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Factors Influencing the Risk of Becoming Sexually Active Among HIV Infected Adolescents in Kampala and Kisumu, East Africa

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Abstract

About 2.1 million adolescents aged 10–19 years are living with HIV, 80% of them in sub-Saharan Africa. Early sexual activity remains an important risk factor for HIV transmission and potentially result in negative health consequences including onward transmission of sexually transmitted infections. Cross-sectional data of 580 adolescents living with HIV (ALHIV) aged 13–17 years (317 girls and 263 boys) from Kenya and Uganda were analyzed to assess factors associated with risk to become sexually active. Factors associated with risk of sexual intercourse were identified using Kaplan–Meier survival curves and Cox regression with gender-stratified bi-and multivariable models. Slightly more females (22%) than males (20%) reported they have had sex. Multivariable models showed that being aware of one's own HIV infection, and receiving antiretroviral treatment were negatively associated with risk of becoming sexually active, while subjective norms conducive to sexuality, and girls' poor health experience increased the risk. In the final multi-variable models, schooling was protective for girls, but not for boys. Being more popular with the opposite sex was negatively associated with the outcome variable only for girls, but not for boys. This study expands the knowledge base on factors associated with onset of sexual activity among ALHIV, potentially informing positive prevention interventions.

Keywords Adolescents · HIV · Sexual activity · Sexual risk behavior · Eastern Africa

Resumen

Alrededor de 2.1 millones de adolescentes de entre 10 y 19 años viven con el VIH, el 80% de ellos residen en el África subsahariana. La actividad sexual precoz sigue siendo un factor de riesgo importante para la transmisión del VIH y puede tener consecuencias negativas para la salud, incluida la transmisión de infecciones de transmisión sexual. Los datos transversales de 580 adolescentes entre los 13–17 años (317 niñas y 263 niños) viviendo con el VIH y originarios de Kenia y Uganda fueron analizados para evaluar los factores asociados con el riesgo de volverse sexualmente activos. Los factores asociados con el riesgo de tener relaciones sexuales se identificaron usando las curvas de supervivencia de Kaplan–Meier y la regresión de Cox con modelos bi y multivariables estratificados por género. Un poco más de mujeres adolescentes (22%) que de hombres adolescentes (20%) informaron haber tenido relaciones sexuales. Los modelos multivariables mostraron que ser conscientes de la propia infección por VIH y recibir tratamiento antiretroviral se asociaron negativamente con el riesgo de volverse sexualmente activos, mientras que las normas subjetivas promoviendo la sexualidad y la mala salud experimentada por las mujeres adolescentes aumentaron el riesgo. En los modelos finales de variables múltiples, la escolarización resulto ser un factor de protección para las mujeres, pero no para los hombres adolescentes. Ser más popular con el sexo opuesto se asoció negativamente con la variable de resultado pero solo para las mujeres, no para los hombres adolescentes. Este estudio amplía la base de conocimientos sobre los factores asociados con el inicio de la actividad sexual en el VIH lo que podría contribuir a las intervenciones de prevención positivas.

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Introduction

Worldwide, 2.1 million adolescents aged 10–19 years were living with HIV in 2016, a 30% increase from 2005. Nearly 80% of them live in sub-Saharan Africa [1]. In Uganda, overall HIV prevalence for those aged 15 to 24 years is 3.7%. Young women are disproportionally affected with HIV, with a prevalence of 4.9% compared to young men where the prevalence is 2.1% [2, 3]. In Kenya, these figures are 4.0% for young women and 2.4% for young men with an overall prevalence of 3.1% [4].

The global response to the HIV/AIDS epidemic has improved access to antiretroviral therapy (ART) and contributed to decreased HIV/AIDS morbidity and mortality in sub-Saharan Africa. Consequently, children living with HIV are reaching adolescence in large numbers with good outcomes when on treatment [5]. Adolescence is a period of establishing complex social networks shifting the point of reference that guides behavior from the family to the social environment. Important adolescent developmental tasks are detachment from parents [6], and developing a psychosexual identity [7]. The period in which most adolescents become sexually active in low- and middle income countries is late adolescence. Adolescent sexual activity may lead to several sexual health risks including behavioral HIV acquisition and other consequences, such as unplanned pregnancies. UNICEF has estimated that between 30 and 50% of girls in resource-limited settings will give birth to their first child before the age of 19 [2], posing considerable health risks to both mother and children [8].

Adolescents living with HIV (ALHIV) may face quite specific challenges in this sensitive developmental period: they may struggle with the fact that they have HIV, adherence to HIV treatment, with HIV-related stigma, and with negotiating HIV prevention measures [9]. As part of the process of building their new social and sexual identity, ALHIV may experiment with sex and other new behaviors and norms, as all adolescents do. Literature reviews have shown that the vast majority of ALHIV practice sexual abstinence, but once sexually activity has started they report substantial sexual risks [10, 11]. The recent systematic review by Toska et al. identified 35 studies looking into the prevalence, factors associated with, and interventions to reduce sexual risk-taking among HIV positive youth in Sub-Saharan Africa [11]. Its results revealed a general high level of sexual risk-taking with inconclusive evidence on determinants.

ALHIV are at potential risk of transmitting HIV to their sexual partners [12, 13], or infecting their babies when they are pregnant [14, 15], and of contracting other sexually transmitted infections (STIs) if they have unprotected sex [3, 16]. Factors predicting sexual activity among adolescents and related negative outcomes such as teenage pregnancy have previously been studied [17–19]. Generally, low self-efficacy has been related to increased sexual risk-taking [20–22], while high self-efficacy has been related to higher condom use, assertiveness in sexual situations, less risky sexual behavior, and delayed sexual activity [20, 23, 24]. Research has also shown the fluid meaning of transactional sex for both HIV-infected and uninfected adolescents in sub-Saharan Africa, [25, 26] enabling them to gain financial and emotional independence. For some ALHIV, sex may serve as a way to become a social "somebody" [27]. Gender-differences in sexual behavior including abstinence have been observed among general adolescent populations [28] and its drivers with boys being more likely to become sexually active at an early age than girls [29]. A prospective South-African study among South-African high school students found that perceived social norms on delaying sex predicted the intention to abstain from sexuality [30]. Finally, a body of evidence shows that investment in effective prevention and treatment strategies is essential to support adolescents in maintaining a good sexual and reproductive health [24], emphasizing the importance of age-appropriate sexual health counseling and unbiased, open communication by service providers with ALHIV [31].

Most of the literature focusses on uninfected adolescents, and factors associated with the initiation of sexual activity among ALHIV in sub-Saharan Africa remain poorly understood. We conducted a study to identify determinants independently associated with the onset of sexual activity among two samples of ALHIV in Uganda and Kenya.

Methods

Study Setting and Procedures

The study was part of a baseline assessment for an intervention targeting ALHIV in resource limited settings in Kenya and Uganda. The intervention was delivered at health care facilities and aimed at improving ALHIV's sexual and reproductive health and coping with HIV. Prior to this study, qualitative research was conducted to culturally adapt an existing primary prevention intervention based on social-cognitive theory, theory of planned behavior, and theory of reasoned action. Details on the intervention's adaptation, theory base, and process evaluation have been published. [32] We performed a cross-sectional analysis on the baseline data, which were collected between February and April, 2011. Study participants were recruited from different health care facilities providing pediatric HIV care and support: in the urban area of Kampala, Uganda data were collected in one

large HIV clinic at Baylor Uganda and three community-based facilities, among which TASO); in Kenya, participants were recruited from district hospitals, youth centers providing HIV testing, and community-based health centers in Asembo, Gem and Kisumu town (Nyanza province). ALHIV aged 13–17 years who were never married or cohabitating and living within 25 km of the study sites were assented and enrolled after their parents/guardian had provided informed consent. Interviewers, independent from regular service provision staff, received standardized one-week training in adolescent-focused interviewing skills, ethics and confidentiality. Study participants received transport remuneration but no reimbursement for their participation.

The study obtained ethical approval though KEMRI Ethical Review Committee (ERC), Makerere University College of Health Sciences Ethical Review Committee, Baylor College of Medicine Ethical Review Board, Uganda National Council of Science and Technology, the Institutional Review Board of Institute of Tropical Medicine and the Ethics Committee of the University Teaching Hospital of Antwerp.

Data Collection Tool and Variables Assessed

To increase data quality and reduce respondent burden [33], data were collected by trained interviewers on hand-held tablet devices. The survey-to-go© software provided built-in error checks and skip patterns to limit inconsistent responses. Data collection tools were translated into Dholuo for Kenya and Luganda for Uganda (i.e. the two dominant languages among the respondents) and back-translated into English by a third independent translator for quality control. The following variables were selected for this study:

Socio-demographic variables included age and country, whether both biological parents were alive and whether the subject lived with a biological parent; whether subjects were currently attending school, and contributed cash to the family income. We also assessed religion (i.e. Catholic, Pentecostal, Anglican, Muslim, or other, including none), and its importance (through the question: "How important is religion to you?" with answering options: very important, important, not important, or not important at all).

Medical- variables included how subjects rated their current health (i.e. as excellent, very good, good, fair, or poor), whether they currently attended an HIV clinic, were member of an HIV support group, and if they received antiretroviral therapy (ART). We also assessed if they had ever consumed alcohol and/or drugs (at least once). Subjects were asked about the age at which they had become aware of their HIV positive status. Based on this, the variable *knowledge of one's own HIV status* was created and entered as a time-varying covariate indicating whether ALHIV knew about their HIV status at each given point in their life.

Sexual health related variables assessed included risk of sexual intercourse (as dependent variable) and the following independent variables hypothesized to influence this outcome:

Risk of intercourse was estimated by taking age at first sex as a time-to-event variable, which is right-censored for subjects who have not yet had sex. Age, though continuous, was measured in years, yielding only a small number of possible event times. Two subjects did not disclose their sexual history and were excluded from all analyses.

The following sexual-health related independent variables were assessed in line with the theoretical underpinnings of the intervention: communication skills with health care providers, attitudes on sexuality, self-efficacy to abstain from sex, and subjective norms on sexual behavior.

Communication skills with health care providers were measured through the adolescents' rating of three self-developed statements using four point Likert scales (ranging from very easy = 4, easy = 3, difficult = 2, very difficult = 1): "Talking to my health provider about sexuality is X?", "Talking to my health provider about prevention of sexually transmitted infections is X?", "Talking to my health provider about family planning is X?".

Attitudes on sexuality were measured based on rating five specific statements stemming from the evaluation of the primary prevention intervention used for adaptation (44,) [34]: "If I have sex before I am married, then God will not be pleased with me", "My partner will break up with me if I don't have sex", "If I have sex I will be more popular with my peers (same sex)", "If I have sex I will be more popular with opposite sex", "Being a virgin is a good thing" (answer options ranged from strongly agree = 4, agree = 3, disagree = 2, strongly disagree = 1).

Self-efficacy to abstain was assessed using a scale constructed in analogy to the validated self-efficacy scale to negotiate condom-use [35]. ALHIV could rate their self-efficacy on a four point Likert scale (strongly agree = 3, agree = 2, disagree = 1, strongly disagree = 0) indicating how much they agreed to five statements pertaining to abstinence ("I can ask a partner not to have sex", "I can refuse sex when I don't feel like having sex", "I can abstain from sex even if I feel like having sex", "I can abstain from sex even if my friends are having sex", "I can abstain from sex with my partner even if s/he gives me money and gifts". The scale ranged from 0 to 15, and higher scores indicated higher self-efficacy to abstain from sex. Cronbach's alpha and a composite score were calculated. This scale's internal consistency was very good ($\alpha = 0.81$) [36].

Subjective norms, i.e. ALHIV's perception of how important people in their environment felt about them having sex were measured as a response to two statements (subjective peer norms and subjective caregiver norms respectively): "What would your friends think about you having sex?",

"What would your parents/caregivers think about you having sex?" (answer options: "very good idea" = 4, "good idea" = 3, "bad idea" = 2, "very bad idea" = 1).

Statistical Analysis

Data analysis was performed with R. Comparison of independent variables by gender was made using bivariate test statistics. The association of each characteristic with risk of intercourse was studied using Kaplan–Meier survival curves and Cox regression with Efron's tie resolution, separately for female and male ALHIV. A multivariable Cox regression model was constructed through backward elimination with p < 0.05 as the threshold for variable exclusion., using any variables associated with intercourse at the bivariate level. For female adolescents, retained variables from bivariate analysis were: year of birth, country, currently in school, religion, health experience, awareness of own HIV status across time, on ART, communication skills, attitudes, and subjective norms. For male adolescents, these were: year of birth, country, religion, awareness of own HIV status across time, on ART, communication skills, the self-efficacy score, and subjective norms.

Prior to any Cox regression models, all covariates were inspected with Kaplan–Meier curves and found to have roughly proportional effects across time (aside from gender itself). Since the four-point Likert scales' effects were monotonic, we opted to dichotomize them to aid interpretation. For the final multivariable models, the importance of religion was excluded as all except eight adolescents (1%) reported religion to be important or very important. Similarly, attending an HIV clinic was dropped as only ten adolescents (2%) were non-attenders. Missing data were handled in different ways: For the bivariate analyses (Table 3), all available data were used in each model, resulting in varying sample sizes. For the multivariable analyses (Table 4), only cases with complete data for all tested predictors were included in the stepwise selection and the final model (female n = 238, male n = 228).

Results

Data were analyzed from 580 HIV positive adolescents with 317 females and 263 males, aged 13–17 years from Kenya (n = 283) and Uganda (n = 297).

Table 1 presents the socio-demographic and health-related characteristics of the study participants by gender. Among the ALHIV in our sample, both parents were alive in about one out of five cases; more than a third were total orphan. Nearly half of the participants were living with either one or two biological parent(s). The majority (85%) was enrolled in school.

Significantly more boys (92%) than girls (86%) were attending school, and more boys than girls (16% vs. 9.5%) contributed to family income. Significant differences were also found with respect to religion and importance of religion, i.e. with more girls belonging to Catholic or Pentecostal churches, and a higher proportion of boys reporting none or other religions. Significantly more girls than boys reported religion to be very important. Inherent to the sampling strategy, 99.6% of the boys versus 97% of the girls were attending an HIV clinic (p = 0.024). The majority of the participants, i.e. 69% and 72% of the girls and boys respectively were receiving ART. Almost half of the participants were members of an HIV peer support group.

22% of females and 20% of males reported they have had sex (see Table 2). The mean age of sexual onset was 11.5 years for boys and 13.2 years for girls.

Graph 1 illustrates the relationship between gender, age and sexual activity as Kaplan–Meier survival curves. Boys reportedly had an early head start, but this was eventually outpaced by girls' reported sexual activity, and by age 15, more girls than boys have had sex.

Boys reported somewhat higher communication skills compared to girls when talking with health-care providers on the topics of sexuality and family planning. No gender difference was found in terms of study participants' self-efficacy on negotiating sexual abstinence (above 9 on a scale from 0 to 15) for both genders (see Table 2).

Irrespective of gender, risk of sexual activity for later born ALHIV was found to be decreasing as time went on (by roughly 30% with each passing year), indicating that younger subjects became sexually active at later ages.

Risk was roughly five times lower among respondents from Uganda than among those from Kenya. For girls who were attending school at the time of the survey, risk was almost three times lower than for those who were out of school. Religion also appeared to have a more prominent role for girls than for boys, as Anglicans and Muslims girls' risk was estimated as four times lower than for Catholics. No other socio-demographic factors were strongly associated with risk.

ALHIV were far more likely to begin having sex while they were still unaware of their HIV infection: risk was ten times more likely in the case of boys, and five times more likely for girls. Significant associations were found with some of the medical and health-related indicators: ALHIV who were on ART had a lower risk, and girls with poor health experienced a higher risk for becoming sexually active.

Significant associations were also found with some of the psychometric indicators: risk to become sexually active was more than two times greater among ALHIV who reported being able to easily communicate about sexuality to their health care providers. Since the majority reported

	Female n = 317 n (%)	Male n = 263 n (%)	p value[a]
Table 1 Socio-demographic and health characteristic of the adolescent study population by gender (N = 580)			
Age			0.498
13–14 years	161 (50.8)	141 (53.6)	
15–17 years	156 (49.2)	122 (46.4)	
Country of study site			0.034
Uganda	175 (55.2)	122 (46.4)	
Kenya	142 (44.8)	141 (53.6)	
Living with at least one biological parent	164 (51.7)	137 (52.1)	0.932
Orphaned*			0.609
Both parents alive	74 (23.4)	57 (21.7)	
One parent alive	125 (39.5)	98 (37.1))	
Neither parent alive	117 (37.0)	108 (41.1)	
Currently in school	272 (85.8)	242 (92.0)	0.019
Contributing cash to the family income	30 (9.5)	43 (16.4)	0.013
Religion			0.012
Catholic	106 (33.4)	75 (28.5)	
Pentecostal	96 (30.3)	61 (23.2)	
Anglican	59 (18.6)	64 (24.3)	
Muslim	26 (8.2)	18 (6.8)	
Other or none	30 (9.5)	45 (17.1)	
Importance of religion			0.049
Very important	143 (45.1)	111 (42.2)	
Important	173 (54.6)	145 (55.1)	
Not important	1 (0.3)	7 (2.7)	
Experiences health as			0.551
Excellent/very good/good	210 (66.2)	168 (63.9)	
Fair/poor	107 (33.8)	95 (36.1)	
Time since knowing HIV-positive status			0.987
Very recent 0–1 year	84 (26.5)	70 (26.6)	
Recent 2–5 years	167 (52.7)	137 (52.1)	
Not recent 6–13 years	66 (20.8)	56 (21.3)	
Attending an HIV clinic	308 (97.2)	262 (99.6)	0.024
Member of an HIV support group	133 (42.0)	123 (46.8)	0.245
Currently on antiretroviral therapy*	217 (68.9)	187 (71.7)	0.471
Consumed alcohol once or more than once	9 (2.9)	10 (3.8)	0.222
Used drugs once or more than once	1 (0.3)	2 (0.7)	0.356

*Missing data: orphaned status n = 1; currently on antiretroviral therapy n = 4

[a]χ^2 test

that talking about preventing HIV transmission was an easy subject, its corresponding effect size is uncertain. Of the selected attitude items, the belief that being a virgin is a good thing reduced sexual risk among girls by half; for boys, a similar effect was found for the belief that them having sex would displease God. A counterintuitive finding arose in that, for girls, the belief that sex leads to greater popularity with the opposite sex was associated with a 70% reduction in risk behavior.

Self-efficacy to negotiate sexual abstinence was significantly associated with lower risk for boys (a difference of five on the 15-point scale reduced risk by about 50% for boys and 30% for girls; not significant). Finally, risk of becoming sexually active was significantly higher for ALHIV who felt that their friends approved of them having sex, while for parents/caregivers' subjective norms this was only true among the male study participants.

Tables 3 and 4 includes both final multivariable models (for both female ALHIV and male ALHIV) using backwards elimination to identify factors independently associated with risk of sexual intercourse.

Being aware of one's own HIV infection remained one of the strongest factors associated with reduced risk of sexual intercourse (about four times). The significant

Table 2 Sexuality related characteristics of the adolescent study population by gender

	Female n = 317	Male n = 263	p value
Ever had sex; n (%)	70 (22.1)	53 (20.2)	0.571[a]
Age first sex; mean (SD)	13.2 (2.3)	11.5 (2.6)	<0.001[b]
Communication skills; mean (SD)	Missing n = 42	Missing n = 22	
About sexuality	2.58 (0.84)	2.72 (0.95)	0.062[c]
About preventing HIV transmission	3.13 (0.70)	3.22 (0.71)	0.129[c]
About family planning	2.76 (0.85)	2.63 (0.89)	0.070[c]
Attitudes; mean (SD)	Missing n = 36	Missing n = 13	
Displeases God	2.15 (0.66)	2.25 (0.70)	0.089[c]
Or else partner would break up with me	2.43 (0.58)	2.34 (0.63)	0.193[c]
More popular with same sex	2.19 (0.49)	2.17 (0.56)	0.384[c]
More popular with opposite sex	2.25 (0.47)	2.07 (0.52)	<0.001[c]
Being a virgin is good	1.80 (0.66)	1.84 (0.77)	0.211[c]
Self-efficacy score: Mean (SD)	Missing n = 6	Missing n = 3	
Range 0–15	9.57 (2.43)	9.68 (2.36)	0.578[b]
Subjective norms; mean (SD)	Missing n = 21	Missing n = 14	
What would your friends think about you having sex:	1.99 (0.93)	2.01 (1.01)	0.614[c]
What would your parents/caregivers think about you having sex:	1.66 (0.62)	1.64 (0.63)	0.850[c]

p: χ^2 test[a], t-test[b] or Kendall's tau test[c]

Graph 1 Survival curves showing age at first sexual debut by gender
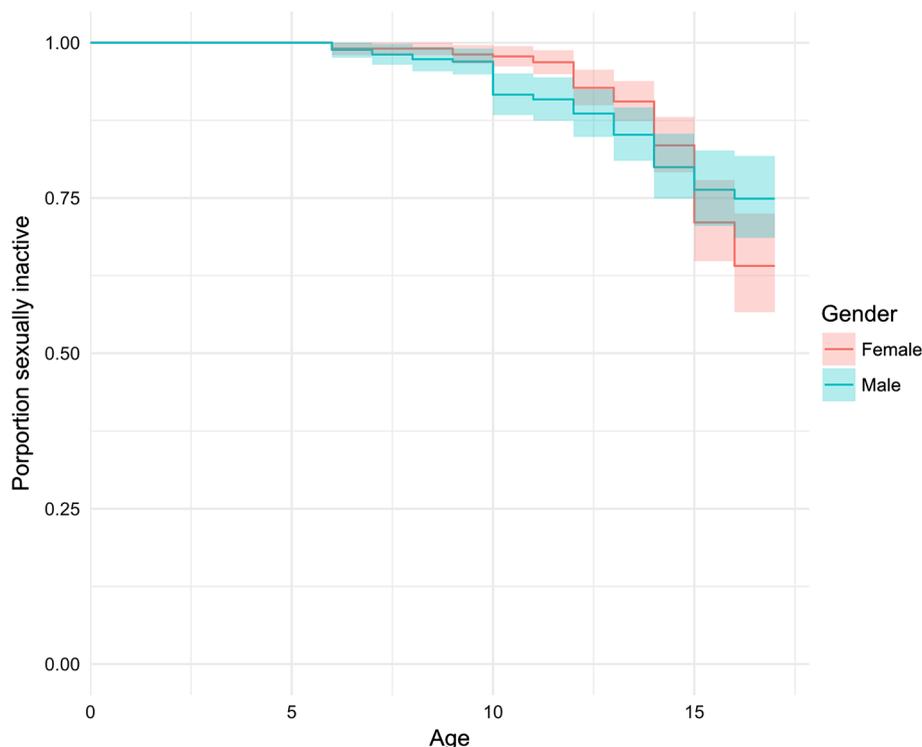
associations of risk with antiretroviral treatment, subjective norms, and girls' poor health experience also largely persisted in the multivariable models. Among the communication skills and attitude items, only the belief that sex leads to popularity with the opposite sex remained negatively associated with risk of becoming sexually active among girls. The country effect for girls was gradually subsumed by the other variables, the largest reduction being due to current ART use and awareness of HIV status.

Table 3 Bivariate analysis of factors associated with risk of sexual intercourse (stratified by gender)

Characteristic (reference)	Risk ratio (ci)	
Gender (Male):	p=0.865	
Female	1.03 (0.72–1.47)	
	Female	Male
Year of birth	p<0.001	p=0.005
Unit increase	0.65 (0.53–0.80)	0.75 (0.62–0.92)
Country of study site (Uganda)	p<0.001	p<0.001
Kenya	4.97 (2.92–8.45)	6.61 (3.10–14.13)
Living with parent(s) (No)	p=0.133	p=0.283
Yes	0.70 (0.43–1.12)	0.74 (0.43–1.28)
Both biological parents deceased (No)	p=0.890	p=0.823
Yes	1.03 (0.64–1.68)	0.94 (0.54–1.62)
Currently in school (No)	p<0.001	p=0.546
Yes	0.34 (0.21–0.56)	0.76 (0.33–1.79)
Contributes cash to family income (No)	p=0.766	p=0.202
Yes	0.90 (0.43–1.87)	1.55 (0.81–2.95)
Religion (Catholic)	p<0.001	p=0.041
Anglican	0.25 (0.10–0.65)	0.66 (0.26–1.65)
Pentecostal	0.65 (0.37–1.16)	1.58 (0.75–3.33)
Muslim	0.22 (0.05–0.93)	0.92 (0.26–3.23)
Other or none	1.56 (0.81–3.03)	2.31 (1.10–4.85)
Importance of religion (Very important)	p=0.203	p=0.006
Important	0.70 (0.43–1.11)	0.50 (0.290–0.86)
Not important	-∞	-∞
Experiences health as (Excellent/very good/good)	p<0.001	p=0.103
Fair/poor	3.11 (1.93–5.02)	1.58 (0.92–2.71)
Aware of own HIV status (No)	p<0.001	p<0.001
Yes	0.20 (0.12–0.35)	0.11 (0.05–0.24)
Member of an HIV support group (No)	p=0.156	p=0.607
Yes	0.70 (0.43–1.15)	0.87 (0.51–1.49)
Currently on antiretroviral therapy (No)	p<0.001	p<0.001
Yes	0.31 (0.20–0.50	0.29 (0.17–0.50)
Communication skills (it is easy, as opposed to difficult, to talk about)	p<0.001	p=0.005
Sexuality	2.47 (1.37–4.46)	2.18 (1.06–4.48)
Preventing HIV transmission	3.68 (0.87–15.50)	2.11 (0.49–9.10)
Family planning (contraceptives)	1.48 (0.81–2.70)	1.40 (0.74–2.66)
Attitude	p<0.001	p=0.110
Having sex displeases God	0.71 (0.41–1.22)	0.53 (0.30–0.95)
… or partner would break up with me	0.87 (0.51–1.49)	0.83 (0.45–1.52)
…make me more popular with same sex	1.88 (0.93–3.77)	1.43 (0.63–3.24)
…make me more popular with opposite sex	0.29 (0.16–0.51)	0.57 (0.24–1.39)
Being a virgin is good	0.49 (0.26–0.92)	0.71 (0.35–1.47)
Self-efficacy score	p=0.146	p=0.032
Unit increase	0.93 (0.84–1.03)	0.88 (0.79–0.99)
Subjective norms (having sex is a good idea according to)	p=0.001	p<0.001
Friends	2.98 (1.73–5.12)	2.53 (1.36–4.71)
Parents/caregivers	0.61 (0.19–1.98)	2.69 (1.20–5.99)

p: likelihood ratio test

Table 4 Multivariable analysis of factors associated with risk of sexual intercourse: for male adolescents, and for female adolescents

Characteristic	RR (CI)	
	Female	Male
	p < 0.001	p < 0.001
Year of Birth	Ω	0.76 (0.61–0.96)
Country	Ω	4.47 (1.64–12.18)
Attending school	0.55 (0.230–0.99)	*
Awareness of HIV status	0.26 (0.13–0.52)	0.26 (0.10–0.64)
Poor health	2.12 (1.18–3.79)	*
ARV	0.29 (0.16–0.50)	0.54 (0.29–0.99)
Sex - > more popular with opposite sex	0.46 (0.26–0.79)	*
Subjective norm of friends	2.39 (1.31–4.35)	Ω
Subjective norm of caregivers	Ω	2.52 (1.20–5.30)

P: likelihood ratio test

*: excluded before the stepwise procedure. Ω: excluded during the stepwise procedure

Discussion

This study documents factors associated with sexual activity among HIV infected adolescents receiving care living in the urban area of Kampala (Uganda), urban city of Kisumu and rural provinces in Western Kenya. We identified a number of potentially modifiable determinants for the risk of becoming sexually active, which could be targeted in future sexual and reproductive health interventions among the ALHIV.

Overall, twenty percent of the girls and 22% of the boys in our study reported ever having sex. This is lower than what has been reported in other studies, i.e. 33% and 40% respectively in Ugandan studies [19, 37, 38], but higher than reported by Toska et al. [39], who found an overall rate of 15% (19.2% for girls and 10.7% for boys).

Generally, larger proportions of young males than young females self-report sexual activity at a young age [40]. Such differences may be partially explained by different study designs, sampling strategies, and age groups including under 19 year olds, while in our study only age-groups 13-17 years were recruited within HIV care settings. A significantly higher proportion of Kenyan than Ugandan ALHIV reported to have had their first sexual intercourse, and this difference was more pronounced for girls than for boys. This may reflect differences in national HIV prevention and care policies between the countries, with Uganda more strongly emphasizing abstinence only approaches, as reflected for instance in "HIV stops with me" campaigns targeting HIV positive youths embedded in the clinics [41]. Age of first sexual activity was particularly low in our study, given that other studies have used 15 years of age as defining threshold for early sexual debut [42]. For those sexually active, age of first sexual activity differed significantly by gender (11.5 and 13 years for boys and girls respectively). Whether or not this gender difference is real or a result of self-reporting bias, it underscores the need for exploring gender-separate

models. There is also a high proportion of orphans in our sample with 37% and 41% of the girls and boys respectively doubly orphaned, potentially resulting in less effective guidance and supervision from caregivers [43]. A previous qualitative study conducted in the same study population revealed that ALHIV were often neglected and treated as the "lesser child", especially in poverty-ridden families [44]. A South-African study found that orphans were nearly one and half times more likely than non-orphans to have had sex, with sexually active orphans reporting younger age of sexual intercourse, i.e. 23% of orphans by age 13 or younger compared to 15% of non-orphans [45]. However, we could not replicate this effect, possibly due to insufficient power.

A Kenyan study showed that youths reporting high-risk behavior (i.e. unprotected sex or multiple partners) were significantly more likely to be young, male, experience low caregiver monitoring and externalizing behavioral problems [46].

For both genders, variables significantly associated with risk of becoming sexually active in the bivariate analysis were older age groups, being from Kenya, religion (Catholic in particular), currently not receiving ART, having lower communication skills with health care providers on sexuality and HIV-prevention topics, and reporting subjective peer norms approving of sexual activity. Additional risk factors for girls included not being enrolled in school, experiencing their health status as fair or poor, and not holding the belief that being a virgin is a good thing. However, the belief that sex increased popularity with the opposite sex was associated with less risk among girls. A possible explanation for this negative association is that this may be a naïve belief which is largely discarded after sexual debut.

Interestingly, when looking at male ALHIV, school enrolment did not turn out to be significantly associated with onset of sexual activity; increased self-efficacy to abstain from sex only had a slight effect, if any.

In the final multivariable models, the strongest negative associations between risk of becoming sexually active were found with the variables being aware of one's HIV status, and receiving antiretroviral treatment for both genders. In the model for female ALHIV, the strong risk difference between Kenya and Uganda could be explained almost entirely by these two variables. This may be due to the difference in the sampling frame between the Ugandan and the Kenyan setting; indeed, girls in Kenya had 5.01 times smaller odds of receiving ART than their counterparts in Uganda (p < 0.001; Fisher's exact test). This ratio is 6.37 for boys (p < 0.001). Similarly, the odds for girls of becoming sexually active before they knew their HIV status were 7.59 times higher in Kenya compared to Uganda (p < 0.001), but only 3.77 times higher for boys (p = 0.124). This indicates an important role of HIV programs in health care systems for reducing sexual risk behaviour.

Subjective peer-norms approving of sexual activity were independently and significantly associated with risk of becoming sexually active for both genders, as shown in previous research [47]. In line with conceptual frameworks emphasizing the influence of multi-level factors on adolescent sexuality [20] [48], our results confirm the importance of a settings approach for promoting sexual health and positive prevention. This may imply that in addition to individual counseling, targeting peer groups of ALHIV may be beneficial, such as peer support activities in regular adolescent HIV care and integrated sexual health services. In our study, 42% of the girls and 47% of the boys attended peer support groups. Although there was no direct link between peer support groups and sexual risk, attendance may provide a safe social space for learning and acquiring HIV information [49], and may enable the adolescents to capitalize on the social and normative support they receive [50].

Attending school had a protective effect only for girls in the final multivariable model. A recent Ugandan study among perinatally infected ALHIV also identified school as a negative correlate of ever having had sex [37]. School might be another enabling environment, in which preventive sexual behaviors can be promoted, also highlighting the importance of a settings approach: Given their need for specific and practical unbiased HIV/STI and pregnancy prevention information, school-based sex education may be a promising avenue for reaching adolescents, especially the younger ones under the age of 15 years [29]. This emphasizes the impact of schooling and the subsequent need to keep girls in school, as evidenced by a body of research for a variety of social and health outcomes [51]. Girls, due to the particular combination of gender-role of conforming to behavior and religion, could be more adhering to prevention messages supporting abstinence only approaches. Generally, it has been shown that educational attainment has a protective effect for HIV risk,

especially for girls [52]. In many parts of Africa, cultural attitudes towards sexuality and gender are closely tied up with religion [53], which could have stronger effects on girls due to socially constructed gender-norms, as shown by the attitudes and beliefs girls held that were found to be significantly associated with the outcome variable (i.e. that being a virgin is a good thing).

Interestingly, no other individual level factors were identified as associated with the risk of becoming sexually active. In contrast to prominent behavioral theories pointing to self-efficacy as a strong individual determinant of prevention behavior [34], this variable was not an associated factor in our study. While a number of intervention studies in the sub-Saharan African context demonstrated increased self-efficacy to abstain from sex to be related to sexual abstinence [54], it is unclear why this factor could not be confirmed in our study. It has been argued that most of the theories and models used to develop HIV communication are based on a social psychology that emphasizes individualism [55]. Our results confirming the importance of peer-norms in all models can be understood in line with this observation. This is also confirmed by other research on the importance of peer influence on developing sexual identities [27], and influencing sexual behavior [56] [57]. Strengthening peer norms to delay sexual activity at a young age and on making informed decisions about sexuality should thus be part of positive prevention interventions.

In interpreting these results, we acknowledge several study limitations: Although this is a cross-sectional study, our outcome variable is longitudinal in nature, and is determined by events that may have occurred years before our survey was administered. Since many of the independent variables measured can be expected to vary over time (for some even as a result of sexual debut), no causal interpretation with regard to risk of sexual intercourse can be given. That said, the strongest associations involved country, which is likely constant over time, ARV treatment, in so far as it not dependent on sexual activity, and the ALHIV's awareness of their HIV infection, which we were able to reconstruct as a time-varying covariate. Unfortunately, the mode of HIV acquisition (i.e. vertically versus behaviourally HIV infected adolescents) was not assessed, while those two groups of ALHIV may differ substantially [58]. A further limitation is that self-reported data on sexual practices may be biased due to social desirability. Our participants mainly came from well-established HIV care settings, and therefore study findings may not generalize to all ALHIV or HIV positive adolescents attending other facilities. However, our study included adolescents from both urban and rural areas, which improves the wider application of the findings.

Conclusion

This study expands the knowledge base on interpersonal, social and health-care related determinants of HIV positive adolescents' risk of becoming sexually active, which so far have not been well researched in the sub-Saharan African context. An understanding of these factors may inform interventions promoting positive prevention for ALHIV delivered in health-care facilities and highlights the need to develop integrated strategies that go beyond individual-level factors.

Compliance with Ethical Standards

Conflict of interest All authors have no conflict of interest to declare.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors. The study obtained ethical clearance from the Kenya Medical Research Institute (KEMRI) Ethical Review Committee, Makerere University College of Health Sciences Ethical Review Committee, Baylor College of Medicine Ethical Review Board, Uganda National Council of Science and Technology, the Institutional Review Board of the Institute of Tropical Medicine, Antwerp and the University of Antwerp, Belgium. All participants were recruited through an informed consent process.

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