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HIV, Syphilis, and Gonorrhea in Rural Kenya: Prevalence and Risk Factors

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2010

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Abstract

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By Baevin S. Carbery

Two baseline cross sectional surveys in rural western Kenya were performed in a largely anti-retroviral naïve population to determine the prevalence and risk factors of seroprevalent infection of HIV, syphilis and gonorrhea infection. Higher prevalence of infection was found in women compared to men for HIV, syphilis and gonorrhea infection. Risk factors that were found to be associated with higher odds of HIV infection were being widowed compared with being married, having a higher number of lifetime sexual partners, being older, and having an occupation that is usually associated with a higher socio-economic status. Lower odds of HIV infection were found to be associated with being single, being younger, being Catholic, and being unemployed or having an occupation usually associated with a lower socio-economic status. The risk factors associated with syphilis were generally the same as those associated with HIV, but the association was often reversed for gonorrhea infection compared to HIV infection. The risk factors determined by these models can be used to target high risk behaviors and groups for interventions.

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BACKGROUND

In eastern Sub-Saharan Africa (SSA), sexually transmitted infections (STIs) are major causes of morbidity and mortality. The most important of these STIs is Human immunodeficiency virus (HIV), with the World Health Organization (WHO) estimating that almost 23 million people in Africa were infected in 2010 (1). The youth population, particularly young females, is at the highest risk of HIV infection. The combination of high prevalence and common transmission leads to negative health outcomes from HIV as well as from other STIs, like syphilis and gonorrhea. Although treatable, syphilis and gonorrhea contribute to the burden STIs put on eastern SSA. HIV, syphilis, and gonorrhea all have known transmission routes and known effective prevention methods, yet these STIs remain common in eastern SSA. In order to effectively reduce the prevalence in this area, an understanding of the relative prevalence rates and risk factors in a young population is needed.

HIV

As the STI that causes the most morbidity and mortality, HIV, and the disease caused by it, Acquired Immune Deficiency Syndrome (AIDS) is of great concern. In SSA, sexual transmission is the primary mode of HIV infection. For example, in Kenya, 90% of HIV transmission is sexual (2, 3), with a higher prevalence usually found in women compared to men.. This gender prevalence is demonstrated in a suburb of Mombasa, Kenya, where the prevalence of HIV was found to be 10.8% overall, 13.7% among women and 8.0% among men (4). HIV prevalence rates are higher in eastern Africa compared to western Africa. For example, the HIV prevalence rate among

sexually active men and women, respectively, was 21.1% and 31.6% in Kisumu, Kenya, and 25.4% and 35.1% in Ndola, Zambia, compared with 3.9% and 4.0% in Cotonou, Benin, 4.4% and 8.4% in Yaoundé, Cameroon (5). This study concluded that behavioral factors are not as important in the differential risk as biological factors, such as male circumcision.

Three randomized control trials in regions in Africa with predominantly heterosexual HIV transmission showed that male circumcision is 50-60% effective in preventing HIV acquisition (6, 7, 8). The hypothesized mechanism of protection is the removal of the foreskin with its high density of target cells for HIV (Langerhans cells, $CD4^+$ cells and macrophages) close to the skin surface in the inner mucosa (which is inverted and exposed during sexual intercourse) (9, 10, 11, 12). Given the efficacy of male circumcision in reducing HIV incidence in heterosexual men, a national Voluntary Medical Male Circumcision program has been established in Kenya. An evaluation one year after launch showed that the primary barriers to the uptake of male circumcision included culture and religion, time away from work and possible adverse events, while the facilitating factors for male circumcision included social pressure, protection against HIV and other STIs and hygiene (13).

While circumcision provides a possible intervention, the high HIV prevalence and incidence rates in SSA are not fully understood. A high prevalence of concurrent partnerships has been one leading hypothesis (14). A recent systematic review concluded that concurrency is not a main driver in eastern and southern Africa (15). However, others were not convinced; they believe concurrency, along with inconsistent condom use and low male circumcision rates are the main drivers of the HIV epidemic in eastern

Africa, and further research and interventions focused on these drivers will produce the most effective results (16).

In Kenya, risk factors for HIV acquisition for women in a nationally representative study in 2007 were the number of lifetime sexual partners, being infected with HSV-2, being widowed versus being never married and consistent condom use with last sexual partner (17). Among men, the risk factors were the number of lifetime sexual partners, being between 30-39 years old, syphilis infection, consistent condom use with last sex partner and the lack of circumcision (17). Marital status, the number of lifetime sexual partners, and having a job were found to be risk factors for HIV in previous studies in urban areas in Kenya (5, 18). Along with similar findings from the previous studies regarding HIV and marital status, an interesting demographic risk factor for HIV found in a study population taken from a suburb of Mombasa, Kenya was religion: Protestant religion and Catholic religion had a higher risk of HIV, compared with Muslim religion (4). Religion may impact behaviors that impact HIV and STI transmission, but one study found that in rural Malawi Christian women, including Catholics, were no more likely to accept condom use than Muslim women either within or outside of marriage (19). As well as providing information to assist in a better understanding of the prevalence rate of eastern SSA, the examination of risk factors for HIV can lead to targeted interventions that could reduce the incidence rates of HIV, and eventually the prevalence rates.

Other Sexually Transmitted Diseases

Syphilis and gonorrhea, as well as other STIs, are also important diseases to target for control. Like HIV, they are both more common in eastern SSA than western SSA and

are spread primarily through sexual transmission. Syphilis is a curable infection that is both sexually transmitted and passed from a mother to fetus during pregnancy; if left untreated in pregnant women, may result in stillbirth, prematurity and neonatal deaths (20). In 2006, the WHO estimated that there are 4 million new cases of syphilis a year in SSA (20). Earlier, the WHO gave a prediction of 16 million new gonorrhea cases per year (21), which if left untreated can cause infertility in both men and women. These STIs are transmitted through the same sexual routes as HIV, and it is possible that the same risky behaviors are spreading HIV, syphilis and gonorrhea, and so reducing risk factors for other STIs may reduce HIV transmission as well. In addition, existing infection for both syphilis and gonorrhea can increase the likelihood of transmission of HIV, so it is important to be able to treat and control other STIs if HIV is going to be managed – currently and with a potential future vaccine.

In a study of syphilis prevalence in Kenya, the overall prevalence was 1.8%, with no difference between men and women (22). It also indicated that higher prevalence was associated with age, lower education, less wealth, more lifetime sexual partners and testing positive for HIV or HSV-2, while decreased prevalence was associated with condom use during last sexual activity in men (22). In a suburb of Mombasa, Kenya, the prevalence of syphilis was 1.3% overall, 1.2% in men and 1.5% in women (4). In the four city study, the prevalence of syphilis for both men and women was between 3% and 4% in Kisumu, Kenya and above 10% in Ndola, Zambia (23). Among men, the prevalence of syphilis increased with age in both cities, while in Ndola there was also an increased risk in men who were married, men and women who had more lifetime sexual

partners in men who drank alcohol more than once a week, and women who had a lower education status, while there was a lower risk in men who were students (23).

In a suburb of Mombasa, Kenya, the prevalence of gonorrhea was 0.9% in the overall population, with a prevalence of 1.2% in men and 0.7% in women (4). In a four city study, the number of gonorrhea cases was too low to do any analysis, as in Kisumu, Kenya the prevalence was 0% for men and 0.9% for women (23). Among fishermen in Kisumu, Kenya, gonorrhea prevalence was 1.2% (24). In an analysis of pooled data from recent microbicide trials, the pooled incidence rate of gonorrhea was 9.9 per 100 person-years, and incident gonorrhea was associated with baseline chlamydia, younger age, less education, and condom use for contraception (25). One possible risk factor for gonorrhea was living in a rural area compared to an urban one, which is also associated with being more likely to be married, as well as being more likely to experience more pregnancies and have partners more than 10 years older (26).

One of the common risk factors for both syphilis and gonorrhea was more sexual partners, which was associated with the urban women in this analysis, as was increased condom usage. This protective effect of condoms was also found in a study examining incidence rates of gonorrhea in men, which also found that the risk of STI infection was higher in those who reported multiple sex partners in the last 30 days and among men with lower educational attainment (27). Compared to pregnant women without STIs such as syphilis and gonorrhea, pregnant women with STIs were younger than 21, had a primary school education only, had a history of a previous STI and tended to have more lifetime sexual partners (28). STIs, including HIV, have high prevalence rates among

mobile occupation groups, which include fishermen, truck driver and migrant workers (24).

There may be different STI rates in rural and urban areas due to cultural or social differences, as well as the differences due directly to the rural setting, such as farming as a common occupation. Investigators surveyed married and previously married persons in rural Mozambique and determined that being male, married, being Catholic or Protestant when compared with those attending Zionist churches, and having genital discharge and ulcers in the last year were associated with risky sexual behavior (29). These differences could lead to a difference in types and amount of risk sexual behaviors. The investigators concluded that although it seemed that those who had a secondary education or who had a recent STI were knowledgeable about prevention strategies and condom usage, it is important that HIV prevention programs take the cultural, economic, and religious conditions of the population into account, and modify the programs based on the rural or urban nature of the target area (29). However, this study found that while 66.7% of these married women believed condom use was acceptable within marriage when one partner suspects or knows the other to be HIV infected, only 38.2% believed condoms are acceptable within a marriage generally, and still fewer, 13.8%, reported ever having used condoms within a marriage (29).

Targeted and culturally appropriate programs are important, as an analysis of married partner condom use in rural Malawi further showed that spouses were resistant to use a condom within their marriage, while also showing some evidence that condoms were more commonly used with extra-marital partners (30). In order to bring about a change in the incidence of HIV and other STIs, this cultural view of condoms needs to be

understood and the prevention programs need to work with the behavior of the people. In this case, the Malawi government has a policy of encouraging condom use with any partner other than one's spouse to bring about a change of sexual behavior that maximizes acceptance and adherence.

Although studies differ on whether there risky sexual behavior is associated with self-identified religion, religion is an important area to evaluate in developing programs as it is also associated with social and cultural practices. For example, there is the practice of ritual sex, rarely including a condom, which often builds off the relationship between sex, prosperity and fertility of the land or is practiced after a husband dies (31). This is a social practice during which HIV and STIs could be transmitted as it features multiple sex partners with no disease protection, but which requires culturally sensitive programs. The acceptability and popularity of some practices allows for a risky behavior to be common, such as transactional sex, or sex in the context of non-marital relationships in exchange for money or gifts, is practiced in Kenya. A study in Kisumu, Kenya that looked at the effect of a young woman's resources on sexual behaviors in transactional sex determined that increased resources, such as income, increased the likelihood of safer sexual activities, such as consistent condom use.

Health and Demographic Surveillance System in western Kenya

The health and demographic surveillance system (HDSS), established in 2001 by a collaboration of the U.S. Centers for Disease Control and Prevention (CDC) and the Kenya Medical Research Institute (KEMRI), found high mortality rates in young adults in Western Kenya, suggestive of high HIV/AIDS related mortality (32). The presence of this surveillance system in an area with high prevalence of HIV and other STIs, even

compared to eastern Kenya, provides a framework for tracking prevalence and risk factors, as well as evaluating any interventions that could be implemented based on the risk factors.

Although there are studies that have been conducted to determine the prevalence of HIV and risk factors in east Africa, as well as some to determine risk factors for individual STIs in high risk populations in east Africa and some in rural populations, there has so far been a lack of published information on the prevalence and risk factors for HIV, syphilis, and gonorrhea in the same population from rural, western Kenya, among both men and women who have different levels of risk. Although sex workers, male and female, are at higher risk for these STIs, it is important to examine the risk factors for a population more representative of the general non-urban population of Kenya.

The analyses presented here aim to enhance the picture of these STIs separately and in comparison to each other in rural Western Kenya, which will allow targeted prevention and educational measures. This study examined two relevant study questions. First, it evaluated the hypothesis that the prevalence of HIV, syphilis, and gonorrhea infection would be higher in women than in males in this study population after adjusting for other factors influencing this relationship. Behavioral and socio-demographic risk factors have been shown to be associated with HIV in other populations (5), and so associations between HIV and marital status, occupation, age, the use of a condom during last sexual intercourse, number of lifetime sexual partners, as well as circumcision status in males and religion in females, were expected to be significant in this study population. A second study question was assessment of the association of behavioral and socio-

demographic risk factors with STIs that have a high prevalence in this population, in comparison with HIV risk factors in this population. HIV is an STI in this population, and so it was expected that many of the associations between risk factors and HIV would also be present between the risk factors and other STIs. Given the predicted difference between men and women in prevalence, and possibly in risk factors, the analyses were performed to determine the seroprevalence of HIV, syphilis, and gonorrhea, in both genders, men alone, and women alone. Analyses of risk factors for these STIs were also performed for the total study population, men only and women only.

METHODS

Hypotheses

I. Prevalence of infection is higher among women

   a. Null hypothesis: The prevalence of infection of each of HIV, syphilis, and gonorrhea is not significantly different in women versus men.

   b. Alternative hypothesis: The prevalence of infection for each of HIV, syphilis, and gonorrhea is significantly higher among women compared to men.

II. Association between HIV and other potentially influential variables

   a. Null hypothesis: There is no statistically significant association between HIV infection and marital status, occupation, age, the use of a condom during last sexual intercourse, number of lifetime sexual partners, circumcision status in males and religion in females.

b. Alternative hypothesis: There is a statistically significant ($p<0.05$) association between HIV and each of the following independent variables: marital status, occupation, age, the use of a condom during last sexual intercourse, number of lifetime sexual partners, circumcision status in males and religion in females.

III. Association between potentially influential variables and syphilis and gonorrhea

a. Null hypothesis: There is no statistically significant association between the predicted significant risk factors for HIV (marital status, occupation, age, the use of a condom during last sexual intercourse, number of lifetime sexual partners, circumcision status in males and religion in females) and syphilis or gonorrhea infection.

b. Alternative hypothesis: Risk factors are shared for multiple STIs, specifically, that there is a statistically significant association between the predicted significant risk factors for HIV (marital status, occupation, age, the use of a condom during last sexual intercourse, number of lifetime sexual partners, circumcision status in males and religion in females) and syphilis or gonorrhea infection.

Data collection

Two baseline cross sectional studies of HIV/STI prevalence and HIV risk behaviors were conducted by the CDC and KEMRI in Asembo and Gem in rural western Kenya between 2003 and 2005. The first was done in the village of Asembo, a 178 km^2

subsistence farming and fishing community with a population of about 57,000. The second study was based in Gem, and was modified based on the results and feedback from the Asembo study. Gem is 265 km^2 and also a rural subsistence farming community, with a population of about 75, 500. Potential participants were identified through the established household demographic surveillance system (HDSS) sampling frame, which is maintained by Kenya Medical Research Institute/CDC (32).

This system was used to sample residents who were 13-34 years old, who were a resident of the community, monitored under HDSS and were able to give informed consent. Subjects were interviewed face-to-face using a detailed questionnaire that covered socio-demographic factors, sexual history and behavior. Specimens were collected at this visit. Blood was taken to test for HIV, syphilis and Herpes SimplexVirus-2 (HSV-2). HIV results were obtained using an enzyme-linked immunosorbent assay (ELISA) test, with discordant results confirmed using a Western Blot. Syphilis results were determined by the rapid plasma regain (RPR) method, and positive sera were confirmed by the treponema pallidum hemagglutination (TPHA) test. HSV-2 results were obtained using an enzyme immunoassay (EIA). In men, urine was collected to test for chlamydia and gonorrhea infection, while in women two self-administered vaginal swabs were used. Both chlamydia and gonorrhea results were determined using a polymerase chain reaction (PCR) test. The self-administered swab was also used to incubate and grow any *trichomonas vaginalis* in women. There was also a physical examination done by a clinician to diagnose symptomatic STI's and confirm male circumcision (33).

Secondary Data Analysis

This study was reviewed by the Emory University IRB, and determined to be exempt from IRB review.

All risk factor analysis and model creation was performed in SAS 9.3. The data collected in the Asembo and Gem studies was merged to create one de-identified database with 2734 observations. After eliminating those participants who did not have an HIV result, the final analysis was performed on 2707 observations. This study focuses on HIV, syphilis and gonorrhea.

The prevalence of each STI was determined, overall and for each gender. The prevalence of co-infection with HIV and another STI was also determined overall and separately by gender. Those participants who claimed to not be sexually active were still included in the analysis, as the literature and the results from this study show STI infection in these people. Those who were not sexually active were excluded by default in the bivariate analysis with variables that are predicated on previous sexual contact, such as age at first sexual contact and condom use during last sexual contact. If the multivariate analysis included these variables based on significance, the models only include those who have had sexual contact. A separate bivariate analysis was performed for each STI with the possible risk factors using proc logistic. Multivariate logistic regression was performed independently of bivariate significance, using a forward process to screen variables with a cutoff p-value for inclusion of 0.2. This p-value was used to ensure that the model included as many important variables as possible. Other variables were forced into the model, regardless of significance. In the models for both genders, the variables gender, age category, work SES, marital status and religion were forced into the model. In the models for women only, age category, work SES, marital

status and religion were forced into the model, while circumcision status was added to these variables for the models for men only. The adjusted odds ratios for each of the variables were included in the tables, even if the variables were not significant at the p=0.5 level and the confidence interval included the null.

All continuous variables were made into categorical variables using quartiles and appropriate groupings. Age of first sexual experience was categorized into four groups: 5-13, 14-17, 18-22, and 23-35. The number of partners beside the main partner or spouse was categorized into four groups: 1, 2-3, and 4 or more. For the age of first period, categories were 8-13, 14, 15, 16-35; while the age at first pregnancy was divided into quartiles, less than 16, 16-17, 18-19, and greater than 19 years old. The age at circumcision was also broken into quartiles, 0-1, 2-6, 7-13, 14-35 years old. The number of lifetime sexual partners was divided using the data, into categories suggested both by the quartiles and review of the literature: 0-1, 2-5, 6-9 and 10 or more.

If the participant did not use a condom at their last sexual encounter, the reason was categorized into 9 categories. 'Didn't know how to use condoms' includes didn't know about condoms and didn't know how to use condoms, 'Didn't have any available' includes didn't have any available, didn't know where to get them and condoms cost too much, 'Don't use condoms with steady partner', 'Trust partner', 'Partner refused to use condoms;, 'condoms reduce pleasure', 'wanted to have a child', 'fear side effects of condoms', and 'other' which includes other, partner would suspect me of being unfaithful, condoms give me disease, condoms are not effective at preventing STI, religious reasons, ritual practice- traditional belief, I use another family planning method, not at risk for STI/HIV, forgot to use, condoms laced with HIV virus. To categorize the

question “What would you say is the main reason you have never been tested for HIV?”, the variable was broken into 10 categories: ‘HIV testing services are too far away’; cannot pay for HIV test’; ‘don’t know where to go for an HIV test’’; ‘afraid of knowing my HIV result’; ‘Afraid will get sick/die more quickly’; ‘Embarrassed to ask for a test’; ‘Not at risk of HIV/AIDS’; ’Too young to get tested’; ‘Not sexually active’; ‘Other’ including afraid of rejection by spouse/partner, afraid of rejection by friends/relatives, afraid will lose job, and can’t do anything about it if I was HIV infected.

In order to classify the economic status of the person and their employment, the employment reported by the participant was defined as the employment socioeconomic status (SES), and classified as low, high, student, homemaker, unemployed or other. A low work SES included reporting employment of farmer, fisherman, small-business owner, casual worker or unskilled labor. A high work SES was defined as employment given as professional/managerial, salaried worker, business owner, self-employed and skilled labor. A homemaker included the categories of both homemaker and retired, while unemployed and student only included those answers.

RESULTS

Enrollment rates for those eligible were 70% and 89.7% in Asembo and Gem, respectively. The final combined dataset, after eliminating those who did not have an HIV test result, had 2707 observations. Of all of the observations, 1406 (52%) observations were female and 1301 (48%) were male. The age distribution was generally equal for males and females [Table 1]. In the HIV multivariate model, 901 observations

were used, 80 observations were used in the HIV female only model and 1300 observations in the HIV male only model. In the syphilis multivariate model 904 observations were used, while 247 observations were used in the female only syphilis model and 1298 observations in the male only model. In the gonorrhea multivariate model 611 observations were used, while 609 observations were used in the female only gonorrhea model and 194 observations in the male only model.

Prevalence

Overall prevalence for this sample of HIV diagnosis was 14.7%, 1.4% for syphilis, and 5.3% for gonorrhea. The prevalence rate among females-only and males-only, respectively, was 18.5% and 10.6% for HIV infection, 1.7% and 1.2% for syphilis infection, and 9.2% and 1.2% for gonorrhea infection. For HIV, syphilis, and gonorrhea the prevalence rates were higher in females than in males by more than 10%. [Table 2]

HIV risk factors

Bivariate Analysis

In the overall bivariate analysis, variables that were significantly associated with having higher odds of HIV diagnosis were being widowed compared with being married, being ages 20-24, 25-29, and 30-35 compared with being ages 15-19, having a post-secondary education compared with having a primary education, having a high work SES compared with having a low work SES, having more than 10 lifetime sexual partners compared with having 2-5 lifetime partners, having participated in ritual sex, having ever been treated for an STI, and having ever had an HIV test. Also associated with higher odds of HIV infection in the bivariate analysis, but not considered for inclusion in the

multivariate analysis was not using a condom during last sexual intercourse because the participant stated they don't use condoms with their steady partner, trust partner, the partner refused to use condoms, fear side effects of condoms or other reason compared with not using condoms because the participant did not have any available and not having ever had an HIV test because testing was too far away, cannot pay for HIV test, afraid of knowing HIV result, afraid will get sick/die more quickly, or other reasons compared with not knowing where to go for an HIV test.

Variables that were significantly associated with having lower odds of HIV diagnosis were being male compared with being female, being single compared with being married, being under 15 years old compared with being ages 15-19, being Catholic compared with being Protestant, being a student, homemaker, or unemployed compared with having a work SES, and having used a condom during last sexual intercourse. Also associated with lower odds of HIV infection in the bivariate analysis, but not considered for inclusion in the multivariate analysis was being a current student, having worn a condom during the last sexual intercourse to prevent pregnancy and to prevent both pregnancy and STI/HIV compared with wearing a condom to prevent STI/HIV, and not having ever had an HIV test because participant stated they were too young to get tested or not sexually active compared with not having had an HIV test because did not know where to go.

Among males, variables associated with having lower odds of HIV diagnosis in the bivariate analysis were being single compared with being married, being Catholic compared with being Protestant, being a student compared with having low work SES, and having used a condom during last sexual intercourse. Also associated with lower

odds of HIV infection in the bivariate analysis, but not considered for inclusion in the multivariate analysis was being a current student, having worn a condom during the last sexual intercourse to prevent pregnancy compared with wearing a condom to prevent STI/HIV, and not having ever had an HIV test because participant stated they don't know how to use condoms compared with not having had an HIV test because did not know where to go.

Among females, variables associated with having higher odds of HIV diagnosis in the bivariate analysis were being separated/divorced and being widowed compared with being married, being ages 20-24, 25-29, and 30-35 compared with being ages 15-19, getting the first period at ages 8-13, 15, or 16-35 compared with getting it age at 14, having a high work SES compared with having a low work SES, having 6-9 lifetime sexual partners compared with having 2-5 lifetime partners, having participated in ritual sex, having used contraception in the last 12 months, having ever been treated for an STI and ever having had an HIV test. Also associated with higher odds of HIV infection in the bivariate analysis, but not considered for inclusion in the multivariate analysis was not using a condom during last sexual intercourse because the participant stated they trust partner or the partner refused to use condoms compared with not using condoms because the participant did not have any available and not having ever had an HIV test because afraid of knowing HIV result or afraid will get sick/die more quickly compared with not knowing where to go for an HIV test.

Among females, variables associated with having lower odds of HIV diagnosis in the bivariate analysis were being single compared with being married, being under age 15 compared with being ages 15-19, being Catholic compared with being Protestant, being a

student, homemaker, or unemployed compared with having a low work SES, having an age at first pregnancy of less than 16 years old compared with at ages 16-17 and having used a condom during last sexual intercourse. Also associated with lower odds of HIV infection in the bivariate analysis, but not considered for inclusion in the multivariate analysis was being a current student, and not having ever had an HIV test because participant was too young to get tested or not sexually active compared with not having had an HIV test because did not know where to go.

Multivariate Analysis

In the final overall model of HIV, the odds of testing positive for HIV among those classified as having a high work SES were 1.77 (95% CI: 1.20, 2.60) times the odds for those who were classified as having a low work SES. Higher odds of HIV diagnosis was also significantly associated with being widowed compared with being married (6.09; 95% CI: 3.58, 10.33), having participated in ritual sex compared with not having participated (1.83; 95% CI: 1.03, 3.25), and having ever been treated for an STI (1.93; 95% CI: 1.29, 2.87). The results of the HIV multivariate analysis should be interpreted with caution due to the small number of observations used and due to the inclusion of a sexual behavior variable, condom use during first sexual intercourse, the multivariate model will only include those women who are sexually active. The results can only apply to these sexually active women. In the final model for women, higher odds of having an positive HIV diagnosis was significantly associated religion, with being Catholic (8.26; 95% CI: 1.05, 65.27) or being Legio (19.39; 95% CI: 1.25, 300.65) compared with being Protestant, being 20-24 years old (9.74; 95% CI: 1.05, 90.48) or 25-29 years old (25.29; 95% CI: 2.16, 296.71) compared with being 15-19, being widowed compared with being married (11.48; 95% CI: 1.27, 103.98), and having used a condom

during the first sexual encounter (16.33; 95% CI: 1.24, 215.25). The final model with men showed a higher odds of HIV diagnosis among men who were 20-24 years old (6.19; 95% CI: 2.05, 18.71), 25-29 years old (14.14; 95% CI: 4.63, 43.22), or 30-35 years old (17.11; 95% CI: 5.40, 54.19) compared with being 15-19 years old, and among men who had been treated previously for an STI compared with those who had not (3.73; 95% CI: 2.38, 5.85). The final model with men only also indicated a significantly lower odds among those men who are single compared to those who are married (0.52; 95% CI: 0.29, 0.93) [Table 6].

Syphilis risk factors

Bivariate Analysis

In the overall bivariate analysis, variables that were significantly associated with having higher odds of syphilis diagnosis were being separated/divorced or widowed compared with being married, and being ages 20-24, 25-29, and 30-35 compared with being ages 15-19.

Variables that were significantly associated with having lower odds of syphilis diagnosis were being single compared with being married and being a student compared with having a work SES. Also associated with lower odds of syphilis infection in the bivariate analysis, but not considered for inclusion in the multivariate analysis was being a current student compared with not being a current student.

Among males, variables associated with having higher odds of syphilis diagnosis in the bivariate analysis were being ages 25-29 compared with being ages 15-19 sand having ever been treated for an STI. Also significant in the bivariate analysis among men

only, but not considered for inclusion in the multivariate analysis, was having not worn a condom at last sexual intercourse because partner refused to use condom.

Among males, variables associated with having lower odds of syphilis diagnosis in the bivariate analysis were being single compared with being married and being a student compared with having low work SES. Being a current student compared with not being a current student was also associated with lower odds of syphilis infection among males.

Among females, variables associated with having higher odds of syphilis diagnosis in the bivariate analysis were being separated/divorced compared with being married, being ages 20-24, 25-29, and 30-35 compared with being ages 15-19, and having 6-9 lifetime sexual partners compared with having 2-5 lifetime partners. Also associated with higher odds of syphilis infection in the bivariate analysis among females only, but not considered for inclusion in the multivariate analysis was being a current student and having worn a condom during the last sexual intercourse because did not trust partner/felt partner has other partners compared with wearing a condom to prevent STI/HIV.

Among females, variables associated with having lower odds of syphilis diagnosis in the bivariate analysis were being a student compared with having a low work SES. Also associated with lower odds of HIV infection in the bivariate analysis, but not considered for inclusion in the multivariate analysis was being a current student compared with not being a current student.

Multivariate Analysis

In the final overall model of syphilis, the odds of testing positive for syphilis among those who were separated/divorced was 4.13 (95% CI: 1.26, 13.52) times the odds

for those who were married. In the final model for women, higher odds of having a positive syphilis diagnosis was significantly associated with having 6-9 lifetime sexual partners compare with having 2-5 sexual partners (94.00; 95% CI: 5.34, >999.99) [Table 7].

Gonorrhea risk factors

Bivariate Analysis

In the overall bivariate analysis, variables that were significantly associated with having higher odds of gonorrhea diagnosis were being a current student, being Nomiya compared with being Protestant, being a student or homemaker compared with having a low work SES, having been raped as a child or young adult, and having spent between 1 week and 1 month away from home compared with having spent less than 1 week away from home. Another variable that was significantly associated with lower odds of gonorrhea infection in the bivariate analysis and was not considered for the multivariate analysis was not using a condom during the last sexual intercourse because participant stated they wanted to have a child as compared to not using a condom because didn't have any available.

Variables that were significantly associated with having lower odds of gonorrhea diagnosis were being male compared with being female, being ages 25-29 compared with being ages 15-19 and having a secondary school education compared with a primary school education. Another variable that was significantly associated with lower odds of gonorrhea in the overall bivariate analysis, but not considered for the multivariate analysis was not having been tested for HIV because not at risk of HIV/AIDS.

Among males, variables associated with having higher odds of gonorrhea diagnosis in the bivariate analysis were being Nomiya compared with being Protestant, having sex with someone other than his spouse or primary partner, being circumcised, having used a condom during the last sexual intercourse, and having ever been treated for an STI.

Among males, the variable associated with having lower odds of gonorrhea diagnosis in the bivariate analysis was being a student compared with having low work SES. Not considered for multivariate analysis, but significantly associated with lower odds of gonorrhea infection was being a current student.

Among females, variables associated with having higher odds of gonorrhea diagnosis in the bivariate analysis were being single compared with being married, being a student or homemaker or unemployed compared with having a low work SES. Variables also associated with higher odds of gonorrhea in the bivariate analysis among females, but not considered in the multivariate model, were being a student, using a condom during last sexual intercourse to prevent both pregnancy and STI/HIV compared with using a condom to prevent STI/HIV, and not using a condom during last sexual intercourse because they wanted to have a child.

Among females, variables associated with having lower odds of gonorrhea diagnosis in the bivariate analysis were being ages 20-24, 25-29, and 30-35 compared with being ages 15-19 and having a secondary school education compared with a primary school education.

Multivariate Analysis

In the final overall model of gonorrhea among both genders, the odds of testing positive for gonorrhea among those who identified their religion as Nomiya was 3.99

(95% CI: 1.64, 9.75) times the odds for those who identified as being Protestant. Higher odds of gonorrhea diagnosis was also significantly associated with being away from home between 1 week and 1 month in the last 6 months compared with being away from home for less than 1 week (OR: 2.54; 95%CI: 1.13, 5.69). In the model among women-only, higher odds of gonorrhea diagnosis was associated with being Nomiya compared with being Protestant (2.47; 95% CI: 1.03, 5.94) and being unemployed compared with having a low work SES (9.63; 95% CI: 1.10, 84.22). In the women-only model, lower odds of gonorrhea diagnosis was significantly associated with being age 25-29 compared with ages 15-19 (OR: 0.35; 95% CI: 0.13, 0.98). In the final model that included only men, the odds of having a positive gonorrhea diagnosis among those who used a condom during the last sexual intercourse is 76.03 (95% CI: 1.42, >999.99) times the odds of those who did not use a condom [Table 9].

DISCUSSION

Increased age was significantly associated with HIV, as well as syphilis and gonorrhea, in the models. This agrees with the initial hypothesis that suggested risk factors for HIV would also be significant for other STIs and the hypothesis that suggested that age would be a significant risk factor for HIV. Being older was associated with higher odds of infection of HIV and syphilis, and unexpectedly associated with lower odds of infection of gonorrhea. The decreased odds of infection with gonorrhea, particularly after age 25 could be a result of knowledge gained with previous and treated exposures. This explanation leaves unresolved why higher odds of syphilis infection is associated in the study population with being older than 20 years in the overall, male-only and female-only models. It may be that in this population, syphilitic primary symptoms are not such that the population seeks medical care, but this possibility would need to be further explored in other studies. Like the association between syphilis infection and age, the odds of HIV infection increases as age increases, for the overall, male-only, and female-only models. As the initial hypothesis suggested, a higher age group increased the risk of the risk of HIV in the male-only model after adjusting for other factors, which would be expected given the chronic and incurable nature of both viruses. Another study found that when controlled for number of lifetime sexual partners and pregnancies, among other factors, older women had a lower HIV risk in the multivariate analysis (18). This may be because if one controls for the possible exposure events to HIV, the extended time does not add additional risk. This contrasts with the findings of this study, but the age trend shown in this data may indicate that apart from

number of sexual partners, the increased likelihood of HIV infection with age and the sexual behaviors of the steady partner impact the risk for the participant.

Occupation and determination of socio-economic status was shown to have a strong effect on the odds of infection with HIV and other STIs in this population. High work SES was associated with higher odds of existing HIV infection in the overall model, as well as in men and women individually, while being unemployed was associated with higher odds of gonorrhea diagnosis in women. However, being unemployed or a homemaker was associated with lower odds of HIV infection. It is possible that those of higher work SES have the resources and social capital to leverage into sexual interactions. If the differences between the risk by various occupations for HIV and gonorrhea infection persist in other studies, further evaluation and exploration for causes should occur. The odds of gonorrhea diagnosis overall increased when between one week and one month were spent away from home, perhaps because that length of time does not encourage one steady second partner, but multiple short term partners, which does seem to be consistent with literature where occupations result in this situation (24).

One influential characteristic was being a student, which was associated with lower odds of infection of HIV and syphilis, overall, in women and in men, as well as for gonorrhea in men. It was associated with these STIs both when it was defined as one possible occupation and when it was a yes/no question. The odds of gonorrhea were higher in those women who identified as a current student. As students have lower odds of HIV, syphilis and gonorrhea (in men), it is possible that if interventions are done in schools and educational facilities, there is opportunity to prevent future infections. These

students may be younger and so have lower risk or may have less infection because of less opportunity to become infected; whatever the reason for the lower odds of STI infection, current students represent a population that could be effectively targeted for prevention. It is also important because those who are secondary or post-secondary school students may be more likely to have more resources and a higher work-SES (34), which puts them at higher odds of having an STI in the future. This makes STI education and interventions among students even more important, as it addresses a group currently with lower odds of infection that may be in a higher risk group in the future.

Marital status did have a strong impact on both HIV infection and other STI infections, which agrees with the initial hypothesis, and other studies (35). This may be because of the social dynamics of sex within and without the context of marriage, along with the social position of women, as there are increased odds among widowed participants of overall HIV diagnosis and HIV diagnosis in women, while separated/divorced participants were at higher risk in the overall model for syphilis diagnosis. The data cannot determine what social dynamics may be raising the risk of infection in widowed women, but this is a high-risk group that could potentially be targeted for an intervention after further studies explore the reasons behind this risk factor. Being single was protective against HIV diagnosis for men, which may be because of use of condoms during non-marital sex or lack of a consistently available sexual partner.

Another cultural factor considered which could lead to more successful and targeted interventions was religion. Identifying religion as Catholic or Legio was associated with higher odds for HIV diagnosis in women, while being Nomiya increased

the odds of gonorrhea diagnosis overall and in men and women individually in the multivariate models. In the bivariate analysis, being Catholic was protective against HIV in the overall model, and the male and female specific models. Each religion has their own cultural practices in an area, and these cultural practices, often within a religious framework, must be explored for interventions and education to be effective. For example, in the overall HIV model, the odds of having participated in ritual sex was a risk factor for higher prevalence of HIV infection, which may be because effective methods of protection are not used in these ritual practices (31). Religion is a socio-demographic factor which can indicate which groups are at higher risk of STI infection, and suggest questions about the behavior differences by religious groups that should be further explored in studies. This distinction of STI risk by religion is important in that it raises questions about the differences of behavior or prevalence within a rural population, and also provides populations which could be used to test interventions and which have a structure of communication that could potentially be used to educate about STI prevention and treatment.

Women who had between 6-9 lifetime sexual partners had higher odds of HIV and syphilis infection, which would be expected and is consistent with the literature, as more partners provide more opportunity for infection. Having more than 10 lifetime sexual partners was associated with higher odds of disease overall and in men in HIV. This was expected because more partners provide more opportunities for the transmission of all STIs, and different STIs were associated with increased partners in the different genders. Having more than 10 or more partners was not significant in women, but this could be because very few women had this many partners, and the ones who did may

have used condoms because of the large number of partners. These factors may contribute to the trends in this population, but it is also possible that the sexual behavior and infection status of the partners is more important than the number of partners. For example, one partner who has had many previous partners is possibly more likely to transmit disease (36) than several partners who have not had sex with others, such as could happen in when one partner is much older than the other (35). There are indications that cross generational sex is common in western Kenya between older men ages 24-34 and females ages 13-19 (37). The implications of cross generational sex are discussed in one predictive model that predicted that impact of other factors such as delaying the age of sexual debut would be reduced if older men continued to prefer young partners and that the current levels of HIV could be sustained from risky sex between any age group, and perhaps the behavioral intervention with the most impact would be to ensure condom use by older men in all sexual encounters (38). Condom use during last sexual intercourse was protective for HIV diagnosis overall, in men and in women, but was associated with higher odds of gonorrhea diagnosis in men. This is generally consistent with the literature (35), and the higher odds of gonorrhea might be due to improper condom use combined with the biological properties of gonorrhea.

Circumcision status was not found to be significantly associated with infection with HIV in this study, which did not support the alternative hypothesis. This was an unexpected result, as circumcision has been found to be associated with decreased incidence of HIV. However, this may be explained by other characteristics of the population, such as the presence of ulcerative STIs and circumcision rate. One simulation that examined the difference between HIV prevalence rates in east and west

Africa found that the impact of male circumcision may be moderated by the prevalence of ulcerative STIs (39). The four city study examined circumcision rate and found a prevalence of circumcision of 27.5% in Kisumu, Kenya and 9% in Ndola, Zambia (40). In Kisumu, Kenya the protective effect of circumcision was strong, with a prevalence of HIV infection of 9.9% in circumcised men and 26.0% in uncircumcised men, while in Ndola, Zambia the prevalence of HIV infection was 25.0% and 26.0%, respectively (40). The authors concluded the effect of circumcision on transmission of HIV is strong, but alone is not enough to account for differences in HIV prevalence of infection between eastern and western Africa. Closer to the circumcision rates in Ndola than in Kisumu, in this rural study population, 9.8% of men were circumcised and the HIV prevalence was 11.0% among circumcised men and 10.6% among uncircumcised men. The trend in this largely uncircumcised rural population of men does not show a difference in risk of HIV infection associated with circumcision, which could indicate that other factors, including the presence of other diseases, are stronger risks in the rural communities. Circumcision was not found in this study to reduce incidence in men of syphilis or gonorrhea which has also been found in other studies (27).

Some other risk factors have an association with the odds of infection for multiple STIs. Having previously treated for an STI increased the odds of an HIV diagnosis overall and in both genders and of gonorrhea diagnosis in men. Although this seems intuitive because those who had risk behaviors resulting in an STI in the past continued those behaviors, it shows that there is an opportunity for education after the first treatment for an STI. Another educational opportunity presents itself as women who used contraception in the past year had increased odds of infection of HIV and syphilis.

While this may simply indicate those who were currently sexually active, there is the possibility of discussion and education when contraception is obtained, if from a source outside the home, on how to protect against STIs.

All STIs examined had a higher prevalence in women by 10% in absolute numbers, but gender was also significant in the bivariate analysis for HIV and gonorrhea. This fits with the initial hypothesis and agrees with results in the literature (41). It is unclear exactly why women have a higher rate of prevalence, but likely is a mixture of biological factors that make transmission easier and social factors.

Of additional concern is that there was HIV and gonorrhea infection in several people who stated they were not sexually active, not at risk of HIV/STIs, or too young to be tested, which has also been found in other studies (4). These infections were unlikely to have been mother to child transmission because of the complications that arise from infants and children with these diseases in this largely anti-retroviral naïve population. While this may suggest to some the possibility of alternate transmission routes, such as been suggested for the STI trichomoniasis (42), it is important to include and test young people who claim to not be sexually active or not at risk of HIV/STIs, as the majority of the discrepancy likely comes from inaccurate reporting.

There are several other approaches to reduce HIV, either through primarily targeting HIV or targeting other STIs because of the increase in HIV with STI co-infections. Although some trials using antivirals to target HSV-2 and hoping to reduce HIV transmission (43, 44, 45, 46) did not show a successful intervention, it is possible that future interventions using anti-retrovirals will be able to reduce HIV and HSV-2 incidence rates, which would likely have an effect on the rates of other STIs.

Transmission between HIV discordant couples can raise the incidence of HIV, and is a continued risk situation. A study performed among African HIV-1-serodiscordant couples determined that other factors can affect the transmission rate, including condom use, while male circumcision and HSV- 2 and trichomoniasis infection affect the transmission rate in the uninfected partner (47). One study found that many of the risk factors for HIV-1 recombinant or dual infection are also risk factors for general HIV infection, and so the differences in the type of HIV-1 in these populations should be taken into account in designing any intervention for these groups, from behavioral interventions to vaccines trials (35,48). Focusing on women, a study suggests that women-centered interventions that attempt to decrease HIV acquisition need to address the co-infection with other STIs, as incident gonorrhea and prevalent HSV-2 infection were statistically associated with the incidence of HIV infection in women (49). Infection with another STI can increase the likelihood of transmission of HIV, although it is debatable what intervention efforts should focus on. A simulation concluded that although increasing treatment for syphilis, chlamydia and gonorrhea would not likely reduce the HIV epidemic more than interventions for HSV-2; any reduction in treating these STIs would result in increased prevalence of curable STIs and increase HIV transmission (50).

Strengths

This analysis combined the data from Asembo and Gem, allowing an effect to be seen for risk factors due to increased power. The low age limit for inclusion in this study allows risk factors to be examined in a population that is at high risk for HIV and STIs, and is well represented in this sample. The examination of HIV and five other STIs from the same population allows comparison of risk factors between the STIs.

Weaknesses

One of the important limitations of this study is that the cross sectional design does not allow causality to be determined. Another limitation of this study is that the sampling system, HDSS, randomly selected compounds in the communities without adjusting for size of the compound, resulting in smaller compounds having the same probability being selected as larger compounds. As smaller compounds were more likely to have young people, the age prevalence rates of this sample overrepresented young people compared to the age distribution in the whole population. Thus, these risk factors are not generalizable to the whole population of Asembo and Gem. Another limitation is that the behavioral and socio-demographic information was collected in a face-to face interview, which may have resulted in underreporting, biasing the association between the STI and the risk factors towards the null. This may have been a particularly strong effect in women, who may have felt shame or embarrassment in answering the questions truthfully.

FUTURE DIRECTIONS

This study provides additional evidence for the increased prevalence of HIV in women, as well as additional information about risk factors individually and those in common for HIV and other STIs from a previously unstudied population. This study population was primarily very young adults in a rural area and so can provide information about this group that is particularly vulnerable to STIs. It is important to target this age group if the overall prevalence and incidence of these STIs are going to be reduced in the future. Both interventions and vaccine trials need to target this group. It also provides a baseline prevalence rate in this population for six STIs, which can be used to evaluate any

interventions performed in this area. Possible interventions include educational programs, behavior interventions and targeted testing for certain groups of the population. This study was also done before widespread voluntary HIV testing and counseling, as well as before large use of anti-retrovirals, and so could be used as a baseline for changes in behavior resulting from knowledge of testing status or treatment of HIV. It also provides a baseline for comparisons of STI prevalence infection rates in the same population, and could be used to help track the relative burden of different STIs in the population over time. The risk factors also provide possible areas of intervention in this rural area, as well as show the importance of looking at risk factors across STIs in order to assess what could have the most impact if targeted for an intervention. As a sampling system is already in place in these communities, this study provides a baseline for future studies that utilize this sampling system.

REFERENCES

1. Global Health Observatory Data Repository, World Health Organization. Data on the size of the epidemic- Data by WHO regions. Geneva, Switzerland; 2010. (http://apps.who.int/ghodata/?vid=10011). (Acessed April 12, 2012).

2. Kenya National AIDS Control Council, UNAIDS. *Kenya- HIV Response and Modes of Transmission Analysis- Final Report.* World Bank, Global AIDS M&E Team; 2009.

3. Potterat JJ. AIDS epidemiology in Africa: a changing of the guard. *Intl J STD AIDS.*2009; 20(12) :812-815.

4. Hawken MP, Melis RD, Ngombo DT, et.al. Opportunity for Prevention of HIV and Sexually Transmitted Infections in Kenyan Youth: Results of a Population-Based Survey. *J Acquir Immune Defic Syndr.* 2002; 31(5):529-535.

5. Auvert B, Buvé A, Ferry B, et al. Ecological and individual level analysis of risk factors for HIV infection in four urban populations in sub-Saharan Africa with different levels of HIV infection. *AIDS*. 2001; 15(Suppl 4):S15-S30.

6. Auvert B, Taljaard D, Lagarde E, et al. Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. *PLoS Medicine.* 2005; 2(11): e298.

7. Bailey RC, Moses S, Parker CB, et al. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial. *Lancet*. 2007; 369(9562):643-656.

8. Gray RH, Li X, Kiqozi G, et al. The impact of male circumcision on HIV incidence and cost per infection prevented: a stochastic simulation model from Rakai, Uganda. *AIDS.* 2007; 21(7): 845-850.

9. Donoval BA, Landay AL, Moses S, et al. HIV-1 target cells in foreskins of African men with varying histories of sexually transmitted infections., Am J Clin Pathol. 2006; 125(3):386-391.

10. McCoombe SG and Short RV. Potential HIV-1 target cells in the human penis. *AIDS*. 2006; 20(11):1491-1495.

11. Patterson BK, Landay A, Siegel JN, et al. Susceptibility to human immunodeficiency virus-1 infection of human foreskin and cervical tissue grown in explant culture. Am J Pathol. 2002; 161(3): 867-873.

12. Szabo R and Short RV. How does male circumcision protect against HIV infection? BMJ. 2000; 320(7249):1592-1594.

13. Herman-Roloff A, Otieno N, Agot K, et al. Acceptability of medical male circumcision among uncircumcised men in Kenya one year after the launch of the national male circumcision program. *PLoS One.* 2011. 6(5): e19814.

14. Mah TL and Halperin DT. Concurrent sexual partnerships and the HIV epidemics in Africa: evidence to move forward. *AIDS Behav.* 2010; 14(1):11-16.

15. Sawers L and Stillwaggon E. Concurrent sexual partnerships do not explain the HIV epidemics in Africa: a systematic review of the evidence. *J Int AIDS Soc*. 2010; 13:34.

16. Epstein H and Morris M. Concurrent partnerships and HIV: an inconvenient truth. *J Int AIDS Soc*. 2011; 14:13. Review.

17. Oluoch T, Mohammed I, Bunnell R, et al. Correlates of HIV Infection Among Sexually Active Adults in Kenya: A National Population-Based Survey. *Open AIDS J.* 2011; 5:125-134.

18. Hunter DJ, Maggwa BN, Mati JK, et al. Sexual behavior, sexually transmitted diseases, male cirucmcision and risk of HIV infection among women in Nairobi, Kenya. *AIDS.* 1994; 8(1): 93-99.

19. Muula AS, Thomas JC, Pettifor AE, et al. Religion, condom use acceptability and use within marriage among rural women in Malawi. *World Health Popul*. 2011; 12(4):35-47.

20. The Sexually Transmitted Diseases Diagnostics Initiative**.** The use of Rapid Syphilis Tests. Special Programme for Research & Training in Tropical Diseases: World Health Organization, 2006.

21. Monitoring the AIDS Pandemic**.** *The Status and Trends of the HIV/AIDS Epidemics in Sub-Saharan Africa.* Abidjan, Côte d'Ivoire: Official Satellite Symposium of the Xth International Conference on STD and AIDS in Africa, 1997.

22. Otieno-Nyunya B, Bennett E, Bunnell R, et al. Epidemiology of syphilis in Kenya: results from a nationally representative serological survey. *Sexy Transm Infect.* 2011; 87(6): 521-525.

23. Buvé A, Weiss HA, Laga M, et al. The epidemiology of gonorrhoea, chlamydial infection and syphilis in four African cities. *AIDS*. 2001; 15(Suppl 4):S79-S88.

24. Kwena ZA, Bukusi EA, Ng'ayo MO, et al. Prevalence and risk factors for sexually transmitted infections in a high-risk occupational group: the case of fishermen along Lake Victoria in Kisumu, Kenya. *Int J STD AIDS.* 2010; 21(10):708-713.

25. Feldblum PJ, Lie CC, Weaver MA, et al**.** Baseline factors associated with incident HIV and STI in four microbicide trials. *Sex Transm Dis*. 2010; 37(10):594-601.

26. Darj E, Mirembe FM and Råssjö, EB**.** STI-prevalence and differences in social background and sexual behavior among urban and rural young women in Uganda. *Sex Reprod Healthc*. 2010; 1(3):111-115.

27. Mehta SD, Moses S, Agot K, et al. Adult Male Circumcision Does Not Reduce the Risk of Incident Nesseria gonorrhoeae, Chalmydia trachomatis, or Trichomonas vaginalis Infection: Results from a Randomized, Controlled Trial in Kenya. *J Infect Dis*. 2009; 200(3):370-378.

28. Marx G, John-Stewart G, Bosire R, et al. Diagnosis of sexually transmitted infections and bacterial vaginosis among HIV-1-infected pregnant women in Nairobi. *Int J of STD AIDS.* 2010; 21(8):549-552.

29. Noden BH, Gomes A and Ferreira A. AIDS-related knowledge and sexual behavior among married and previously married persons in rural central Mozambique. Sahara J. 2009; 6(3):134-144.

30. Chimbiri AM. The condom is an 'intruder' in marriage: evidence from rural Malawi. *Soc Sci Med.* 2007; 64(5):1102-115.

31. Ayikukwei R, Ngare D, Sidle J, et al. HIV/AIDS and cultural practices in western Kenya: the impact of sexual cleansing rituals on sexual behaviors. Cult Health Sex. 2008; 10(6):587-599.

32. Adazu K, Lindblade KA, Rosen DH, et al. Health and Demographic Surveillance in Rural Western Kenya: A Platform for Evaluating Interventions to Reduce Morbidity and Mortality from Infectious Diseases. *Am J Trop Med Hyg.* 2005; 73(6):1151-1158.

33. Amornkul P, Vandenhoudt 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(7):e6470.

34. Soldan VA, deGraft-Johnson JE, Bisika T and Tsui AO. Social, economic and demographic determinants of sexual risk behaviors among men in rural Malawi: A district-level study. *Afr J Reprod Health*. 2007; 11(2): 33-46.

35. Arroyo MA, Sateren WB, Foglia G, et al. Short Communication: HIV Type 1 Genetic Diversity among Tea Plantation Workers in Kericho, Kenya. *AIDS Res Hum Retroviruses*. 2009; 25(11):1061-1064.

36. Wand H and Ramjee G. The relationship between age of coital debut and HIV seroprevalence among women in Durban, South Africa: a cohort study. *BMJ Open*. 2012; 2:e000285.

37. Zeh C, Inzalue S, Ondoa P, et al. Molecular Characterization and Phlyodynamics of the Recent and Established HIV-1 Epidemics in Rural, Western Kenya[abstract]. Presented at the 19th Conference on Retroviruses and Opportunistic Infections, Seattle, Washington, USA, March 5-8 2012.

38. Hallett TB, Gregson S, Lewis JJ, et al**.** Behavior change in generalised HIV epidemivs: impact of reducing cross-generational sex and delaying age at sexual debut. *SexTransm Infect*. 2007; 83(Suppl 1):i50-i54.

39. Orroth KK, Freeman EE, Bakker R, et al**.** Understanding the differences between contrasting HIV epidemics in east and west Africa: results from a simulation model of the Four Cities Study. *Sex Transm Infect*. 2007; 83(Suppl 1):i5-i16.

40. Auvert B, Buvé A, Lagarde E, et al. Male circumcision and HIV infection in four cities in sub-Saharan Africa. *AIDS.* 2001; 15(Suppl 4):S31-S40.

41. Glynn JR, Caraël 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-S60.

42. Buvé A, Weiss HA, Laga M, et al. The epidemiology of trichomoniasis in women in four African cities. *AIDS.* 2001; 15(Suppl 4):S89-S96.

43. Patel P, Bush T, Mayer KH, et al. Prevalence and Risk Factors Associated with Herpes Simplex Virus-2 Infection in a Contemporary Cohort of HIV-Infected Persons in the United States. *Sex Transm Dis.* 2012; 39(2):154-160.

44. Celum C, Wald A, Lingappa JR, et al. Acyclovir and transmission of HIV-1 from persons infected with HIV-1 and HSV-2. *N Engl J Med*. 2010; 362(5):427-439.

45. Mugwanya K, Baeten JM, Mugo NR, et al**.** High-dose valacyclovir HSV-2 suppression results in greater reduction in plasma HIV-1 levels compared with standard dose acyclovir among HIV-1/HSV-2 coinfected persons: a randomized, crossover trial. *J Infect Dis.* 2011; 204(12):1912-1917.

46. Baeten JM, Lingappa J, Beck I, et al. Herpes simplex virus type 2 suppressive therapy with acyclovir or valacyclovir does not select for specific HIV-1 resistance in HIV-1/HSV-2 dually infected persons. *J Infect Dis*. 2011; 203(1):117-121.

47. Hughes JP, Baeten JM, Lingappa JR, et al. Determinants of per-coital-act HIV-1 infectivity among African HIV-1-serodiscordant couples. *J Infect Dis*. 2012; 205(3):358-365.

48. Yang C, Li M, Shi YP, et al. Genetic diversity and high proportion of intersubtype recombinants among HIV type 1-infected pregnant women in Kisumu, western Kenya. *AIDS Res Hum Retroviruses*. 2004; 20(5):565-574.

49. Venkatesh KK, van der Straten A, Cheng H, et al. The relative contribution of viral and bacterial sexually transmitted infections on HIV acquisition in southern African women in the Methods for Improving Reproductive Health in Africa study. *Int J STD AIDS*. 2011; 22(4):218-224.

50. Freeman EE, Orroth KK, White RG, et al. Proportion of new HIV infections attributable to herpes simplex 2 over time: simulations of the changing role of sexually transmitted infections in sub-Saharan African HIV epidemics. Sex Transm Infect. 2007; 83(Suppl 1):i17-i24.

57. Luke N, Goldberg RE, Mberu BU and Zulu EM. Social Exchange and Sexual Behavior in Young Women's Premarital Relationships in Kenya. *J Marriage Fam*. 2011; 73(5):1048-1064.

58. Mantell JE., Correale J, Adams-Skinner J and Stein ZA. Conflicts between conservative Christian institutions and secular groups in sub-Saharan Africa: ideological discourses on sexualities, reproduction and HIV/AIDS. *Glob Public Health.* 201; 6(Suppl 2):S192-S209.

59. Ybarra ML, Bull SS, Kiwanuka J, et al. Prevalence rates of sexual coercion victimization and perpetration among Uganda adolescents. *AIDS Care*. Feb 2, 2012;Epub ahead of print.

60. Onoya D, Reddy P, Sifunda S, et al**.** Transactional Sexual Relationships, Sexually Transmitted Infection Risk, and Condom Use Among Young Black Women in Peri-Urban Areas of the Western Cape Province of South Africa. *Womens Health Issues*. Jan 20, 2012; Epub ahead of print.

TABLES

Table 1: Age Distribution of Sample

Age Group (years old)	Overall (n, %) [a]	Male (n, %) [a]	Female (n, %)[a]
<15	383 (14)	174 (13)	209 (15)
15-19	1281 (47)	641 (49)	640 (46)
20-24	354 (13)	166 (13)	179 (13)
25-29	355 (13)	179 (14)	176 (13)
30-35	343 (13)	141 (11)	202 (14)

[a] % is percent of population in each age category

Table 2: Prevalence of Sexually Transmitted Infections and Co-infections

Sexually Transmitted Infection	**Male Prevalence n (%)**	**Female Prevalence n(%)**	**Total Prevalence n(%)**
HIV	138 (10.6)	260 (18.5)	398 (14.7)
Syphilis	15 (1.2)	24 (1.7)	39 (1.4)
Gonorrhea	15 (1.2)	126 (9.2)	141 (5.3)
HIV and Syphilis	2 (0.2)	10 (0.7)	12 (0.4)
HIV and Gonorrhea	4 (0.3)	22 (1.6)	26 (1.0)

Table 3: Summary Table of Risk Factors: Overall

Significant Risk Factor	**HIV**		**Syphilis**		**Gonorrhea**	
	B	M	B	M	B	M
Gender: Male	<	--	<<<	--	--	--
Marital Status: Single	<<<	--	--	--	<<	--
Marital Status: Separated/Divorced	--	--	--	--	>>	>>
Marital status: Widowed	>>>	>>>	--	--	--	--
Current student	<<<	///	>	///	<<<	///
First sexual intercourse at age 23-35	--	--	--	--	--	--
Age: <15	<<	--	--	--	--	--
Age: 20-24	>>>	--	--	--	>>	--
Age 25-29	>>>	--	<	--	>>	--
Age 30-35	>>>	--	--	--	>>>	--
Secondary Education Obtained	--	--	<	--	--	--
Religion: Catholic	<	--	--	--	--	--
Religion: Anglican	--	--	--	--	--	--
Religion: Nomiya	--	--	>	>>	--	--
Religion: Legio	--	--	--	--	--	--
Occupation: High SES	>	>	--	--	--	--
Occupation: Student	<<	--	>	--	<<<	--
Occupation: Homemaker	<	--	>>	--	--	--
Occupation: Unemployed	<	--	--	--	--	--
Ever used condom with spouse	--	--	--	--	--	--
0-1 lifetime sexual partners	--	--	--	--	--	--
More than 10 lifetime sexual partners	>	--	--	--	--	--
Ritual sex participation	>	>	--	--	--	--
Raped as child or young adult	--	--	>>	--	--	--
Had sex with someone other than spouse or primary partner	--	--	--	--	--	--
1 week to 1 month away from home	--	--	>	>>	--	--
Used condom in last sexual encounter	<	--	--	--	--	--
Used condom to prevent pregnancy	<	///	--	///	--	///

Significant Risk Factor	HIV		Syphilis		Gonorrhea	
Used condom to prevent both pregnancy and STI/HIV	<<<	///	--	///	--	///
Did not use condom because don't use condoms with steady partner	>>	///	--	///	--	///
Did not use condom because trust partner	>>	///	--	///	--	///
Did not use condom because partner refused to use condoms	>>	///	--	///	--	///
Did not use condom because condoms reduce pleasure	--	///	--	///	--	///
Did not use condom because wanted to have a child	--	///	>>>	///	--	///
Did not use condom because fear side effects of condoms	>	///	--	///	--	///
Did not use condom because of other reason	>	///	--	///	--	///
Ever been treated for an STI	>>>	>	--	--	--	--
Ever had HIV test	>	--	--	--	--	--
No HIV test because testing too far away	>	///	--	///	--	///
No HIV test because cannot pay for test	>	///	--	///	--	///
No HIV test because afraid of knowing HIV result	>>	///	--	///	--	///
No HIV test because afraid will get sick/die more quickly	>>	///	--	///	--	///
No HIV test because not at risk of HIV/AIDS	--	///	<	///	--	///
No HIV test because too young to get tested	<<<	///	--	///	--	///
No HIV test because not sexually active	<<<	///	--	///	-	///
No HIV test for other reason	>	///	--	///	--	///
Told someone results of HIV test	--	--	--	--	--	--

B- OR significant in the bivariate analysis at the p=0.05 significance level
M- OR significant in the multivariate analysis at the p=0.05 significance level
/// Variable not considered for significance in the multivariate analysis
OR≤0.2= <<<; 0.2<OR≤ 0.4= <<; 0.4 < OR <1.00= <; 1.00< OR≤ 2.50 = >; 2.50<OR ≤5.00= >>; 5.00< OR= >>>

Table 4: Summary Table of Risk Factors: Females

Significant Risk Factor	**HIV**		**Syphilis**		**Gonorrhea**	
	B	M	B	M	B	M
Marital Status: Single	<<<	--	>	--	--	--
Marital Status: Separated/Divorced	>>>	--	--	--	>>>	--
Marital status: Widowed	>>>	>>>	--	--	--	--
Current student	<<<	///	>	///	<<<	///
First sexual intercourse at age 23-35	--	--	--	--	--	--
Age: <15	<<<	--	--	--	--	--
Age: 20-24	>>	>>>	<	--	>>>	--
Age 25-29	>>>	>>>	<<	<<	>>>	--
Age 30-35	>>>	--	<<	--	>>>	--
Secondary Education Obtained	--	--	<	--	--	--
Religion: Catholic	<	>>>	--	--	--	--
Religion: Anglican	--	--	--	--	--	--
Religion: Nomiya	--	--	--	>	--	--
Religion: Legio	--	>>>	--	--	--	--
Occupation: High SES	>	--	--	--	--	--
Occupation: Student	<<<	--	>>	--	<<<	--
Occupation: Homemaker	<	--	>	--	--	--
Occupation: Unemployed	<	--	--	>>>	--	--
Occupation: Other	--	--	--	--	--	--
Ever used condom with spouse	--	///	--	///	--	///
0-1 lifetime sexual partners	--	--	--	--	--	--
6-9 lifetime sexual partners	>	--	--	--	>>	>>>
Ritual sex participation	>>>	--	--	--	--	--
Used condom in first sexual encounter	>>>	--	--	--	--	--
Had sex with someone other than spouse or primary partner	--	--	--	--	--	--
Used condom in last sexual encounter	<	--	--	--	--	--
Used condom to prevent pregnancy	--	///	--	///	--	///
Used condom to prevent both pregnancy and STI/HIV	--	///	>>>	///	--	///

Significant Risk Factor	HIV		Syphilis		Gonorrhea	
Used condom because did not trust partner/felt partner has other partners	--	///	--	///	>>>	///
Did not use condom because don't use condoms with steady partner	--	///	--	///	--	///
Did not use condom because trust partner	>	///	--	///	--	///
Did not use condom because partner refused to use condoms	>	///	--	///	--	///
Did not use condom because wanted to have child	--	///	>>	///	--	///
Did not use condom because fear side effects of condoms	--	///	--	///	--	///
Ever been treated for an STI	>>	--	--	--	--	--
Ever had HIV test	>	--	--	--	--	--
No HIV test because HIV testing too far away	--	///	--	///	--	///
No HIV test because afraid of knowing HIV result	>>	///	--	///	--	///
No HIV test because afraid will get sick/die more quickly	>>	///	--	///	-	///
No HIV test because embarrassed to ask for test	--	///	--	///	--	///
No HIV test because too young to get tested	--	///	--	///	--	///
No HIV test because not sexually active	--	///	--	///	--	///
Told someone results of HIV rest	--	--	--	--	--	--
8-13 years old at first period	>	--	--	--	--	--
15 years old at first period	>	--	--	--	--	--
16-35 years old at first period	>	--	--	--	--	--
Currently pregnant	--	--	--	--	--	--
<16 years old when first pregnant	<	--	--	--	--	--
18-19 years old when first pregnant	--	--	--	--	--	--
>19 years old when first pregnant	--	--	--	--	--	--
Used contraception in last year	>	--	--	--	>>	--

B- OR significant in the bivariate analysis at the p=0.05 significance level
M- OR significant in the multivariate analysis at the p=0.05 significance level
/// Variable not considered for significance in the multivariate analysis
OR≤0.2= <<<; 0.2<OR≤ 0.4= <<; 0.4 < OR <1.00= <; 1.00< OR≤ 2.50 = >; 2.50<OR ≤5.00= >>; 5.00< OR= >>>

Table 5: Summary Table of Significant Risk Factors: Males

Significant Risk Factor	**HIV**		**Syphilis**		**Gonorrhea**	
	B	M	B	M	B	M
Marital Status: Single	<<<	<	--	--	<<<	--
Marital Status: Widowed	--	--	--	--	--	--
Current student	<<<	///	<<<	///	<<<	///
Age: <15	--	--	--	--	--	--
Age: 20-24	>>>	>>>	--	--	--	--
Age 25-29	>>>	>>>	--	--	>>	--
Age 30-35	>>>	>>>	--	--	--	--
Post-secondary education obtained	--	--	--	--	--	--
Religion: Catholic	<	--	--	--	--	--
Religion: Nomiya	--	--	>>>	--	--	--
Occupation: High SES	>	--	--	--	--	--
Occupation: Student	<<<	--	<<<	--	<<<	--
Occupation: Homemaker	--	--	--	--	--	--
Occupation: Unemployed	--	--	--	--	--	--
More than 10 Lifetime sexual partners	>	--	--	--	--	--
Had sex with someone other than spouse or primary partner	--	--	>>>	--	--	--
1 week to 1 month away from home	>	--	--	--	--	--
More than 1 month away from home	>	--	--	--	--	--
Used condom in last sexual encounter	<	--	>>	>>>	--	--
Used condom to prevent pregnancy	<<	///	--	///	--	///
Used condom to prevent both pregnancy and STI/HIV	--	///	--	///	--	///
Did not use condom because did not know how to use one	<<<	///	--	///	--	///
Did not use condom because don't use condoms with steady partner	>>>	///	--	///	--	///
Did not use condom because trust partner	>>>	///	--	///	--	///
Did not use condom because partner refused to use condoms	--	///	--	///	>>>	///
Did not use condom because condoms reduce pleasure	--	///	--	///	--	///
Did not use condom because wanted to have child	--	///	--	///	--	///

Significant Risk Factor	HIV		Syphilis		Gonorrhea	
Did not use condom because fear side effects of condoms	--	///	--	///	--	///
Did not use condom for other reason	--	///	--	///	--	///
Ever been treated for an STI	>>>	>>	>>>	--	--	--
Ever had HIV test	--	--	--	--	--	--
No HIV test because testing too far away	>	///	--	///	--	///
No HIV test because cannot pay for test	>>>	///	--	///	--	///
No HIV test because afraid of knowing HIV result	>>>	///	--	///	--	///
No HIV rest because afraid will get sick/die more quickly	--	///	--	///	--	///
No HIV test because embarrassed to ask for test	>>	///	--	///	--	///
No HIV test for other reason	>>	///	--	///	--	///

B- OR significant in the bivariate analysis at the p=0.05 significance level
M- OR significant in the multivariate analysis at the p=0.05 significance level
/// Variable not considered for significance in the multivariate analysis
OR≤0.2= <<<; 0.2<OR≤ 0.4= <<; 0.4 < OR <1.00= <; 1.00< OR≤ 2.50 = >; 2.50<OR ≤5.00= >>; 5.00< OR= >>>

Table 6: Risk factors for HIV infection

	HIV Infection		OR (95% CI)	AOR (95% CI)	HIV Infection (Females)		Females OR (95% CI)	Female AOR (95% CI)	HIV Infection (Males)		Males OR (95% CI)	Male AOR (95% CI)
	Yes (N= 398)	No (N=2309)			Yes (N= 260)	No (N=1146)			Yes (N=138)	No (N=1163)		
	n (%)	n (%)			n (%)	n (%)			n (%)	n (%)		
Gender												
Male	138 (10.61)	1163 (89.39)	0.523 (0.419, 0.653)	0.776 (0.531, 1.134)	--	--	--	--	--	--	--	--
Female	260 (18.49)	1146 (81.51)	Ref	Ref	--	--	--	--	--	--	--	--
Marital Status												
Single	74 (4.11)	1728 (95.89)	0.094 (0.071, 0.124)	2.029 (0.122, 33.666)	40 (5.08)	748 (94.92)	0.129 (0.089, 0.187)	--	34 (3.35)	980 (96.65)	0.063 (0.041, 0.096)	0.515 (0.286, 0.928)
Married	244 (31.32)	535 (68.68)	Ref	Ref	154 (29.28)	372 (70.72)	Ref	Ref	90 (35.57)	163 (64.43)	Ref	Ref
Separated/Divorced	17 (43.59)	22 (56.41)	1.694 (0.884, 3.248)	1.364 (0.687, 2.709)	9 (56.25)	7 (43.75)	3.106 (1.136, 8.488)	15.305 (0.524, 446.861)	8 (34.78)	15 (65.22)	0.966 (0.394, 2.366)	0.699 (0.267, 1.831)
Widowed	62 (72.94)	23 (27.06)	5.911 (3.578, 9.763)	6.085 (3.583, 10.333)	56 (75.68)	18 (24.32)	7.515 (4.279, 13.200)	11.483 (1.268, 103.981)	6 (54.55)	5 (45.45)	2.173 (0.645, 7.318)	2.270 (0.581, 8.872)
Current Student Status												
Current student	21 (1.66)	1245 (98.34)	0.047 (0.030, 0.074)	--	14 (2.38)	574 (97.62)	0.057 (0.033, 0.098)	--	7 (1.03)	671 (98.97)	0.039 (0.018, 0.084)	--
Not current student	373 (26.23)	1049 (73.77)	Ref	--	242 (30.10)	562 (69.90)	Ref	--	131 (21.20)	487 (78.80)	Ref	--
Age at first sexual intercourse												
5-13	71 (34.47)	135 (65.53)	0.876 (0.626, 1.225)	--	46 (35.38)	84 (64.62)	0.966 (0.639, 1.461)	--	25 (32.89)	51 (67.11)	0.698 (0.390, 1.250)	--
14-17	203 (37.52)	338 (62.48)	Ref	--	144 (36.18)	254 (63.82)	Ref	--	59 (41.26)	84 (58.74)	Ref	--
18-22	36 (34.29)	69 (65.71)	0.869 (0.560, 1.347)	--	23 (37.70)	38 (62.30)	1.068 (0.612, 1.863)	--	13 (29.55)	31 (70.45)	0.597 (0.288, 1.237)	--
23-35	4 (30.77)	9 (69.23)	0.740 (0.225, 2.434)	--	2 (40.00)	3 (60.00)	1.176 (0.194, 7.120)	--	2 (25.00)	6 (75.00)	0.475 (0.093, 2.434)	--

	HIV Infection		OR (95% CI)	AOR (95% CI)	HIV Infection (Females)		Females OR (95% CI)	Female AOR (95% CI)	HIV Infection (Males)		Males OR (95% CI)	Male AOR (95% CI)
Age Groups												
<15	4 (1.04)	379 (98.96)	0.201 (0.073, 0.555)	--	3 (1.44)	206 (98.56)	0.146 (0.045, 0.472)	--	1 (0.57)	173 (99.43)	0.612 (0.073, 5.115)	0.825 (0.094, 7.251)
15-19	64 (5.00)	1217 (95.00)	Ref	Ref	58 (9.06)	582 (90.94)	Ref	Ref	6 (0.94)	635 (99.06)	Ref	Ref
20-24	76 (22.03)	269 (77.97)	5.372 (3.757, 7.683)	1.355 (0.780, 2.354)	58 (32.40)	121 (67.60)	4.810 (3.182, 7.272)	9.738 (1.048, 90.478)	18 (10.84)	148 (89.16)	12.872 (5.023, 32.987)	6.189 (2.048, 18.706)
25-29	130 (36.62)	225 (63.38)	10.987(7.888, 15.303)	1.701 (0.998, 2.901)	72 (40.91)	104 (59.09)	6.947 (4.639, 10.404)	25.288 (2.155, 296.708)	58 (32.40)	121 (67.60)	50.730 (21.409, 120.209)	14.142 (4.628, 43.216)
30-35	124 (36.15)	219 (63.85)	10.767 (7.708, 15.040)	1.230 (0.719, 2.104)	69 (34.16)	133 (65.84)	5.206 (3.501, 7.741)	7.004 (0.568, 86.417)	55 (39.01)	86 (60.99)	67.684 (28.293, 161.918)	17.113 (5.404, 54.191)
Age at First Period												
8-13	--	--	--	--	82 (23.77)	263 (76.23)	1.652 (1.118, 2.443)	--	--	--	--	--
14	--	--	--	--	50 (15.87)	265 (84.13)	Ref	--	--	--	--	--
15	--	--	--	--	65 (22.57)	223 (77.43)	1.545 (1.026, 2.327)	--	--	--	--	--
16-35	--	--	--	--	59 (28.23)	150 (71.77)	2.085 (1.361, 3.194)	--	--	--	--	--
Highest Education level obtained												
Standard (Primary)	302 (14.01)	1853 (85.99)	Ref	--	209 (18.19)	940 (81.81)	Ref	--	93 (9.24)	913 (90.76)	Ref	--
Form (Secondary)	76 (15.80)	405 (84.20)	1.151 (0.876, 1.514)	--	42 (18.83)	181 (81.17)	1.044 (0.723, 1.507)	--	34 (13.18)	224 (86.82)	1.490 (0.980, 2.266)	--
Post-Secondary	12 (34.29)	23 (65.71)	3.201 (1.576, 6.502)	--	3 (27.27)	8 (72.73)	1.689 (0.445, 6.418)	--	9 (37.50)	15 (62.50)	5.890 (2.509, 13.829)	--
Religion												
Catholic	64 (10.87)	525 (89.13)	0.625 (0.463, 0.843)	0.910 (0.585, 1.414)	41 (13.58)	261 (86.42)	0.643 (0.439, 0.942)	8.263 (1.046, 65.271)	23 (8.01)	264 (91.99)	0.594 (0.365, 0.968)	0.696 (0.386, 1.256)
Anglican	53 (13.15)	350 (86.85)	0.776 (0.561, 1.075)	1.155 (0.730, 1.827)	38 (17.04)	185 (82.96)	0.841 (0.564, 1.253)	8.074 (0.915, 71.256)	15 (8.33)	165 (91.67)	0.620 (0.347, 1.107)	0.650 (0.328, 1.287)

	HIV Infection		OR (95% CI)	AOR (95% CI)	HIV Infection (Females)		Females OR (95% CI)	Female AOR (95% CI)	HIV Infection (Males)		Males OR (95% CI)	Male AOR (95% CI)
Nomiya	53 (15.54)	288 (84.46)	0.943 (0.679, 1.311)	0.796 (0.520, 1.220)	39 (22.54)	134 (77.46)	1.191 (0.794, 1.787)	1.290 (0.206, 8.070)	14 (8.33)	154 (91.67)	0.620 (0.341, 1.126)	0.542 (0.254, 1.159)
Legio	19 (19.39)	79 (80.61)	1.233 (0.731, 2.079)	0.845 (0.433, 1.650)	13 (25.00)	39 (75.00)	1.365 (0.708, 2.632)	19.391 (1.251, 300.646)	40 (86.96)	6 (13.04)	1.023 (0.420, 2.492)	0.668 (0.226, 1.970)
Protestant, other	206 (16.32)	1056 (83.68)	Ref	Ref	128 (19.63)	524 (80.37)	Ref	Ref	532 (87.21)	78 (12.79)	Ref	Ref
Other	2 (16.67)	10 (83.33)	1.025 (0.223, 4.714)	0.830 (0.082, 8.356)	0 (0)	2 (100)	<0.001 (++)	<0.001 (++)	8 (80.0)	2 (20.0)	1.705 (0.356, 8.177)	1.970 (0.289, 13.413)
Occupation												
Low SES	240 (26.46)	667 (73.54)	Ref	Ref	149 (32.32)	312 (67.68)	Ref	Ref	91 (20.40)	355 (79.60)	Ref	Ref
High SES	78 (36.62)	135 (63.38)	1.606 (1.171, 2.201)	1.769 (1.203, 2.602)	47 (43.52)	61 (56.48)	1.613 (1.052, 2.474)	3.945 (0.666, 23.383)	31 (29.52)	74 (70.48)	1.634 (1.013, 2.637)	1.656 (0.947, 2.895)
Student	21 (1.66)	1241 (98.34)	0.047 (0.030, 0.074)	<0.001 (++)	14 (2.39)	573 (97.61)	0.051 (0.029, 0.090)	--	7 (1.04)	668 (98.96)	0.041 (0.019, 0.089)	0.705 (0.236, 2.108)
Homemaker	41 (19.16)	173 (80.84)	0.659 (0.454, 0.955)	1.223 (0.745, 2.005)	39 (21.31)	144 (78.69)	0.567 (0.379, 0.849)	1.969 (0.332, 11.658)	2 (6.45)	29 (93.55)	0.269 (0.063, 1.148)	0.661 (0.108, 4.055)
Unemployed	11 (13.58)	70 (86.42)	0.437 (0.227, 0.839)	2.129 (0.468, 9.681)	8 (17.02)	39 (82.98)	0.430 (0.196, 0.942)	--	3 (8.82)	31 (91.18)	0.378 (0.113, 1.263)	1.201 (0.307, 4.706)
Other	6 (23.08)	20 (76.92)	0.834 (0.331, 2.101)	1.024 (0.225, 4.653)	2 (12.50)	14 (87.50)	0.299 (0.067, 1.333)	<0.001 (++)	4 (40.00)	6 (60.00)	2.601 (0.719, 9.410)	4.941 (0.807, 30.243)
Ever used condom with spouse since marriage												
Yes	161 (32.01)	342 (67.99)	1.141 (0.730, 1.784)	--	91 (29.07)	222 (70.93)	1.143 (0.641, 2.038)	--	70 (36.84)	120 (63.16)	1.125 (0.553, 2.287)	--
No	33 (29.20)	80 (70.80)	Ref	--	19 (26.39)	53 (73.61)	Ref	--	14 (34.15)	27 (65.85)	Ref	--
Number of lifetime partners												
0-1	12 (24.00)	38 (76.00)	0.630 (0.322, 1.233)	--	12 (27.27)	32 (72.73)	0.717 (0.360, 1.425)	5.667 (0.080, 401.375)	0 (0.00)	6 (100.00)	<0.001 (++)	--
2-5	203 (33.39)	405 (66.61)	Ref	--	180 (34.35)	344 (65.65)	Ref	Ref	23 (27.38)	61 (72.62)	Ref	--
6-9	51 (42.15)	70 (57.85)	1.454 (0.976, 2.165)	--	24 (55.81)	19 (44.19)	2.414 (1.288, 4.524)	0.017 (<0.001, 1.142)	27 (34.62)	51 (65.38)	1.404 (0.719, 2.741)	--
10+	55 (45.83)	65 (54.17)	1.688 (1.135,	--	4 (66.67)	2 (33.33)	3.819 (0.693,	>999 (++)	51 (44.74)	63 (55.26)	2.147 (1.172,	--

	HIV Infection		OR (95% CI)	AOR (95% CI)	HIV Infection (Females)		Females OR (95% CI)	Female AOR (95% CI)	HIV Infection (Males)		Males OR (95% CI)	Male AOR (95% CI)
			2.510)				21.046)				3.933)	
Ritual Sex participation												
Yes	35 (55.56)	28 (44.44)	2.387 (1.424, 4.003)	1.827 (1.025, 3.254)	15 (83.33)	3 (16.67)	9.610 (2.750, 33.576)	--	20 (44.44)	25 (55.56)	1.505 (0.790, 2.868)	--
No	289 (34.36)	552 (65.64)	Ref	Ref	205 (34.22)	394 (65.78)	Ref	--	84 (34.71)	158 (65.29)	Ref	--
Condom use in first sexual encounter												
Yes	18 (30.00)	42 (70.00)	0.756 (0.428, 1.337)	--	12 (30.00)	28 (70.00)	0.762 (0.380, 1.531)	16.333 (1.239, 215.245)	6 (30.00)	14 (70.00)	0.743 (0.277, 1.997)	--
No	306 (36.17)	540 (63.83)	Ref	--	208 (35.99)	370 (64.01)	Ref	Ref	98 (36.57)	170 (63.43)	Ref	--
Raped as a child or young adult												
Yes	23 (45.10)	28 (54.90)	1.515 (0.857, 2.676)	--	18 (50.00)	18 (50.00)	1.886 (0.960, 3.705)	--	5 (33.33)	10 (66.67)	0.879 (0.292, 2.644)	--
No	301 (35.16)	555 (64.84)	Ref	--	202 (34.65)	381 (65.35)	Ref	--	99 (36.26)	174 (63.74)	Ref	--
Sex with someone other than spouse or primary partner												
Yes	85 (17.63)	397 (82.37)	0.791 (0.606, 1.032)	--	35 (27.56)	92 (72.44)	1.129 (0.743, 1.716)	--	50 (14.08)	305 (85.92)	0.907 (0.622, 1.323)	--
No	304 (21.30)	1123 (78.70)	Ref	--	218 (25.20)	647 (74.80)	Ref	--	86 (15.30)	476 (84.70)	Ref	--
Time spent away from home in the last 6 months												
None to 1 Week	105 (17.30)	502 (82.70)	Ref	--	73 (25.09)	218 (74.91)	Ref	Ref	32 (10.13)	284 (89.87)	Ref	--
Between 1 Week and 1 Month	119 (20.80)	453 (79.20)	1.256 (0.938, 1.681)	--	78 (25.16)	232 (74.84)	1.004 (0.694, 1.452)	0.429 (0.107, 1.719)	41 (15.65)	221 (84.35)	1.646 (1.004, 2.700)	--
More than 1 Month	66 (18.28)	295 (81.72)	1.070 (0.761, 1.502)	--	32 (18.39)	142 (81.61)	0.673 (0.422, 1.073)	0.237 (0.045, 1.251)	34 (18.18)	153 (81.82)	1.972 (1.171, 3.321)	--
Number of Sex Partners other than spouse												

	HIV Infection		OR (95% CI)	AOR (95% CI)	HIV Infection (Females)		Females OR (95% CI)	Female AOR (95% CI)	HIV Infection (Males)		Males OR (95% CI)	Male AOR (95% CI)
1	62 (18.62)	271 (81.38)	Ref	--	28 (25.23)	83 (74.77)	Ref	--	34 (15.32)	188 (84.68)	Ref	--
2-3	20 (15.50)	109 (84.50)	0.802 (0.462, 1.391)	--	7 (46.67)	8 (53.33)	2.594 (0.862, 7.801)	--	13 (11.40)	101 (88.60)	0.712 (0.359, 1.410)	--
4 or more	3 (14.29)	18 (85.71)	0.729 (0.208, 2.551)	--	0 (0.0)	1 (100.00)	<0.001 (++)	--	3 (15.00)	17 (85.00)	0.976 (0.271, 3.512)	--
Currently Pregnant												
Yes	--	--	--	--	17 (19.10)	72 (80.90)	0.976 (0.549, 1.736)	3.853 (0.866, 17.145)	--	--	--	--
No	--	--	--	--	91 (19.49)	376 (80.51)	Ref	Ref	--	--	--	--
Age at First Pregnant												
<16	--	--	--	--	25 (22.94)	84 (77.06)	0.570 (0.338, 0.959)	--	--	--	--	--
16-17	--	--	--	--	81 (34.32)	155 (65.68)	Ref	--	--	--	--	--
18-19	--	--	--	--	62 (31.63)	134 (68.37)	0.885 (0.591, 1.326)	--	--	--	--	--
>19	--	--	--	--	48 (35.04)	89 (64.96)	1.302 (0.663, 1.606)	--	--	--	--	--
Circumcised												
Yes	--	--	--	--	--	--	--	--	14 (11.02)	113 (88.98)	1.048 (0.584, 1.883)	0.706 (0.337, 1.477)
No	--	--	--	--	--	--	--	--	124 (10.57)	1049 (89.43)	Ref	Ref
Age of Circumcision												
0-1 years old	--	--	--	--	--	--	--	--	2 (6.25)	30 (93.75)	Ref	--
2-6 years old	--	--	--	--	--	--	--	--	3 (14.29)	18 (85.71)	2.500 (0.381, 16.420)	--
7-13 years old	--	--	--	--	--	--	--	--	1 (5.26)	18 (94.74)	0.833 (0.070, 9.858)	--
14 years and older	--	--	--	--	--	--	--	--	4 (16.67)	20 (83.33)	3.000 (0.501, 17.954)	--
Use of Contraception in the												

	HIV Infection		OR (95% CI)	AOR (95% CI)	HIV Infection (Females)		Females OR (95% CI)	Female AOR (95% CI)	HIV Infection (Males)		Males OR (95% CI)	Male AOR (95% CI)
last 12 months												
Yes	--	--	--	--	45 (28.66)	112 (71.34)	1.939 (1.332, 2.825)	--	--	--	--	--
No	--	--	--	--	214 (17.16)	1033 (82.84)	Ref	--	--	--	--	--
Condom Use During Last Sexual Intercourse												
Yes	37 (12.94)	249 (87.06)	0.503 (0.347, 0.728)	--	18 (15.93)	95 (84.07)	0.522 (0.307, 0.890)	0.156 (0.010, 2.428)	19 (10.98)	154 (89.02)	0.546 (0.324, 0.920)	--
No	277 (22.82)	937 (77.18)	Ref	--	173 (26.62)	477 (73.38)	Ref	Ref	104 (18.44)	460 (81.56)	Ref	--
Reason for Using a condom during last sexual intercourse												
To prevent pregnancy	19 (12.84)	129 (87.16)	0.469 (0.265, 0.828)	--	13 (19.40	54 (80.60)	0.769 (0.363, 1.625)	--	6 (7.41)	75 (92.59)	0.254 (0.100, 0.644)	--
To protect against STI/HIV	55 (23.91)	175 (76.09)	Ref	--	26 (23.85)	83 (76.15)	Ref	--	29 (23.97)	92 (76.03)	Ref	--
To prevent both pregnancy & STI/HIV	2 (5.26)	36 (94.74)	0.177 (0.041, 0.758)	--	2 (12.50)	14 (87.50)	0.456 (0.097, 2.139)	--	0 (0.00)	22 (100.00)	<0.001 (++)	--
Did not trust partner/feel partner has other partners	3 (15.00)	17 (85.00)	0.561 (0.159, 1.988)	--	0 (0.00)	3 (100.00)	<0.001 (++)	--	3 (17.65)	14 (82.35)	0.680 (0.183, 2.532)	--
Because other partner insisted	1 (20.00)	4 (80.00)	0.795 (0.087, 7.267)	--	0 (0.00)	3 (100.00)	<0.001 (++)	--	1 (50.00)	1 (50.00)	3.172 (0.192, 52.329)	--
Other	1 (12.50)	7 (87.50)	0.455 (0.055, 3.776)	--	0 (0.00)	2 (100.00)	<0.001 (++)	--	1 (16.67)	5 (83.33)	0.634 (0.071, 5.654)	--
Reason for not using condom during last sexual intercourse												
Didn't know how to use condoms	15 (7.65)	181 (92.35)	0.603 (0.321, 1.130)	--	14 (19.44)	58 (80.56)	0.850 (0.404, 1.791)	--	1 (0.81)	123 (99.19)	0.109 (0.014, 0.841)	--
Didn't have any available	37 (12.09)	269 (87.91)	Ref	--	23 (22.12)	81 (77.88)	Ref	--	14 (6.93)	188 (93.07)	Ref	--
Don't use condoms with steady partner	58 (34.94)	108 (65.06)	3.904 (2.443, 6.240)	--	36 (33.03)	73 (66.97)	1.737 (0.942, 3.201)	--	22 (38.60)	35 (61.40)	8.441 (3.943, 18.068)	--
Trust Partner	103 (30.38)	236 (69.62)	3.173 (2.097, 4.802)	--	55 (33.54)	109 (66.46)	1.777 (1.010, 3.127)	--	48 (27.43)	127 (72.57)	5.075 (2.686, 9.591)	--

	HIV Infection		OR (95% CI)	AOR (95% CI)	HIV Infection (Females)		Females OR (95% CI)	Female AOR (95% CI)	HIV Infection (Males)		Males OR (95% CI)	Male AOR (95% CI)
Partner refused to use condoms	59 (33.33)	118 (66.67)	3.635 (2.284, 5.784)	--	56 (34.78)	105 (65.22)	1.878 (1.067, 3.306)	--	3 (18.75)	13 (81.25)	3.099 (0.789, 12.168)	--
Condoms reduce pleasure	8 (13.11)	53 (86.89)	1.097 (0.484, 2.489)	--	3 (20.00)	12 (80.00)	0.880 (0.229, 3.387)	--	5 (10.87)	41 (81.25)	1.638 (0.559, 4.801)	--
Wanted to have child	6 (22.22)	21 (77.78)	2.077 (0.787, 5.481)	--	4 (20.00)	16 (80.00)	0.880 (0.268, 2.893)	--	2 (28.57)	5 (71.43)	5.371 (0.955, 30.219)	--
Fear side effects of condoms	12 (25.00)	36 (75.00)	2.423 (1.158, 5.070)	--	11 (34.38)	21 (65.63)	1.845 (0.777, 4.377)	--	1 (6.25)	15 (93.75)	0.895 (0.110, 7.280)	--
Other	37 (19.58)	152 (80.42)	1.770 (1.076, 2.910)	--	82 (82.83)	17 (17.17)	0.730 (0.363, 1.467)	--	20 (22.22)	70 (77.78)	3.837 (1.838, 8.010)	--
Ever been treated for an STI												
Yes	111 (44.22)	140 (55.78)	6.021 (4.560, 7.951)	1.928 (1.294, 2.874)	28 (47.46)	31 (52.54)	4.359 (2.565, 7.408)	--	83 (43.23)	109 (56.77)	14.594 (9.845, 21.636)	3.728 (2.377, 5.849)
No	285 (11.64)	2164 (88.36)	Ref	Ref	230 (17.16)	1110 (82.84)	Ref	--	55 (4.96)	1054 (95.04)	Ref	Ref
Ever had HIV test												
Yes	38 (20.54)	147 (79.46)	1.556 (1.071, 2.261)	0.801 (0.493, 1.302)	28 (26.67)	77 (73.33)	1.681 (1.066, 2.651)	--	10 (12.50)	70 (87.50)	1.220 (0.613, 2.426)	--
No	359 (14.25)	2161 (85.75)	Ref	Ref	231 (17.78)	1068 (82.22)	Ref	--	128 (10.48)	1093 (89.52)	Ref	--
Why never got HIV test												
HIV testing too far away	40 (20.51)	155 (79.49)	1.918 (1.236, 2.978)	--	19 (21.59)	69 (78.41)	1.325 (0.731, 2.404)	--	21 (19.63)	86 (80.37)	4.375 (2.062, 9.281)	--
Cannot pay for HIV test	16 (23.19)	53 (76.81)	2.244 (1.206, 4.174)	--	4 (19.05)	17 (80.95)	1.132 (0.365, 3.515)	--	12 (25.00)	36 (75.00)	5.972 (2.491, 14.320)	--
Don't know where to go for HIV test	60 (11.86)	446 (88.14)	Ref	--	48 (17.20)	231 (82.80)	Ref	--	12 (5.29)	215 (94.71)	Ref	--
Afraid of knowing HIV result	67 (29.13)	163 (70.87)	3.055 (2.065, 4.521)	--	44 (34.65)	83 (65.35)	2.551 (1.579, 4.122)	--	23 (22.23)	80 (77.67)	5.151 (2.449, 10.836)	--
Afraid will get sick/die more quickly	10 (31.25)	22 (68.75)	3.379 (1.526, 7.479)	--	8 (50.00)	8 (50.00)	4.812 (1.721, 13.455)	--	2 (12.50)	14 (87.50)	2.560 (0.521, 12.571)	--
Embarrassed to ask for a test	5 (12.50)	35 (87.50)	1.062 (0.401, 2.815)	--	1 (4.76)	20 (95.24)	0.241 (0.032, 1.836)	--	4 (21.05)	15 (78.95)	4.778 (1.373, 16.622)	--
Not at risk of HIV/AIDS	35 (9.26)	343 (90.74)	0.759 (0.489,	--	22 (11.64)	167 (88.36)	0.634 (0.369,	--	13 (6.88)	176	1.323 (0.589,	--

	HIV Infection		OR (95% CI)	AOR (95% CI)	HIV Infection (Females)		Females OR (95% CI)	Female AOR (95% CI)	HIV Infection (Males)		Males OR (95% CI)	Male AOR (95% CI)
			1.178)				1.091)			(93.12)	2.973)	
Too young to get tested	1 (1.79)	55 (98.21)	0.135 (0.018, 0.995)	--	1 (3.70)	26 (96.30)	0.185 (0.025, 1.397)	--	0 (0.00)	29 (100.00)	<0.001 (++)	--
Not sexually active	1(0.48)	207 (99.52)	0.036 (0.005, 0.261)	--	0 (0.00)	100 (100.00)	<0.001 (++)	--	1 (0.93)	107 (99.07)	0.167 (0.021, 1.305)	--
Other	93 (17.85)	428 (82.15)	1.615 (1.138, 2.293)	--	59 (23.32)	194 (76.68)	1.464 (0.956, 2.241)	--	34 (12.69)	234 (87.31)	2.603 (1.314, 5.157)	--
Did you tell anyone the results of your HIV test												
Yes	16 (15.09)	90 (84.91)	0.566 (0.239, 1.338)	--	11 (20.37)	43 (79.63)	0.540 (0.192, 1.517)	--	5 (9.62)	47 (90.38)	0.851 (0.150, 4.825)	--
No	11 (23.91)	35 (76.09)	Ref	--	9 (32.14)	19 (67.86)	Ref	--	2 (11.11)	16 (88.89)	Ref	--

++95% Confidence Interval is <0.001, >999.999, and so non-significant

Table 7: Risk factors for Syphilis

	Syphilis Infection		OR (95% CI)	AOR (95% CI)	Syphilis Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Syphilis Infection (Males)		Males OR (95% CI)	AOR (95% CI)
	Yes (N= 39)	No (N=2665)			Yes (N= 24)	No (N=1381)			Yes (N=15)	No (N=1284)		
	n (%)	n (%)			n (%)	n (%)			n (%)	n (%)		
Gender					--	--	--		--	--	--	
Male	15 (1.15)	1284 (98.85)	0.672 (0.351, 1.287)	1.160 (0.468, 2.878)	--	--	--	--	--	--	--	--
Female	24 (1.71)	1381 (98.29)	Ref	Ref	--	--	--	--	--	--	--	--
Marital Status												
Single	13 (0.72)	1788 (99.28)	0.290 (0.143, 0.590)	<0.001 (++)	8 (1.02)	779 (98.98)	0.440 (0.179, 1.084)	--	5 (0.49)	1009 (99.51)	0.173 (0.054, 0.549)	0.858 (0.186, 3.969)
Married	19 (2.45)	758 (97.55)	Ref	Ref	12 (2.28)	514 (97.72)	Ref	Ref	7 (2.79)	244 (97.21)	Ref	Ref
Separated/Divorced	4 (10.26)	35 (89.74)	4.559 (1.472, 14.117)	4.127 (1.259, 13.524)	2 (12.50)	14 (87.50)	6.119 (1.250, 29.955)	2.105 (0.116, 38.201)	2 (8.70)	21 (91.30)	3.320 (0.648, 17.002)	2.782 (0.513, 15.097)
Widowed	3 (3.53)	82 (96.47)	1.460 (0.423, 5.037)	1.341 (0.371, 4.843)	2 (2.70)	72 (97.30)	1.190 (0.261, 5.424)	0.657 (0.020, 21.849)	1 (9.09)	10 (90.91)	3.486 (0.391, 31.103)	2.235 (0.238, 20.986)
Current Student Status												
Current student	4 (0.32)	1261 (99.68)	0.126 (0.045, 0.354)	--	2 (0.34)	585 (99.66)	0.122 (0.028, 0.519)	--	2 (0.29)	676 (99.71)	0.137 (0.031, 0.611)	--
Not current student	35 (2.46)	1385 (97.54)	Ref	--	22 (2.74)	782 (97.26)	Ref	--	13 (2.11)	603 (97.89)	Ref	--
Age at first sexual intercourse												
5-13	4 (1.94)	202 (98.06)	0.649 (0.214, 1.963)	--	2 (1.54)	128 (98.46)	0.550 (0.120, 2.513)	0.526 (0.026, 10.714)	2 (2.63)	74 (97.37)	0.741 (0.140, 3.910)	--
14-17	16 (2.96)	524 (97.04)	Ref	--	11 (2.76)	387 (97.24)	Ref	Ref	5 (3.52)	137 (96.48)	Ref	--
18-22	4 (3.81)	101 (96.19)	1.297 (0.425, 3.960)	--	2 (3.28)	59 (96.72)	1.193 (0.258, 5.515)	2.660 (0.268, 26.409)	2 (4.55)	42 (95.45)	1.305 (0.244, 6.972)	--
23-35	0 (0.00)	13 (100.00)	<0.001 (++)	--	0 (0.00)	5 (100.00)	<0.001 (++)	--	0 (0.00)	8 (100.00)	<0.001 (++)	--

	Syphilis Infection		OR (95% CI)	AOR (95% CI)	Syphilis Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Syphilis Infection (Males)		Males OR (95% CI)	AOR (95% CI)
Age Groups												
<15	1 (0.26)	381 (99.74)	0.418 (0.052, 3.350)	>999.999 (++)	0 (0.00)	174 (100.00)	<0.001 (++)	--	1 (0.48)	207 (99.52)	0.437 (0.053, 3.572)	<0.001 (++)
15-19	8 (0.62)	1273 (99.38)	Ref	Ref	1 (0.16)	640 (99.84)	Ref	Ref	7 (1.09)	633 (98.91)	Ref	Ref
20-24	9 (2.61)	336 (97.39)	4.262 (1.632, 11.131)	3.150 (0.352, 28.221)	4 (2.41)	162 (97.59)	15.802 (1.754, 142.343)	>999 (++)	5 (2.79)	174 (97.21)	2.599 (0.815, 8.288)	9.986 (0.744, 133.980)
25-29	9 (2.54)	345 (97.46)	4.151 (1.590, 10.839)	2.828 (0.325, 24.587)	3 (1.69)	175 (98.31)	10.971 (1.134, 106.127)	>999 (++)	6 (3.41)	170 (96.59)	3.192 (1.059, 9.622)	4.887 (0.269, 88.884)
30-35	12 (3.51)	330 (96.49)	5.786 (2.346, 14.272)	3.726 (0.440, 31.571)	7 (5.00)	133 (95.00)	33.684 (4.110, 276.062)	>999 (++)	5 (2.48)	197 (97.52)	2.295 (0.720, 7.312)	13,262 (0.745, 236.227)
Age at First Period												
8-13	--	--	--	--	7 (2.03)	338 (97.97)	1.067 (0.355, 3.208)	--	--	--	--	--
14	--	--	--	--	6 (1.90)	309 (98.10)	Ref	--	--	--	--	--
15	--	--	--	--	4 (1.39)	284 (98.61)	0.725 (0.203, 2.597)	--	--	--	--	--
16-35	--	--	--	--	7 (3.35)	202 (96.65)	1.785 (0.591, 5.387)	--	--	--	--	--
Highest Education level obtained												
Standard (Primary)	32 (1.49)	2120 (98.51)	Ref	--	22 (1.92)	1126 (98.08)	Ref	--	10 (1.00)	994 (99.00)	Ref	--
Form (Secondary)	6 (1.25)	475 (98.75)	0.837 (0.348, 2.013)	--	2 (0.90)	221 (99.10)	0.463 (0.108, 1.984)	--	4 (1.55)	254 (98.45)	1.565 (0.487, 5.032)	--
Post-Secondary	0 (0.00)	35 (100.00)	<0.001 (++)	--	0 (0.00)	11 (100.00)	<0.001 (++)	--	0 (0.00)	24 (100.00)	<0.001 (++)	--
Religion												
Catholic	7 (1.19)	580 (98.81)	0.650 (0.277, 1.524)	0.739 (0.210, 2.604)	4 (1.33)	297 (98.67)	0.572 (0.188, 1.738)	<0.001 (++)	3 (1.05)	283 (98.95)	0.798 (0.210, 3.029)	0.929 (0.233, 3.706)
Anglican	6 (1.49)	397 (98.51)	0.814 (0.329, 2.014)	0.793 (0.224, 2.805)	4 (1.79)	219 (98.21)	0.776 (0.255, 2.362)	5.720 (0.506, 64.629)	2 (1.11)	178 (98.89)	0.846 (0.178, 4.018)	0.931 (0.188, 4.599)

	Syphilis Infection		OR (95% CI)	AOR (95% CI)	Syphilis Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Syphilis Infection (Males)		Males OR (95% CI)	AOR (95% CI)
Nomiya	3 (0.88)	337 (99.12)	0.480 (0.143, 1.607)	0.580 (0.166, 2.033)	1 (0.58)	172 (99.42)	0.247 (0.032, 1.882)	<0.001 (++)	2 (1.20)	165 (98.80)	0.912 (0.192, 4.336)	0.598 (0.105, 3.398)
Legio	0 (0.00)	98 (100.00)	<0.001 (++)	<0.001 (++)	0 (0.00)	52 (100.00)	<0.001 (++)	<0.001 (++)	0 (0.00)	46 (100.00)	<0.001 (++)	<0.001 (++)
Protestant, other	23 (1.82)	1239 (98.18)	Ref	Ref	15 (2.30)	637 (97.70)	Ref	Ref	8 (1.31)	602 (98.69)	Ref	Ref
Other	0 (0.00)	12 (100.00)	<0.001 (++)	<0.001 (++)	0 (0.00)	2 (100.00)	<0.001 (++)	--	0 (0.00)	10 (100.00)	<0.001 (++)	<0.001 (++)
Occupation												
Low SES	24 (2.65)	881 (97.35)	Ref	Ref	12 (2.60)	449 (97.40)	Ref	Ref	12 (2.70)	432 (97.30)	Ref	Ref
High SES	5 (2.35)	208 (97.65)	0.882 (0.333, 2.340)	1.111 (0.396, 3.115)	3 (2.78)	105 (97.22)	1.069 (0.296, 3.856)	1.656 (0.104, 26.462)	2 (1.90)	103 (98.10)	0.699 (0.154, 3.172)	0.635 (0.136, 2.966)
Student	3 (0.24)	1258 (99.76)	0.088 (0.026, 0.292)	<0.001 (++)	2 (0.34)	584 (99.66)	0.128 (0.029, 0.575)	--	1 (0.15)	674 (99.85)	0.053 (0.007, 0.412)	0.419 (0.032, 5.517)
Homemaker	6 (2.80)	208 (97.20)	1.059 (0.427, 2.623)	1.365 (0.358, 5.214)	6 (3.28)	177 (96.72)	1.268 (0.469, 3.432)	2.112 (0.173, 25.851)	0 (0.0)	31 (100.00)	<0.001 (++)	<0.001 (++)
Unemployed	1 (1.23)	80 (98.77)	0.459 (0.061, 3.436)	<0.001 (++)	1 (2.13)	46 (97.87)	0.813 (0.103, 6.398)	--	0 (0.00)	34 (100.00)	<0.001 (++)	<0.001 (++)
Other	0 (0.0)	26 (100.00)	<0.001 (++)	<0.001 (++)	0 (0.00)	16 (100.00)	<0.001 (++)	0.358 (++)	0 (0.00)	10 (100.00)	<0.001 (++)	<0.001 (++)
Ever used condom with spouse since marriage												
Yes	15 (2.99)	486 (97.01)	>999.99 (++)	--	9 (2.88)	304 (97.12)	>999.99 (++)	--	6 (3.19)	182 (96.81)	>999.99 (++)	--
No	0 (0.00)	113 (100.00)	Ref	--	0 (0.00)	72 (100.00)	Ref	--	0 (0.00)	41 (100.00)	Ref	--
Number of lifetime partners												
0-1	1 (2.00)	49 (98.00)	0.755 (0.098, 5.814)	--	1 (2.27)	43 (97.73)	1.085 (0.137, 8.600)	3.441 (0.179, 66.211)	0 (0.00)	6 (100.00)	<0.001 (++)	--
2-5	16 (2.63)	592 (97.37)	Ref	--	11 (2.10)	513 (97.90)	Ref	Ref	5 (5.95)	79 (94.05)	Ref	--
6-9	5 (4.20)	114 (95.80)	1.623 (0.583, 4.518)	--	4 (9.30)	39 (90.70)	4.783 (1.455, 15.719)	94.001 (5.335, >999)	1 (1.32)	75 (98.68)	0.211 (0.024, 1.845)	--

	Syphilis Infection		OR (95% CI)	AOR (95% CI)	Syphilis Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Syphilis Infection (Males)		Males OR (95% CI)	AOR (95% CI)
10+	4 (3.33)	116 (96.67)	1.276 (0.419, 3.885)	--	0 (0.00)	6 (100.00)	<0.001 (++)	<0.001 (++)	4 (3.51)	110 (96.49)	0.575 (0.150, 2.208)	--
Ritual Sex participation												
Yes	3 (4.76)	60 (95.24)	1.774 (0.518, 6.077)	--	1 (5.56)	17 (94.44)	2.290 (0.286, 18.348)	--	2 (4.44)	43 (95.56)	1.349 (0.277, 6.571)	--
No	23 (2.74)	816 (97.26)	Ref	--	15 (2.50)	584 (97.50)	Ref	--	8 (3.33)	232 (96.67)	Ref	--
Condom use during first sexual encounter												
Yes	0 (0.00)	60 (100.00)	<0.001 (++)	<0.001 (++)	0 (0.00)	40 (100.00)	<0.001 (++)	--	0 (0.00)	20 (100.00)	<0.001 (++)	--
No	26 (3.08)	818 (96.92)	Ref	Ref	16 (2.77)	562 (97.23)	Ref	--	10 (3.76)	256 (96.24)	Ref	--
Raped as a child or young adult												
Yes	1 (1.96)	50 (98.04)	0.633 (0.088, 4.995)	--	1 (2.78)	35 (97.22)	1.082 (0.139, 8.428)	--	0 (0.00)	15 (100.00)	<0.001 (++)	--
No	25 (2.93)	829 (97.07)	Ref	--	15 (2.57)	568 (97.43)	Ref	--	10 (3.29)	261 (96.31)	Ref	--
Sex with someone other than spouse or primary partner												
Yes	12 (2.49)	469 (97.51)	1.434 (0.715, 2.877)	--	3 (2.36)	124 (97.64)	1.077 (0.314, 3.693)	--	9 (2.54)	345 (97.46)	2.413 (0.851, 6.839)	--
No	25 (1.75)	1401 (98.25)	Ref	--	19 (2.20)	846 (97.80)	Ref	--	6 (1.07)	555 (98.93)	Ref	--
Time spent away from home in the last 6 months												
None to 1 Week	10 (1.65)	597 (98.35)	Ref	--	7 (2.41)	284 (97.59)	Ref	--	3 (0.95)	313 (99.05)	Ref	--
Between 1 Week and 1 Month	11 (1.92)	561 (98.08)	1.171 (0.493, 2.778)	--	6 (1.94)	304 (98.06)	0.801 (0.266, 2.411)	--	5 (1.91)	257 (98.09)	2.030 (0.481, 8.575)	--
More than 1 Month	7 (1.94)	353 (98.06)	1.184 (0.447, 3.138)	--	6 (3.45)	168 (96.55)	1.449 (0.479, 4.383)	--	1 (0.54)	185 (99.46)	0.564 (0.058, 5.462)	--
Number of Sex Partners other than spouse												

	Syphilis Infection		OR (95% CI)	AOR (95% CI)	Syphilis Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Syphilis Infection (Males)		Males OR (95% CI)	AOR (95% CI)
1	9 (2.70)	324 (97.30)	Ref	--	3 (2.70)	108 (97.30)	Ref	--	6 (2.70)	216 (97.30)	Ref	--
2-3	2 (1.56)	126 (98.44)	0.571 (0.122, 2.681)	--	0 (0.00)	15 (100)	<0.001 (++)	--	2 (1.77)	111 (98.23)	0.649 (0.129, 3.267)	--
4 or more	1 (4.76)	20 (95.24)	1.801 (0.217, 14.918)	--	0 (0.00)	1 (100.00)	<0.001 (++)	--	1 (5.00)	19 (95.00)	1.896 (0.217, 16.568)	--
Currently Pregnant												
Yes	--	--	--	--	1 (1.12)	88 (98.88)	0.519 (0.066, 4.108)	<0.001 (++)	--	--	--	--
No	--	--	--	--	10 (2.14)	457 (97.86)	Ref	Ref	--	--	--	--
Age at First Pregnant												
<16	--	--	--	--	6 (5.50)	103 (94.50)	1.906 (0.625, 5.811)	--	--	--	--	--
16-17	--	--	--	--	7 (2.97)	229 (97.03)	Ref	--	--	--	--	--
18-19	--	--	--	--	2 (1.02)	194 (98.98)	0.337 (0.069, 1.642)	--	--	--	--	--
>19	--	--	--	--	3 (2.19)	134 (97.81)	0.732 (0.186, 2.880)	--	--	--	--	--
Circumcised												
Yes	--	--	--	--	--	--	--	--	3 (2.38)	123 (97.62)	2.358 (0.656, 8.469)	2.264 (0.540, 9.492)
No	--	--	--	--	--	--	--	--	12 (1.02)	1160 (98.98)	Ref	Ref
Age of Circumcision												
0-1 years old	--	--	--	--	--	--	--	--	1 (3.13)	31 (96.88)	Ref	--
2-6 years old	--	--	--	--	--	--	--	--	0 (0.00)	21 (100.00)	<0.001 (++)	--
7-13 years old	--	--	--	--	--	--	--	--	0 (0.00)	18 (100.00)	<0.001 (++)	--
14 years and older	--	--	--	--	--	--	--	--	1 (4.17)	23 (95.83)	1.348 (0.080, 22.698)	--
Use of Contraception in the												

	Syphilis Infection		OR (95% CI)	AOR (95% CI)	Syphilis Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Syphilis Infection (Males)		Males OR (95% CI)	AOR (95% CI)
last 12 months												
Yes	--	--	--	--	6 (3.82)	151 (96.18)	2.711 (1.060, 6.935)	--	--	--	--	--
No	--	--	--	--	18 (1.44)	1228 (98.56)	Ref	--	--	--	--	--
Condom Use During Last Sexual Intercourse												
Yes	3 (1.05)	283 (98.95)	0.465 (0.140, 1.544)	--	2 (1.77)	111 (98.23)	0.714 (0.162, 3.148)	--	1 (0.58)	172 (99.42)	0.291 (0.037, 2.272)	--
No	27 (2.23)	1185 (97.77)	Ref	--	16 (2.46)	634 (97.54)	Ref	--	11 (1.96)	551 (98.04)	Ref	--
Reason for Using a condom during last sexual intercourse												
To prevent pregnancy	1 (0.68)	147 (99.32)	0.254 (0.030, 2.131)	--	1 (1.49)	66 (98.51)	0.535 (0.055, 5.255)	--	0 (0.00)	81 (100.00)	<0.001 (++)	--
To protect against STI/HIV	6 (2.61)	224 (97.39)	Ref	--	3 (2.75)	106 (97.25)	Ref	--	3 (2.48)	118 (97.52)	Ref	--
To prevent both pregnancy & STI/HIV	0 (0.00)	38 (100.00)	<0.001 (++)	--	0 (0.00)	16 (100.00)	<0.001 (++)	--	0 (0.00)	22 (100.00)	<0.001 (++)	--
Did not trust partner/feel partner has other partners	1 (5.00)	19 (95.00)	1.965 (0.225, 17.178)	--	1 (33.33)	2 (66.67)	17.667 (1.235, 252.725)	--	0 (0.00)	17 (100.00)	<0.001 (++)	--
Because other partner insisted	0 (0.00)	5 (100.00)	<0.001 (++)	--	0 (0.00)	3 (100.00)	<0.001 (++)	--	0 (0.00)	2 (100.00)	<0.001 (++)	--
Other	0 (0.00)	8 (100.00)	<0.001 (++)	--	0 (0.00)	2 (100.00)	<0.001 (++)	--	0 (0.00)	6 (100.00)	<0.001 (++)	--
Reason for not using condom during last sexual intercourse												
Didn't know how to use condoms	1 (0.51)	195 (99.49)	0.256 (0.031, 2.146)	--	0 (0.00)	72 (100.00)	<0.001 (++)	--	1 (0.81)	123 (99.19)	0.539 (0.055, 5.243)	--
Didn't have any available	6 (1.96)	300 (98.04)	Ref	--	3 (2.88)	101 (97.12)	Ref	--	3 (1.49)	199 (98.51)	Ref	--
Don't use condoms with steady partner	4 (2.42)	161 (97.58)	1.242 (0.346, 4.466)	--	3 (2.75)	106 (97.25)	0.953 (0.188, 4.831)	--	1 (1.79)	55 (98.21)	1.206 (0.123, 11.824)	--
Trust Partner	5 (1.48)	333 (98.52)	0.751 (0.227, 2.485)	--	4 (2.44)	160 (97.56)	0.842 (0.185, 3.839)	--	1 (0.57)	173 (99.43)	0.383 (0.040, 3.720)	--

	Syphilis Infection		OR (95% CI)	AOR (95% CI)	Syphilis Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Syphilis Infection (Males)		Males OR (95% CI)	AOR (95% CI)
Partner refused to use condoms	5 (2.82)	172 (97.18)	1.453 (0.437, 4.833)	--	3 (1.86)	158 (98.14)	0.639 (0.127, 3.229)	--	2 (12.50)	14 (87.50)	9.476 (1.461, 61.452)	--
Condoms reduce pleasure	2 (3.28)	59 (96.72)	1.695 (0.334, 8.603)	--	0 (0.00)	15 (100.00)	<0.001 (++)	--	2 (4.35)	44 (95.65)	3.015 (0.489, 18.586)	--
Wanted to have child	2 (7.41)	25 (92.59)	4.000 (0.767, 20.859)	--	2 (10.00)	18 (90.00)	3.741 (0.583, 23.985)	--	0 (0.00)	7 (100.00)	<0.001 (++)	--
Fear side effects of condoms	1 (2.08)	47 (97.92)	1.064 (0.125, 9.035)	--	1 (3.13)	31 (96.88)	1.086 (0.109, 10.818)	--	0 (0.00)	16 (100.00)	<0.001 (++)	--
Other	7 (3.70)	182 (96.30)	1.923 (0.636, 5.811)	--	3 (3.03)	96 (96.97)	1.052 (0.207, 5.340)	--	4 (4.44)	86 (95.56)	3.085 (0.676, 14.081)	--
Ever been treated for an STI												
Yes	6 (2.41)	243 (97.59)	1.807 (0.750, 4.356)	--	1 (1.69)	58 (98.31)	0.987 (0.131, 7.432)	0.238 (0.007, 7.760)	5 (2.63)	185 (97.37)	2.970 (1.004, 8.788)	--
No	33 (1.35)	2415 (98.65)	Ref	--	23 (1.72)	1316 (98.28)	Ref	Ref	10 (0.90)	1099 (99.10)	Ref	--
Ever had HIV test												
Yes	4 (2.16)	181 (97.84)	1.567 (0.551, 4.458)	--	3 (2.86)	102 (97.14)	1.789 (0.525, 6.097)	--	1 (1.25)	79 (98.75)	1.090 (0.141, 8.391)	--
No	35 (1.39)	2482 (98.61)	Ref	--	21 (1.62)	1277 (98.38)	Ref	--	14 (1.15)	1205 (98.85)	Ref	--
Why never got HIV test												
HIV testing too far away	3 (1.54)	192 (98.46)	0.861 (0.231, 3.215)	--	2 (2.27)	86 (97.73)	1.054 (0.209, 5.320)	--	1 (0.93)	106 (99.07)	0.704 (0.072, 6.852)	--
Cannot pay for HIV test	2 (2.90)	67 (97.10)	1.645 (0.348, 7.776)	--	1 (4.76)	20 (95.24)	2.267 (0.260, 19.756)	--	1 (2.08)	47 (97.92)	1.589 (0.162, 15.608)	--
Don't know where to go for HIV test	9 (1.78)	496 (98.22)	Ref	--	6 (2.16)	272 (97.84)	Ref	--	3 (1.32)	224 (98.68)	Ref	--
Afraid of knowing HIV result	3 (1.30)	227 (98.70)	0.728 (0.195, 2.716)	--	2 (1.57)	125 (98.43)	0.725 (0.144, 3.644)	--	1 (0.97)	102 (99.03)	0.732 (0.075, 7.123)	--
Afraid will get sick/die more quickly	1 (3.13)	31 (96.88)	1.778 (0.218, 14.483)	--	1 (6.25)	15 (93.75)	3.022 (0.342, 26.733)	--	0 (0.00)	16 (100.00)	<0.001 (++)	--
Embarrassed to ask for a test	2 (5.00)	38 (95.00)	2.901 (0.605, 13.904)	--	2 (9.52)	19 (90.48)	4.772 (0.901, 25.261)	--	0 (0.00)	19 (100.00)	<0.001 (++)	--

	Syphilis Infection		OR (95% CI)	AOR (95% CI)	Syphilis Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Syphilis Infection (Males)		Males OR (95% CI)	AOR (95% CI)
Not at risk of HIV/AIDS	0 (0.00)	377 (100.00)	<0.001 (++)	--	0 (0.00)	189 (100.00)	<0.001 (++)	--	0 (0.00)	188 (100.00)	<0.001 (++)	--
Too young to get tested	0 (0.00)	56 (100.00)	<0.001 (++)	--	0 (0.00)	27 (100.00)	<0.001 (++)	--	0 (0.00)	29 (100.00)	<0.001 (++)	--
Not sexually active	0 (0.00)	208 (100.00)	<0.001 (++)	--	0 (0.00)	100 (100.00)	<0.001 (++)	--	0 (0.00)	108 (100.00)	<0.001 (++)	--
Other	11 (2.12)	509 (7.88)	1.191 (0.489, 2.899)	--	4 (1.58)	249 (98.42)	0.728 (0.203, 2.611)	--	7 (2.62)	260 (97.38)	2.010 (0.514, 7.866)	--
Did you tell anyone the results of your HIV test												
Yes	2 (1.89)	104 (98.11)	<0.001 (++)	--	1 (1.85)	53 (98.15)	<0.001 (++)	--	1 (1.92)	51 (98.08)	<0.001 (++)	--
No	0 (0.00)	46 (100.00)	Ref	--	0 (0.00)	28 (100.00)	Ref	--	0 (0.00)	18 (100.00)	Ref	--

++95% Confidence Interval is <0.001, >999.999, and so non-significant

Table 8: Risk factors for Gonorrhea

	Gonorrhea Infection		OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Males)		Males OR (95% CI)	AOR (95% CI)
	Yes (N= 141)	No (N= 2503)			Yes (N= 126)	No (N= 1243)			Yes (N= 15)	No (N= 1260)		
	n (%)	n (%)			n (%)	n (%)			n (%)	n (%)		
Gender					--	--	--		--	--	--	
Male	15 (1.18)	1260 (98.82)	0.117 (0.068, 0.202)	0.397 (0.138, 1.143)	--	--	--	--	--	--	--	--
Female	126 (9.20)	1243 (90.80)	Ref	Ref	--	--	--	--	--	--	--	--
Marital Status												
Single	98 (5.59)	1654 (94.41)	1.167 (0.792, 1.721)	<0.001 (++)	88 (11.59)	671 (88.41)	1.992 (1.307, 3.035)	<0.001 (++)	10 (1.01)	983 (98.99)	0.494 (0.167, 1.460)	--
Married	37 (4.83)	729 (95.17)	Ref	Ref	32 (6.18)	486 (93.82)	Ref	Ref	5 (2.02)	243 (97.98)	Ref	Ref
Separated/Divorced	2 (5.13)	37 (94.87)	1.065 (0.247, 4.589)	2.014 (0.402, 10.081)	2 (12.50)	14 (87.50)	2.170 (0.473, 9.961)	1.992 (0.406, 9.778)	0 (0.00)	23 (100.00)	<0.001 (++)	<0.001 (++)
Widowed	3 (3.53)	82 (96.47)	0.721 (0.217, 2.390)	0.712 (0.192, 2.633)	3 (4.05)	71 (95.95)	0.642 (0.192 2.151)	0.707 (0.195, 2.568)	0 (0.00)	11 (100.00)	<0.001 (++)	0.138 (++)
Current Student Status												
Current student	79 (6.40)	1156 (93.60)	1.491 (1.058, 2.102)	--	77 (13.58)	490 (86.42)	2.426 (1.662, 3.541)	--	2 (0.30)	666 (99.70)	0.136 (0.031, 0.606)	--
Not current student	61 (4.38)	1331 (95.62)	Ref	--	48 (6.08)	741 (93.92)	Ref	--	13 (2.16)	590 (97.84)	Ref	--
Age at first sexual intercourse												
5-13	11 (5.42)	192 (94.58)	1.119 (0.543, 2.310)	--	10 (7.75)	119 (92.25)	1.417 (0.653, 3.077)	--	1 (1.35)	73 (98.65)	0.469 (0.051, 4.275)	<0.001 (<0.001, >999)
14-17	26 (4.87)	508 (95.13)	Ref	--	22 (5.60)	371 (94.40)	Ref	--	4 (2.84)	137 (97.16)	Ref	--
18-22	5 (4.81)	99 (95.19)	0.987 (0.370, 2.632)	--	5 (8.33)	55 (91.67)	1.533 (0.558, 4.215)	--	0 (0.00)	44 (100.00)	<0.001 (++)	--
23-35	0 (0.0)	12 (100.00)	<0.001 (++)	--	0 (0.00)	5 (100.00)	<0.001 (++)	--	0 (0.00)	7 (100.00)	<0.001 (++)	--

	Gonorrhea Infection		OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Males)		Males OR (95% CI)	AOR (95% CI)
Age Groups												
<15	31 (8.20)	347 (91.80)	1.390 (0.899, 2.148)	>999.99 (++)	30 (14.56)	176 (85.44)	1.325 (0.836, 2.099)	--	1 (0.58)	171 (99.42)	0.729 (0.085, 6.279)	0.002 (++)
15-19	75 (6.04)	1167 (93.96)	Ref	Ref	70 (11.40)	544 (88.60)	Ref	Ref	5 (0.80)	623 (99.20)	Ref	Ref
20-24	13 (3.83)	326 (96.17)	0.620 (0.340, 1.132)	0.333 (0.099, 1.121)	10 (5.75)	164 (94.25)	0.474 (0.239, 0.940)	0.480 (0.182, 1.267)	3 (1.82)	162 (98.18)	2.307 (0.546, 9.756)	1.974 (++)
25-29	10 (2.87)	338 (97.13)	0.460 (0.235, 0.900)	0.343 (0.116, 1.019)	7 (4.02)	167 (95.98)	0.326 (0.147, 0.722)	0.351 (0.125, 0.981)	3 (1.72)	171 (98.28)	2.186 (0.517, 9.238)	717.009 (++)
30-35	12 (3.56)	325 (96.44)	0.575 (0.309, 1.070)	0.417 (0.143, 1.214)	9 (4.48)	192 (95.52)	0.364 (0.179, 0.743)	0.409 (0.153, 1.096)	3 (2.21)	133 (97.79)	2.811 (0.664, 11.907)	231.98 (++)
Age at First Period												
8-13	--	--	--	--	28 (8.41)	305 (91.59)	0.817 (0.478, 1.397)	--	--	--	--	--
14	--	--	--	--	31 (10.10)	276 (89.90)	Ref	--	--	--	--	--
15	--	--	--	--	23 (8.13)	260 (91.87)	0.788 (0.447, 1.386)	--	--	--	--	--
16-35	--	--	--	--	12 (5.94)	190 (94.06)	0.562 (0.282, 1.123)	--	--	--	--	--
Highest Education level obtained												
Standard (Primary)	123 (5.85)	1979 (94.15)	Ref	Ref	111 (9.93)	1007 (90.07)	Ref	--	12 (1.22)	972 (98.78)	Ref	--
Form (Secondary)	15 (3.16)	459 (96.84)	0.526 (0.305, 0.907)	0.869 (0.370, 2.039)	12 (5.50)	206 (94.50)	0.528 (0.286, 0.977)	--	3 (1.17)	253 (98.83)	0.960 (0.269, 3.429)	--
Post-Secondary	0 (0.00)	34 (100.00)	<0.001 (++)	--	0 (0.00)	11 (100.00)	<0.001 (++)	--	0 (0.00)	23 (100.00)	<0.001 (++)	--
Religion												
Catholic	34 (5.95)	537 (94.05)	1.260 (0.816, 1.945)	1.304 (0.394, 4.318)	30 (10.34)	260 (89.66)	1.197 (0.750, 1.910)	1.079 (0.372, 3.132)	4 (1.42)	277 (98.58)	2.854 (0.635, 12.840)	0.002 (++)
Anglican	18 (4.55)	378 (95.45)	0.948 (0.552, 1.627)	1.756 (0.524, 5.884)	17 (7.76)	202 (92.24)	0.873 (0.496, 1.538)	1.307 (0.410, 4.165)	1 (0.56)	176 (99.44)	1.123 (0.116, 10.865)	0.003 (++)
Nomiya	26 (7.76)	309 (92.24)	1.674 (1.038,	3.992 (1.635,	20 (11.83)	149 (88.17)	1.393 (0.810,	2.468 (1.025,	6 (3.61)	160	7.412 (1.834,	28.435 (0.681,

	Gonorrhea Infection		OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Males)		Males OR (95% CI)	AOR (95% CI)
			2.701)	9.745)			2.393)	5.942)		(96.39)	29.965)	>999.9)
Legio	3 (3.16)	92 (96.84)	0.649 (0.200, 2.110)	0.710 (0.081, 6.194)	2 (4.00)	48 (96.00)	0.432 (0.102, 1.826)	0.788 (0.097, 6.405)	1 (2.22)	44 (97.78)	4.492 (0.458, 44.088)	0.002 (++)
Protestant, other	59 (4.79)	1174 (95.21)	Ref	Ref	56 (8.79)	581 (91.21)	Ref	Ref	3 (0.50)	593 (99.50)	Ref	Ref
Other	0 (0.00)	12 (100.00)	<0.001 (++)	<0.001 (++)	0 (0.00)	2 (100.00)	<0.001 (++)	<0.001 (++)	0 (0.00)	10 (100.00)	<0.001 (++)	0.002 (++)
Occupation												
Low SES	30 (3.37)	860 (96.63)	Ref	Ref	21 (4.64)	432 (95.36)	Ref	Ref	9 (2.06)	428 (97.94)	Ref	Ref
High SES	9 (4.39)	196 (95.61)	1.316 (0.615, 2.817)	1.298 (0.481, 3.501)	5 (4.76)	100 (95.24)	1.029 (0.379, 2.794)	1.259 (0.438, 3.620)	4 (4.00)	96 (96.00)	1.981 (0.598, 6.568)	0.591 (0.012, 28.475)
Student	79 (6.42)	1152 (93.58)	1.966 (1.279, 3.021)	<0.001 (++)	77 (13.60)	489 (86.40)	3.239 (1.965, 5.338)	--	2 (0.30)	663 (9.70)	0.143 (0.031, 0.667)	>999 (++)
Homemaker	17 (8.13)	192 (91.87)	2.538 (1.372, 4.696)	1.397 (0.469, 4.154)	17 (9.50)	162 (90.50)	2.159 (1.111, 4.195)	2.058 (0.874, 4.845)	0 (0.00)	30 (100.00)	<0.001 (++)	1.447 (++)
Unemployed	4 (5.00)	76 (95.00)	1.509 (0.518, 4.396)	2.133 (0.080, 56.869)	4 (8.51)	43 (91.49)	1.913 (0.628, 5.831)	9.633 (1.102, 84.218)	0 (0.00)	33 (100.00)	<0.001 (++)	0.002 (++)
Other	1 (4.00)	24 (96.00)	1.194 (0.156, 9.124)	<0.001 (++)	1 (6.67)	14 (93.33)	1.469 (0.184, 11.708)	6.415 (0.638, 64.446)	0 (0.00)	10 (100.00)	<0.001 (++)	<0.001 (++)
Ever used condom with spouse since marriage												
Yes	24 (4.83)	473 (95.17)	1.357 (0.461, 3.991)	--	20 (6.47)	289 (93.53)	1.569 (0.453, 5.431)	--	4 (2.13)	184 (97.87)	0.848 (0.092, 7.793)	--
No	4 (3.60)	107 (96.40)	Ref	--	3 (4.23)	68 (95.77)	Ref	--	1 (2.50)	39 (97.50)	Ref	--
Number of lifetime partners												
0-1	5 (10.20)	44 (89.80)	2.321 (0.854, 6.309)	--	5 (11.63)	38 (88.37)	2.298 (0.839, 6.292)	2.091 (0.706, 6.192)	0 (0.00)	6 (100.00)	1.00 (++)	--
2-5	28 (4.67)	572 (95.33)	Ref	--	28 (5.42)	489 (94.58)	Ref	Ref	0 (0.00)	83 (100.00)	Ref	--
6-9	5 (4.17)	115 (95.83)	0.888 (0.336, 2.349)	--	3 (6.98)	40 (93.02)	1.310 (0.382, 4.497)	1.380 (0.375, 5.083)	2 (2.60)	75 (97.40)	>999.99 (++)	--
10+	4 (3.42)	113 (96.58)	0.723 (0.249, 2.102)	--	1 (16.67)	5 (83.33)	3.493 (0.395. 30.916)	6.405 (0.665, 61.730)	3 (2.70)	108 (97.30)	>999.99 (++)	--

	Gonorrhea Infection		OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Males)		Males OR (95% CI)	AOR (95% CI)
Ritual Sex participation												
Yes	2 (3.23)	60 (96.77)	0.658 (0.155, 2.787)	--	1 (5.56)	17 (94.44)	0.907 (0.117, 7.008)	--	1 (2.27)	43 (97.73)	1.360 (0.148, 12.468)	--
No	40 (4.83)	789 (95.17)	Ref	--	36 (6.09)	555 (93.91)	Ref	--	4 (1.68)	234 (98.32)	Ref	--
Condom use during first sexual encounter												
Yes	3 (5.00)	57 (95.00)	1.072 (0.321, 3.574)	--	3 (7.50)	37 (92.50)	1.279 (0.375, 4.359)	--	0 (0.00)	20 (100.00)	<0.001 (++)	--
No	39 (4.68)	794 (95.32)	Ref	--	34 (5.96)	536 (94.04)	Ref	--	5 (1.90)	258 (98.10)	Ref	--
Raped as a child or young adult												
Yes	6 (11.76)	45 (88.24)	2.905 (1.165, 7.240)	2.511 (0.710, 8.877)	5 (13.89)	31 (86.11)	2.649 (0.967, 7.257)	--	1 (6.67)	14 (93.33)	4.714 (0.494, 45.009)	17.710 (0.377, 832.600)
No	37 (4.39)	806 (95.61)	Ref	Ref	33 (5.74)	542 (94.26)	Ref	--	4 (1.49)	264 (98.51)	Ref	Ref
Sex with someone other than spouse or primary partner												
Yes	16 (3.39)	456 (96.61)	0.657 (0.378, 1.142)	--	6 (4.84)	118 (95.16)	0.585 (0.248, 1.378)	--	10 (2.87)	338 (97.13)	5.404 (1.477, 19.777)	--
No	71 (5.07)	1330 (94.93)	Ref	--	68 (8.00)	782 (92.00)	Ref	--	3 (0.54)	548 (99.46)	Ref	--
Time spent away from home in the last 6 months												
None to 1 Week	26 (4.45)	558 (95.55)	Ref	Ref	21 (7.53)	258 (92.47)	Ref	--	5 (1.64)	300 (98.36)	Ref	Ref
Between 1 Week and 1 Month	41 (7.28)	522 (92.72)	1.686 (1.017, 2.795)	2.537 (1.131, 5.690)	36 (11.76)	270 (88.24)	1.638 (0.931, 2.881)	--	5 (1.95)	252 (98.05)	1.190 (0.341, 4.159)	12.173 (0.610, 242.824)
More than 1 Month	10 (2.82)	344 (97.18)	0.624 (0.297, 1.310)	0.315 (0.065, 1.530)	8 (4.71)	162 (95.29)	0.607 (0.263, 1.402)	--	2 (1.09)	182 (98.91)	0.659 (0.127, 3.434)	0.004 (++)
Number of Sex Partners other than spouse												
1	9 (2.74)	320 (97.26)	Ref	--	5 (4.59)	104 (95.41)	Ref	--	4 (1.82)	216 (98.18)	Ref	--

	Gonorrhea Infection		OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Males)		Males OR (95% CI)	AOR (95% CI)
2-3	7 (5.65)	117 (94.35)	2.127 (0.775, 5.842)	--	1 (6.67)	14 (93.33)	1.486 (0.162, 13.657)	--	6 (5.50)	103 (94.50)	3.146 (0.869, 11.390)	--
4 or more	0 (0.00)	20 (100.00)	<0.001 (++)	--	0 (0.00)	0 (0.00)	<0.001 (++)	--	0 (0.00)	20 (100.00)	<0.001 (++)	--
Currently Pregnant												
Yes	--	--	--	--	8 (9.20)	79 (90.80)	1.404 (0.621, 3.176)	--	--	--	--	--
No	--	--	--	--	30 (6.73)	416 (93.27)	Ref	--	--	--	--	--
Age at First Pregnant												
<16	--	--	--	--	7 (6.42)	102 (93.58)	1.069 (0.419, 2.728)	--	--	--	--	--
16-17	--	--	--	--	14 (6.03)	218 (93.97)	Ref	--	--	--	--	--
18-19	--	--	--	--	10 (5.24)	181 (94.76)	0.860 (0.373, 1.983)	--	--	--	--	--
>19	--	--	--	--	7 (5.15)	129 (94.85)	0.845 (0.332, 2.148)	--	--	--	--	--
Circumcised												
Yes	--	--	--		--	--	--		5 (4.00)	120 (96.00)	4.746 (1.596, 14.114)	2.293 (0.093, 56.459)
No	--	--	--		--	--	--		10 (0.87)	1139 (99.13)	Ref	Ref
Age of Circumcision												
0-1 years old	--	--	--	--	--	--	--	--	2 (6.45)	29 (93.55)	Ref	--
2-6 years old	--	--	--	--	--	--	--	--	0 (0.00)	21 (100.00)	<0.001 (++)	--
7-13 years old	--	--	--	--	--	--	--	--	1 (5.56)	17 (94.44)	0.853 (0.072, 10.124)	--
14 years and older	--	--	--	--	--	--	--	--	1 (4.17)	23 (95.83)	0.630 (0.054, 7.394)	--
Use of Contraception in the last 12 months												
Yes	--	--	--	--	11 (7.24)	141 (92.76)	0.754 (0.396,	--	--	--	--	--

	Gonorrhea Infection		OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Males)		Males OR (95% CI)	AOR (95% CI)
							1.434)					
No	--	--	--	--	114 (9.38)	1101 (90.62)	Ref	--	--	--	--	--
Condom Use During Last Sexual Intercourse												
Yes	14 (5.00)	266 (95.00)	1.134 (0.620, 2.074)	--	8 (7.34)	101 (92.66)	0.959 (0.441, 2.084)	--	6 (3.51)	165 (96.49)	4.991 (1.392, 17.898)	76.028 (1.418, >999)
No	53 (4.44)	1142 (95.56)	Ref	--	49 (7.63)	593 (92.37)	Ref	--	4 (0.72)	549 (99.28)	Ref	Ref
Reason for Using a condom during last sexual intercourse												
To prevent pregnancy	2 (1.37)	144 (98.63)	0.332 (0.071, 1.558)	--	2 (3.08)	63 (96.92)	0.641 (0.121, 3.406)	--	0 (0.00)	81 (100.00)	<0.001 (++)	--
To protect against STI/HIV	9 (4.02)	215 (95.98)	Ref	--	5 (4.72)	101 (95.28)	Ref	--	4 (3.39)	114 (96.61)	Ref	--
To prevent both pregnancy & STI/HIV	4 (10.81)	33 (89.19)	2.896 (0.843, 9.941)	--	4 (26.67)	11 (73.33)	7.345 (1.715, 31.459)	--	0 (0.00)	22 (100.00)	<0.001 (++)	--
Did not trust partner/feel partner has other partners	1 (5.88)	16 (94.12)	1.493 (0.178, 12.532)	--	0 (0.00)	2 (100.00)	<0.001 (++)	--	1 (6.67)	14 (93.33)	2.036 (0.212, 19.518)	--
Because other partner insisted	0 (0.00)	5 (100.00)	<0.001 (++)	--	0 (0.00)	3 (100.00)	<0.001 (++)	--	0 (0.00)	2 (100.00)	<0.001 (++)	--
Other	1 (12.50)	7 (87.50)	3.413 (0.379, 30.764)	--	0 (0.00)	2 (100.00)	<0.001 (++)	--	1 (16.67)	5 (83.33)	5.700 (0.534, 60.807)	--
Reason for not using condom during last sexual intercourse												
Didn't know how to use condoms	8 (4.17)	184 (95.83)	1.415 (0.537, 3.734)	--	7 (9.72)	65 (90.28)	1.723 (0.554, 5.361)	--	1 (0.83)	119 (99.17)	0.552 (0.057, 5.366)	--
Didn't have any available	9 (2.98)	293 (97.02)	Ref	--	6 (5.88)	96 (94.12)	Ref	--	3 (1.50)	197 (98.50)	Ref	--
Don't use condoms with steady partner	11 (6.83)	150 (93.17)	2.387 (0.968, 5.888)	--	9 (8.41)	98 (91.59)	1.469 (0.504, 4.287)	--	2 (3.70)	52 (96.30)	2.526 (0.411, 15.512)	--
Trust Partner	5 (1.51)	327 (98.49)	0.498 (0.165, 1.502)	--	5 (3.14)	154 (96.86)	0.519 (0.154, 1.749)	--	0 (0.00)	173 (100.00)	<0.001 (++)	--
Partner refused to use condoms	12 (6.86)	163 (93.14)	2.397 (0.989, 5.809)	--	12 (7.50)	148 (92.50)	1.297 (0.471, 3.573)	--	0 (0.00)	15 (100.00)	<0.001 (++)	--

	Gonorrhea Infection		OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Males)		Males OR (95% CI)	AOR (95% CI)
Condoms reduce pleasure	3 (5.00)	57 (95.00)	1.713 (0.450, 6.525)	--	2 (13.33)	13 (86.67)	2.462 (0.449, 13.500)	--	1 (2.22)	44 (97.78)	1.492 (0.152, 14.688)	--
Wanted to have child	4 (15.38)	22 (84.62)	5.919 (1.687, 20.763)	--	4 (20.00)	16 (80.00)	4.000 (1.015, 15.763)	--	0 (0.00)	6 (100.00)	<0.001 (++)	--
Fear side effects of condoms	0 (0.00)	47 (100.00)	<0.001 (++)	--	0 (0.00)	31 (100.00)	<0.001 (++)	--	0 (0.00)	16 (100.00)	<0.001 (++)	--
Other	11 (6.01)	172 (93.99)	2.082 (0.846, 5.125)	--	11 (11.46)	85 (88.54)	2.071 (0.734, 5.839)	--	0 (0.00)	87 (100.00)	<0.001 (++)	--
Ever been treated for an STI												
Yes	10 (4.03)	238 (95.97)	0.731 (0.379, 1.409)	--	1 (1.69)	58 (98.31)	0.164 (0.023, 1.194)	--	9 (4.76)	180 (95.24)	9.000 (3.165, 25.591)	--
No	130 (5.44)	2259 (94.56)	Ref	--	124 (9.52)	1179 (90.48)	Ref	--	6 (0.55)	1080 (99.45)	Ref	--
Ever had HIV test												
Yes	6 (3.26)	178 (96.74)	0.585 (0.254, 1.343)	1.885 (0.636, 5.587)	6 (5.77)	98 (94.23)	0.589 (0.253, 1.371)	1.010 (0.358, 2.846)	0 (0.00)	80 (100.00)	<0.001 (++)	--
No	134 (5.45)	2324 (94.55)	Ref	Ref	119 (9.42)	1144 (90.58)	Ref	Ref	15 (1.26)	1180 (98.74)	Ref	--
Why never got HIV test												
HIV testing too far away	8 (4.26)	180 (95.74)	0.603 (0.274, 1.327)	--	7 (8.14)	79 (91.86)	0.673 (0.286, 1.584)	--	1 (0.98)	101 (99.02)	1.079 (0.097, 12.040)	--
Cannot pay for HIV test	6 (8.82)	62 (91.18)	1.312 (0.530, 3.252)	--	5 (23.81)	16 (76.19)	2.375 (0.815, 6.921)	--	1 (2.13)	46 (97.87)	2.370 (0.210, 26.686)	--
Don't know where to go for HIV test	34 (6.87)	461 (93.13)	Ref	--	32 (11.64)	243 (88.36)	Ref	--	2 (0.91)	218 (99.09)	Ref	--
Afraid of knowing HIV result	14 (6.25)	210 (93.75)	0.904 (0.475, 1.720)	--	11 (8.87)	113 (91.13)	0.739 (0.360, 1.519)	--	3 (3.00)	97 (97.00)	3.371 (0.554, 20.499)	--
Afraid will get sick/die more quickly	2 (6.45)	29 (93.55)	0.935 (0.214, 4.086)	--	2 (13.33)	13 (86.67)	1.168 (0.252, 5.415)	--	0 (0.00)	16 (100.00)	<0.001 (++)	--
Embarrassed to ask for a test	4 (10.00)	36 (90.00)	1.507 (0.507, 4.482)	--	3 (14.29)	18 (85.71)	1.266 (0.353, 4.537)	--	1 (5.26)	18 (94.74)	6.056 (0.524, 70.041)	--
Not at risk of HIV/AIDS	12 (3.26)	356 (96.74)	0.457 (0.233, 0.895)	--	12 (6.67)	168 (93.33)	0.542 (0.272, 1.084)	--	0 (0.00)	188 (100.00)	<0.001 (++)	--
Too young to get tested	2 (3.64)	53 (96.36)	0.512 (0.120, 2.190)	--	2 (7.69)	24 (92.31)	0.633 (0.143, 2.805)	--	0 (0.00)	29 (100.00)	<0.001 (++)	--

	Gonorrhea Infection		OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Females)		Females OR (95% CI)	AOR (95% CI)	Gonorrhea Infection (Males)		Males OR (95% CI)	AOR (95% CI)
Not sexually active	13 (6.57)	185 (93.43)	0.953 (0.492, 1.846)	--	12 (12.90)	81 (87.10)	1.125 (0.553, 2.287)	--	1 (0.95)	104 (99.05)	1.048 (0.094, 11.690)	--
Other	22 (4.28)	492 (95.72)	0.606 (0.349, 1.052)	--	17 (6.83)	232 (93.17)	0.556 (0.301, 1.029)	--	5 (1.89)	260 (98.11)	2.096 (0.403, 10.911)	--
Did you tell anyone the results of your HIV test												
Yes	3 (2.86)	102 (97.14)	1.323 (0.134, 13.069)	--	3 (5.66)	50 (94.34)	1.620 (0.161, 16.338)	--	0 (0.00)	52 (100.00)	<0.001 (++)	--
No	1 (2.17)	45 (97.83)	Ref	--	1 (3.57)	27 (96.43)	Ref	--	0 (0.00)	18 (100.00)	Ref	--

++95% Confidence Interval is <0.001, >999.999, and so non-significant

APPENDIX: IRB APPROVAL LETTER

EMORY UNIVERSITY | Institutional Review Board

December 5, 2011

Baevin Carbery
Department of Practical Experience
School of Public Health
Emory University

RE: Determination: No IRB Review Required
IRB # 53334; Title: Risk factors and prevalence of sexually transmitted infections individually and in co-infection with HIV as determined from two cross sectional studies in Kenya
PI: Baevin Carbery

Dear Ms. Carbery:

Thank you for requesting a determination from our office about the above-referenced project. Based on our review of the materials you provided, we have determined that it does not require IRB review because it does not meet the definition of research involving "human subjects" as set forth in Emory policies and procedures and federal rules, if applicable. Specifically, in this project, you will use a deidentified dataset (from the KEMRI-CDC in Kenya) to determine the prevalence rates of STIs, as well as associations between STIs and risk behavior in Asembo and Gem Kenya.

This determination could be affected by substantive changes in the study design, subject populations, or identifiability of data. If the project changes in any substantive way, please contact our office for clarification.

Thank you for consulting the IRB.

Sincerely,

Brandy Covington, BBA
Senior Research Protocol Analyst
This letter has been digitally signed

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