSION

The prevalence of HIV was over 7% among sexually active adolescents in our study populations, which was more than twice the 2008 DHS estimate for all girls aged 15–19 years in Kenya. Several modifiable risk factors, including knowledge of partner HIV status, were strongly associated with HIV infection. Despite high HIV prevalence and ongoing unprotected sex, a quarter of adolescents believed they were too young to become infected with HIV. These adolescents also reported sexual situations that put them at high risk for HIV, such as exchanging sex for money and being forced to have sex against their will. The results of this large, cross-sectional survey of sexually active adolescent girls in Nairobi, Kenya, demonstrate the urgent need to reach out to this population at high-risk for HIV. Scaling up of adolescent friendly couple-based interventions that include HIV testing, disclosure support, condom distribution and antiretroviral therapy may reduce HIV risk among young women in Africa.

Our results are consistent with previous literature that have identified risk factors for HIV infection among adolescent girls to be increased number of sexual partners, young age at sexual debut, increased years since sexual debut and history of STIs. Several studies have found strong associations between HIV infection and sexual partnerships with older men.^{10,19,20,23} Unlike previous studies, we observed no difference in the proportion of adolescents who currently or within the previous year had older partners and no difference in the age difference between recent partners among HIV-seropositive compared with HIV-seronegative girls. Similarly, Amornkul *et al.*²⁴ reported no association between male partner's age and female HIV infection, however, young women in their population were less likely to have older partners. There is a strong body of literature suggesting that sexual concurrency is a key driver of the HIV epidemic.^{15,25,26} Although there was a high prevalence of concurrent sexual relationships in our young population, we did not find a clear association with HIV infection. Our cross-sectional assessment of concurrency was limited to only one other sexual partner in the previous 12 months.

In sub-Saharan Africa, commercial sex work has been strongly associated with HIV positivity. Few studies have examined occasional transactional sex and HIV infection among adolescent girls.^{27–29} In our population of adolescents, a small percentage of girls reported ever exchanging sex for money or favours, and those who did were more than five times as likely to be HIV-seropositive. However, there was a diminished association between a girl reporting having ever exchanged sex for money and HIV infection after controlling for other risk factors. The difference between unadjusted and adjusted estimates may be due to the fact that we were not able to include data on frequency or duration of transactional sex and due to the small numbers of adolescent girls reporting transactional sex. Similarly, we observed a strong association between self-reported non-consensual sex and HIV infection, but this association was attenuated after controlling for confounding variables. It is likely that trauma associated with non-consensual sex and lack of condom use in these high-risk situations put these adolescents at an increased risk of HIV, however, in

this study we cannot distinguish between verbal or physical persuasion, coercion by other means and rape.

Adolescent girls enrolled in the study were asked if they knew their current or previous sexual partner's HIV status. Having a partner who was not tested, or not knowing the result if the partner was tested, was the strongest independent predictor of HIV infection. These girls were more than 14 times as likely to be HIV-seropositive compared with girls who had partners who were tested and shared their HIV test results. This finding is independent of the partner's actual HIV status, which we did not know. Although knowledge of partner status was not collinear with other risk factors in the model, it is possible that this variable is actually a proxy for male partner's actual HIV status or related to other unmeasured confounders. For example, it is possible that partners who did not share or did not know their status were more likely to be HIV-seropositive as compared with tested partners who disclosed their HIV status. In addition, the observed association could be due to differences in sexual risk behaviours among those who know compared with those who do not know their partner's HIV status. The association between knowledge of partner status and HIV seropositivity, however, is based on a small sample size, which limited our ability to explore the association between partner test outcome knowledge and risk factors for HIV such as condom use.

The main strength of this study was the large number of at-risk sexually active adolescent girls who provided extensive data on individual sexual characteristics and data on their sexual partnership characteristics. However, we could not distinguish between sexually transmitted HIV and vertically transmitted HIV in this population. This study focused on adolescents who were seeking care for gynaecological problems such as STIs or family planning and pregnancy-related issues. Whereas this population is likely representative of sexually active adolescents in urban settings in sub-Saharan Africa, these findings may not be generalizable to all groups of adolescents, including young women in rural settings, those not seeking gynaecological or ante- and postnatal care, or those with less education or fewer resources related to health-seeking behaviour. Also, the majority of adolescents in our study were currently pregnant, making these findings less generalizable to nulligravid young women. However, there were no statistically significant differences in the sexual histories or prevalence of HIV among our pregnant compared with non-pregnant participants. Most questions on sexual behaviour were based on the previous 12 months or recent partnerships in order to minimize recall bias yet remain representative of the girls' histories of sexual risk and partnerships. The use of face-to-face interviews to obtain self-reported information may have resulted in adolescent girls under-reporting their high-risk sexual behaviours and partnerships.³⁰ Published studies have documented significant differences in sensitive data obtained on face-to-face interviews versus a more confidential method such as audio computer-assisted self-interview.³¹

In summary, nearly one-quarter of sexually active adolescent girls believed they were too young to become infected with HIV. We found a low prevalence of condom use, despite multiple and concurrent partnerships. Programmes that reinforce messages of condom use would have the dual benefit of HIV and pregnancy prevention, both important public health issues for young women. Although most individual sexual characteristics were more strongly associated with HIV infection than partnership characteristics, the exception was knowledge of partner's HIV status. Our data strongly support ongoing 'know your status' campaigns. 'Know your partner's status' represents a tangible intervention to reduce HIV transmission within young heterosexual couples. Messages that emphasize disclosure within partnerships regarding HIV testing outcomes should be incorporated into HIV testing and prevention programmes. In light of the fact that up to 50% of all couples that present to VCT

services in sub-Saharan Africa are HIV-discordant,^{32,33} these intervention messages are applicable to individuals of all ages in sexual partnerships.

Acknowledgments

Funding statement: AFR was supported in part by the NIH Fogarty International Center through the International Clinical Research Fellows Program at Vanderbilt University (grant R24 TW007988). PC was a scholar in the AIDS International Training and Research Program supported by the NIH Fogarty International Center (grant D43 TW00007). CF received support from the NIH grant K24 AI087399-01A1.

References

1. The National AIDS and STI Control Programme. Kenya AIDS Indicator Survey: Preliminary Report. Kenyan Ministry of Health, Nairobi. Kenya: 2007.
2. Kenya Demographic and Health Survey. Kenya National Bureau of Statistics, Nairobi. Kenya: 2008–2009.
3. Hallett TB, Gregson S, Lewis JJ, Lopman BA, Garnett GP. Behaviour change in generalised HIV epidemics: impact of reducing cross-generational sex and delaying age at sexual debut. *Sex Transm Infect.* 2007; 83(Suppl 1):i50–4. [PubMed: 17314125]
4. Hallett TB, Lewis JJ, Lopman BA, et al. Age at first sex and HIV infection in rural Zimbabwe. *Stud Fam Plann.* 2007; 38:1–10. [PubMed: 17385378]
5. Kelly RJ, Gray RH, Sewankambo NK, et al. Age differences in sexual partners and risk of HIV-1 infection in rural Uganda. *J Acquir Immune Defic Syndr.* 2003; 32:446–51. [PubMed: 12640205]
6. Akwara PA, Madise NJ, Hinde A. Perception of risk of HIV/AIDS and sexual behaviour in Kenya. *J Biosoc Sci.* 2003; 35:385–411. [PubMed: 12887220]
7. Jaspán HB, Berwick JR, Myer L, et al. Adolescent HIV prevalence, sexual risk, and willingness to participate in HIV vaccine trials. *J Adolesc Health.* 2006; 39:642–8. [PubMed: 17046499]
8. Pettifor AE, van der Straten A, Dunbar MS, Shiboski SC, Padian NS. Early age of first sex: a risk factor for HIV infection among women in Zimbabwe. *AIDS.* 2004; 18:1435–42. [PubMed: 15199320]
9. Pettifor A, Macphail C, Rees H, Cohen M. HIV and sexual behavior among young people: the South African paradox. *Sex Transm Dis.* 2008; 35:843–4. [PubMed: 18716569]
10. Sturdevant MS, Belzer M, Weissman G, Friedman LB, Sarr M, Muenz LR. The relationship of unsafe sexual behavior and the characteristics of sexual partners of HIV infected and HIV uninfected adolescent females. *J Adolesc Health.* 2001; 29(3 Suppl):64–71. [PubMed: 11530305]
11. Chapman R, White RG, Shafer LA, et al. Do behavioural differences help to explain variations in HIV prevalence in adolescents in sub-Saharan Africa? *Trop Med Int Health.* 2010; 15:554–66. [PubMed: 20345559]
12. Powers KA, Hoffman IF, Ghani AC, et al. Sexual partnership patterns in Malawi: implications for HIV/STI transmission. *Sex Transm Dis.* 2011; 38:657–66. [PubMed: 21301383]
13. Flom PL, Friedman SR, Kottiri BJ, et al. Stigmatized drug use, sexual partner concurrency, and other sex risk network and behavior characteristics of 18- to 24-year-old youth in a high-risk neighborhood. *Sex Transm Dis.* 2001; 28:598–607. [PubMed: 11689758]
14. Lagarde E, Auvert B, Carael M, et al. Concurrent sexual partnerships and HIV prevalence in five urban communities of sub-Saharan Africa. *AIDS.* 2001; 15:877–84. [PubMed: 11399960]
15. Mah TL. Prevalence and correlates of concurrent sexual partnerships among young people in South Africa. *Sex Transm Dis.* 2010; 37:105–8. [PubMed: 19823109]
16. Manhart LE, Aral SO, Holmes KK, Foxman B. Sex partner concurrency: measurement, prevalence, and correlates among urban 18–39-year-olds. *Sex Transm Dis.* 2002; 29:133–43. [PubMed: 11875374]
17. Sandoy IF, Dzikedzeke K, Fylkesnes K. Prevalence and correlates of concurrent sexual partnerships in Zambia. *AIDS Behav.* 2010; 14:59–71. [PubMed: 18841461]

18. Glynn JR, Carael M, Auvert B, et al. Why do young women have a much higher prevalence of HIV than young men? A study in Kisumu, Kenya and Ndola, Zambia. *AIDS*. 2001; 15(Suppl 4):S51–60. [PubMed: 11686466]
19. Gregson S, Nyamukapa CA, Garnett GP, et al. Sexual mixing patterns and sex-differentials in teenage exposure to HIV infection in rural Zimbabwe. *Lancet*. 2002; 359:1896–903. [PubMed: 12057552]
20. Luke N. Confronting the ‘sugar daddy’ stereotype: age and economic asymmetries and risky sexual behavior in urban Kenya. *Int Fam Plan Perspect*. 2005; 31:6–14. [PubMed: 15888404]
21. Pettifor A, O’Brien K, Macphail C, Miller WC, Rees H. Early coital debut and associated HIV risk factors among young women and men in South Africa. *Int Perspect Sex Reprod Health*. 2009; 35:82–90. [PubMed: 19620092]
22. Cherutich P, Brentlinger P, Nduati R, Kiarie JN, Farquhar C. Condom use among sexually active Kenyan female adolescents at risk for HIV-1 infection. *AIDS Behav*. 2008; 12:923–9. [PubMed: 18688705]
23. Pettifor AE, Rees HV, Kleinschmidt I, et al. Young people’s sexual health in South Africa: HIV prevalence and sexual behaviors from a nationally representative household survey. *AIDS*. 2005; 19:1525–34. [PubMed: 16135907]
24. Amornkul PN, Vandenhoude H, Nasokho P, et al. HIV prevalence and associated risk factors among individuals aged 13–34 years in Rural Western Kenya. *PLoS One*. 2009; 4:e6470. [PubMed: 19649242]
25. Morris M, Kretzschmar M. Concurrent partnerships and the spread of HIV. *AIDS*. 1997; 11:641–8. [PubMed: 9108946]
26. Mah TL, Halperin DT. Concurrent sexual partnerships and the HIV epidemics in Africa: evidence to move forward. *AIDS Behav*. 2010; 14:11–6. discussion 34–7. [PubMed: 18648926]
27. Adedimeji AA, Omololu FO, Odutolu O. HIV risk perception and constraints to protective behaviour among young slum dwellers in Ibadan, Nigeria. *J Health Popul Nutr*. 2007; 25:146–57. [PubMed: 17985816]
28. Hein K, Dell R, Futterman D, Rotheram-Borus MJ, Shaffer N. Comparison of HIV+ and HIV– adolescents: risk factors and psychosocial determinants. *Pediatrics*. 1995; 95:96–104. [PubMed: 7770318]
29. Marshall BD, Shannon K, Kerr T, Zhang R, Wood E. Survival sex work and increased HIV risk among sexual minority street-involved youth. *J Acquir Immune Defic Syndr*. 2010; 53:661–4. [PubMed: 19927006]
30. Minnis AM, Steiner MJ, Gallo MF, et al. Biomarker validation of reports of recent sexual activity: results of a randomized controlled study in Zimbabwe. *Am J Epidemiol*. 2009; 170:918–24. [PubMed: 19741042]
31. Langhaug LF, Sherr L, Cowan FM. How to improve the validity of sexual behaviour reporting: systematic review of questionnaire delivery modes in developing countries. *Trop Med Int Health*. 2010; 15:362–81. [PubMed: 20409291]
32. Guthrie BL, de Bruyn G, Farquhar C. HIV-1-discordant couples in sub-Saharan Africa: explanations and implications for high rates of discordancy. *Curr HIV Res*. 2007; 5:416–29. [PubMed: 17627505]
33. Eyawo O, de Walque D, Ford N, Gakii G, Lester RT, Mills EJ. HIV status in discordant couples in sub-Saharan Africa: a systematic review and meta-analysis. *Lancet Infect Dis*. 2010; 10:770–7. [PubMed: 20926347]

Figure 1.

Flowchart of study participants by HIV infection and marital status. Final study population included 761 adolescent girls from three Nairobi health clinics

Table 1

Sociodemographic and sexual characteristics of female adolescents attending reproductive health clinics in Nairobi, Kenya

Characteristics*	HIV-seronegative (n = 706) N (%) or median (IQR)	HIV-seropositive (n = 55) N (%) or median (IQR)	Overall (N = 761) N (%) or median (IQR)
Sociodemographics			
Age in years	18 (17–18)	18 (17–18)	18 (17–18)
Reason for attending clinic			
Ante- and postnatal, family planning	612 (87%)	43 (78%)	655 (86%)
STI evaluation, VCT, reproductive needs	94 (13%)	12 (22%)	106 (14%)
Marital status			
Not currently married [†]	233 (33%)	15 (27%)	248 (33%)
Married	282 (40%)	24 (44%)	306 (41%)
Partnered/cohabitating	185 (26%)	16 (29%)	201 (27%)
Participant is an orphan			
Yes	99 (14%)	11 (20%)	110 (14%)
Current living situation			
Lives with parent(s) or family member(s)	208 (29%)	14 (25%)	222 (29%)
Lives with current partner	312 (44%)	29 (53%)	341 (45%)
Lives with non-relative, other [‡]	186 (26%)	12 (22%)	198 (26%)
Education level attained			
Primary or less	496 (72%)	45 (83%)	541 (73%)
Vocational, secondary and greater	190 (28%)	9 (17%)	199 (27%)
Still attending school			
Yes	39 (6%)	2 (4%)	41 (6%)
Currently earn money			
Yes	91 (13%)	13 (24%)	104 (14%)
Monthly income	\$33 (\$20–53)	\$20 (\$13–33)	\$32 (\$20–53)
Sexual behaviours			
Age at first intercourse	16 (15–17)	15 (14–16)	16 (15–17)
Years since sexual debut [§]	1 (1–3)	3 (2–4)	2 (1–3)
Currently pregnant			
Yes	535 (77%)	39 (71%)	574 (76%)
Number of previous pregnancies			
0	467 (68%)	27 (50%)	494 (67%)
1	105 (15%)	9 (17%)	114 (15%)
2+	115 (16%)	18 (33%)	133 (17%)
Number of sexual partners in last 12 months ^{**}			
1	607 (87%)	42 (76%)	649 (86%)
2+	91 (13%)	13 (24%)	104 (14%)
Treated for STI in last 12 months			
Yes	54 (8%)	15 (28%)	69 (9%)

Characteristics*	HIV-seronegative (n = 706)	HIV-seropositive (n = 55)	Overall (N = 761)
	N (%) or median (IQR)	N (%) or median (IQR)	N (%) or median (IQR)
Ever exchanged sex for money			
Yes	18 (3%)	7 (13%)	25 (3%)
Ever had non-consensual sex ^{††}			
Yes	75 (11%)	14 (25%)	89 (12%)
Previous HIV test			
Yes	274 (40%)	22 (40%)	296 (40%)
Individual beliefs of HIV risk ^{‡‡}			
Too young to get HIV	170 (24%)	9 (17%)	179 (24%)
Had sex with someone at risk of HIV	52 (7%)	9 (17%)	61 (8%)
At risk for HIV	91 (13%)	10 (19%)	101 (13%)

STI =sexually transmitted infections; VCT =voluntary HIV counselling and testing; IQR =interquartile range

* Missing data: marital status (n=6); education level (n=21); still attending school (n=20); currently earning money (n=22); number sexual partners (n=8); treated for STI (n=7); exchanged sex for money (n=11); non-consensual sex (n=5); currently pregnant (n=9); previous pregnancies (n=20); previous HIV test (n=13)

[†] Not currently married includes separated, divorced and widowed

[‡] Non-relative, alone, unknown or other

[§] Years since sexual debut is equal to current age minus age at sexual debut

^{**} For pregnant adolescents, this refers to the 12 months before realizing they were pregnant

^{††} Self-reported response to the question 'have you ever been forced to have sex against your will?'

^{‡‡} Risk belief categories are not mutually exclusive

Table 2

Characteristics of adolescent sexual partnerships in Nairobi, Kenya

Characteristics*	HIV-seronegative (n = 706)	HIV-seropositive (n = 55)	Overall (N = 761)
	N (%) or median (IQR)	N (%) or median (IQR)	N (%) or median (IQR)
Relation to current sexual partner			
Spouse/cohabitating partner	462 (65%)	40 (73%)	502 (66%)
Boyfriend/fiancé/other [†]	244 (35%)	15 (27%)	259 (34%)
Current relationship duration ≤ 1 year			
Yes	438 (63%)	36 (67%)	474 (63%)
Current partner is older			
Yes	683 (97%)	53 (98%)	736 (97%)
Age difference with current partner [‡]	5 (3–7)	5 (3–9)	5 (3–7)
Any condom use with current partner in last 12 months			
Yes	140 (20%)	10 (18%)	150 (20%)
Belief that current partner has been unfaithful			
Yes	464 (67%)	29 (58%)	493 (66%)
Knowledge of partner's HIV status			
Yes, know status	174 (25%)	1 (2%)	175 (23%)
No, do not know status [§]	532 (75%)	54 (98%)	586 (77%)
Drug or alcohol use at last sex			
Yes	33 (5%)	3 (6%)	36 (5%)
Has had sex with other man in last 12 months**			
Yes	68 (10%)	8 (15%)	76 (10%)
Relation to other sexual partner			
Spouse, boyfriend or fiancé	46 (68%)	5 (63%)	51 (67%)
Friend, acquaintance or relative ^{††}	22 (32%)	3 (38%)	25 (33%)
Concurrent sexual relationship ^{‡‡}			
Yes	14 (23%)	4 (57%)	18 (27%)
Other partner is older			
Yes	51 (91%)	7 (88%)	58 (91%)
Age difference with other partner ^{§§}	3 (2–5)	3 (2–4)	3 (2–5)
Any condom use with other partner			
Yes	19 (28%)	2 (25%)	21 (27%)

IQR =interquartile range

* Missing data: current partner age difference (n=14); unfaithful (n=18); sex with other man (n=8); concurrent relationship (n=9); other partner age difference (n=5); condom with other partner (n=5)

[†] Other includes friends, other acquaintances and unknown (n=25)

[‡] This includes: overall 97% of women had older partners (n=736); 98% of HIV-seronegative (n=53) and 97% of HIV-seropositive women had older partners (n=683)

[§] 'No' includes women who do not know their partner's status (n=35) and women with partners who have not been tested (n=552)

^{**} Other man refers to a different partner than the current sexual partner, in the last 12 months

^{††} A relative/family member ($n=1$)

^{††} Self-reported response to the question: 'In the last 12 months, would you say one sexual relationship ended before the other relationship started?'
Response options: yes, one man a time (serial) or no, more than one man at a time (concurrent)

^{§§} This includes: overall 91% of women had an older partner ($n=58$); 91% of HIV-seronegative ($n=51$) and 88% of HIV-seropositive ($n=7$) had older partners

Table 3

Comparison between HIV-seronegative and HIV-seropositive adolescents' sociodemographic, sexual behaviour and partnership characteristics

	Unadjusted odds ratio (95% CI)	P value	Adjusted odds ratio (95% CI)*
Sociodemographics			
Age in years	1.2 (0.9, 1.5)	0.33	
Marital status			
Not currently married	REF	0.66	
Married	1.3 (0.7, 2.6)		
Partnered/cohabitating	1.3 (0.7, 2.8)		
Care type sought			
Ante- or postnatal, family planning	REF	0.08	
STI, VCT, other	1.8 (0.9, 3.6)		
Health clinic			
Lunga Lunga	REF	0.003	
Kariobangi	3.5 (1.4, 8.3)		3.0 (1.2, 7.6)
KNH	5.0 (1.9, 13.6)		2.6 (0.7, 9.3)
Participant is an orphan			
Yes	1.5 (0.8, 3.1)	0.22	
Years of education	0.9 (0.8, 1.0)	0.002	1.0 (0.8, 1.1)
Currently earn money			
Yes	2.0 (1.0, 3.9)	0.03	0.5 (0.2, 1.2)
Sexual behaviour and partners			
Age at first intercourse	0.8 (0.6, 0.9)	<0.001	
Years since sexual debut	1.5 (1.2, 1.7)	<0.001	1.3 (1.1, 1.6)
Number of partners in last 12 months	1.4 (1.0, 2.0)	0.03	1.2 (0.7, 2.2)
Treated for STI in last 12 months			
Yes	4.6 (2.4, 8.9)	<0.001	2.8 (1.1, 7.6)
Ever exchange sex for money			
Yes	5.6 (2.2, 14.1)	<0.001	1.8 (0.5, 7.2)
Ever non-consensual sex			
Yes	2.9 (1.5, 5.5)	<0.001	1.9 (0.8, 5.5)
Any condom use in last 12 months			
Yes	0.9 (0.4, 1.8)	0.77	
Ever given birth			
Yes	2.2 (1.3, 3.8)	0.01	2.0 (1.1, 4.1)
Currently pregnant			
Yes	0.7 (0.4, 1.4)	0.33	
Previous HIV test			
Yes	1.0 (0.6, 1.7)	0.95	
Current sex partner is older			
Yes	1.7 (0.2, 12.9)	0.60	

	Unadjusted odds ratio (95% CI)	P value	Adjusted odds ratio (95% CI)*
Age difference with current partner	1.0 (1.0, 1.1)	0.68	
Knowledge of partner's HIV status			
No, do not know status	17.7 (2.4, 128.5)	<0.001	14.2 (1.8, 109.3)
Drug or alcohol use at last sex			
Yes	1.2 (0.4, 4.0)	0.78	
Other sexual relationships			
Serial relations in last 12 months	REF		
Concurrent in last 12 months	4.4 (0.9, 22.0)	0.08	

CI =confidence interval; STI =sexually transmitted infection; VCT =voluntary HIV counselling and testing; KNH =Kenyatta National Hospital; REF =referent group

* Health clinic attended was included in adjusted model as an *a priori* confounder. Age at sexual debut was not included in the multivariable model due to collinearity with years since sexual debut. All other variables with $P < 0.05$ in bivariate analysis were entered into the final adjusted model