



SAHARA-J: Journal of Social Aspects of HIV/AIDS

An Open Access Journal

ISSN: 1729-0376 (Print) 1813-4424 (Online) Journal homepage: www.tandfonline.com/journals/rsah20

Sexual behaviour among Kenyan adolescents enrolled in an efficacy trial of a smartphone game to prevent HIV: a cross-sectional analysis of baseline data

Victor Mudhune, Kate Winskell, Robert A. Bednarczyk, Ken Ondenge, Calvin Mbede, Emily Kerubo, Richard Ndivo, Judith Arego, Marissa Morales, Brianna Halliburton & Gaëlle Sabben

To cite this article: Victor Mudhune, Kate Winskell, Robert A. Bednarczyk, Ken Ondenge, Calvin Mbede, Emily Kerubo, Richard Ndivo, Judith Arego, Marissa Morales, Brianna Halliburton & Gaëlle Sabben (2024) Sexual behaviour among Kenyan adolescents enrolled in an efficacy trial of a smartphone game to prevent HIV: a cross-sectional analysis of baseline data, SAHARA-J: Journal of Social Aspects of HIV/AIDS, 21:1, 2320188, DOI: [10.1080/17290376.2024.2320188](https://doi.org/10.1080/17290376.2024.2320188)

To link to this article: <https://doi.org/10.1080/17290376.2024.2320188>



© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 22 Feb 2024.



[Submit your article to this journal](#)



Article views: 4131



[View related articles](#)



[View Crossmark data](#)



Citing articles: 1 [View citing articles](#)

Sexual behaviour among Kenyan adolescents enrolled in an efficacy trial of a smartphone game to prevent HIV: a cross-sectional analysis of baseline data

Victor Mudhune ^a, Kate Winskell ^b, Robert A. Bednarczyk ^b, Ken Ondenge ^a, Calvin Mbeda^a, Emily Kerubo^a, Richard Ndivo ^a, Judith Arego ^a, Marissa Morales ^b, Brianna Halliburton^c and Gaëlle Sabben ^b

^aHIV Research Division, Centre for Global Health Research, Kenya Medical Research Institute, Kisumu, Kenya; ^bHubert Department of Global Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA; ^cDepartment of Behavioral, Social, and Health Education Sciences, Rollins School of Public Health, Emory University, Atlanta, GA, USA

ABSTRACT

Sexual behaviour of adolescents is contextual, with various determinants affecting sexual activity and age of sexual debut. Insight into sexual activity among young adolescents has the potential to influence appropriate sexual and reproductive health interventions. For this analysis, adolescents were recruited as part of the *Tumaini* smartphone game efficacy trial. Data collection included a self-administered behavioural survey and blood test for HIV and HSV-2. Descriptive statistics were calculated for demographics and measures of sexual behaviour and behavioural intent based on gender and sexual experience, with associations assessed using chi-square tests, *t*-tests and Wilcoxon rank sum tests as appropriate. We enrolled 996 adolescents, mean age 14 years and 2.2% HSV-2 positivity. Overall, 15% of the adolescents were sexually experienced, this being associated with lower socio-economic status ($p=0.01$), household food insecurity ($p=0.008$), a living situation without both parents ($p<0.01$), substance use ($p=0.02$), no adult conversation about future goals ($p=0.003$), conversations about condoms ($p=0.01$), with some gender disparity within these factors. Among those sexually experienced, 21.7% reported unwilling sex; 17.5% had engaged in transactional sex; 57.8% had willing first sex, of whom 60.9% reported no condom use. Among those abstaining, female adolescents were less likely to contemplate condom use at first sex ($p=0.006$). Our findings determine that young sexually active adolescents are likely engaging in unprotected sex and having unwilling sexual experiences. Socio-economic status, living situation and parental monitoring remain significant factors associated with sexual experience among young adolescents. In this context, early adolescence is an opportunity to provide age- and developmentally appropriate education about safer sex practices.

Trial registration: [ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT04437667) identifier: NCT04437667.

ARTICLE HISTORY

Received 29 May 2022
Accepted 13 February 2024

KEYWORDS

Kenya; young adolescent; sexual behaviour; sexual activity; sexual debut

Introduction

Early adolescence is a critical developmental period, characterised by rapid physical, social, cognitive and emotional changes (Yurgelun-Todd, 2007). The beginning of sexual and reproductive maturation is a time of natural experimentation and increasing sexual feelings and impulses. This stage of the human life cycle has been the focus of harm prevention and health promotion (Galambos & Leadbeater, 2000), as sexual activity and risky behaviour are initiated and decisions during this vulnerable period can influence the quality and length of adolescents' lives.

Early sexual debut, commonly defined as sexual experience before the age of 15 years, and experience of coercion or violence contribute negatively to adolescents' life goals. Early sexual debut has been

associated with increased numbers of sexual partners (Fatusi & Wang, 2009; Zuma et al., 2010); unprotected sex (Ajuwon, Olaleye, Faromoku, & Ladipo, 2006; Nkata, Teixeira, & Barros, 2019); risk of sexually transmitted diseases, including HIV/AIDS (Kaestle, Halpern, Miller, & Ford, 2005; Mmbaga, Leonard, & Leyna, 2012) and HPV resulting in cervical cancer (Houlihan et al., 2016); unwanted teenage pregnancies (Baumgartner, Geary, Tucker, & Wedderburn, 2009; Bengesai, Khan, & Dube, 2018); and unsafe abortions (Nkata et al., 2019; Polis et al., 2009). In addition, early sexual debut has negative effects on academic outcomes (Bengesai et al., 2018; Parkes, Wight, Henderson, & West, 2010). Data from 34 nationally representative surveys in sub-Saharan Africa conducted between 2006 and 2014 (Amo-Adjei & Tuoyire, 2018) show that sexual debut occurred, on average, at age 16 and 17 years

CONTACT Victor Mudhune  vmudhune@gmail.com  HIV Research Division, Centre for Global Health Research, Kenya Medical Research Institute, P.O. Box 1578-40100, Kisumu, Kenya

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

for women and men, respectively. Coercion and power dynamics play a significant role in reported first sexual experiences (Koenig et al., 2004; Williams, McCloskey, & Larsen, 2008). Between 15% and 48% of young women in sub-Saharan Africa report they were 'not willing' at their first sexual encounter (Moore, Awusabo-Asare, Kumi-Kyereme, Madise, & John-Langba, 2007). In Kenya, recent data show the age of sexual debut among adolescent girls to be 16 years (SD 15.0–17.0) (Zulaika et al., 2021). The timing of first sexual intercourse and the context in which it occurs have health implications, with the proportion of adolescents who are sexually experienced being of public health interest.

There is significant regional variation in sexual behaviour, mainly driven by social and economic determinants (Wellings et al., 2006). This has the potential to influence the appropriate intervention in a given region. Individual and contextual factors contributing to early sexual debut include: substance and alcohol use (Durowade et al., 2017; Furlanetto, Ghedin, Gonçalves, & Marin, 2020); male gender (Durowade et al., 2017); high prevalence of sexual initiation among peers (Durowade et al., 2017; Mmbaga et al., 2012); inadequate parental monitoring (Furlanetto et al., 2020; Lohman & Billings, 2008); problems at school (Furlanetto et al., 2020; Pengpid & Peltzer, 2021); inadequate parent-child communication (Gavin, Williams, Rivera, & Lachance, 2015; Mmbaga et al., 2012); not attending religious programmes (Kassahun, Gelagay, Muche, Dessie, & Kassie, 2019); and unstable family environments (Mmbaga et al., 2012). Increasing age at sexual debut has been centre stage for most public health interventions in sub-Saharan Africa. Several proposed models for adolescent sexual and reproductive health education exist, including through innovative techniques like computer programmes or social media (Winskell et al., 2018) and through the more traditional influence from parents (Gavin et al., 2015), peers (Fongkaew, Fongkaew, & Suchaxaya, 2007) and teachers (Walker, Drakeley, Welch, Leahy, & Boyle, 2021).

Knowledge of factors associated with sexual behaviour, its occurrence, and risk factors among adolescents in a specific population helps in informing intervention strategies targeting delay of sexual debut and promotion of safer sex. As part of an ongoing study of *Tumaini*, an interactive narrative-based smartphone game to prevent HIV among young adolescents in Kisumu, Western Kenya (Mudhune et al., 2022), we collected baseline data on adolescent demographics, a range of mediators of early sexual debut, sexual risk-taking and HIV and herpes simplex virus type 2 (HSV-2) status at enrolment. Drawing on these data, we set out to evaluate the prevalence of early adolescent sexual activity and associated factors in this context, in an effort to shed light on adolescent sexual behaviours.

Methods

Study design

This paper presents cross-sectional analysis of baseline data from an efficacy trial of the intervention *Tumaini* (Winskell, Sabben, & Obong'o, 2019), a smartphone-based game aiming to delay sexual debut and increase condom use at first sex among adolescents.

Ethical approval

The study was approved by the Institutional Review Board (IRB) of Emory University (STUDY00002974), and Kenya Medical Research Institute (KEMRI), Scientific and Ethics Review Unit (KEMRI/SERU/CGHR/11/3812).

Study recruitment and procedures

Detailed study procedures for the efficacy trial during which these data were collected, including recruitment, survey development activities, and biological testing and follow-up are described elsewhere (Mudhune et al., 2022) and summarised here. The parent study is being conducted in urban and peri-urban Kisumu County, Western Kenya. Recruitment was initiated via (1) schools distributing invitation letters to parents of potentially eligible adolescents to inform them of the study and (2) direct recruitment in the community at community meetings. Recruitment materials and consent/assent forms were available in Kenya's national languages (English and Kiswahili) and the most common local language within the catchment area (Dholuo). Assent was obtained separately and privately with the adolescents, following consenting of one parent/caregiver. Inclusion criteria for study participation were: age 12–14, residence in Kisumu, and basic English literacy (assessed via a short listening and reading comprehension test). Recruitment, consenting, enrolment and baseline data collection occurred between October and December 2020.

Baseline data collection for the parent study consisted of a behavioural survey and a blood test for HIV and HSV-2. The behavioural survey was self-administered in English by adolescents via tablet-based Open Data Kit (ODK) Collect forms. Audio recordings of the questions were included to ensure comprehension; adolescents were provided with headphones and given ample space for privacy. In line with the goals of the intervention and its theoretical underpinnings, the survey focused on mediators of age at onset of sexual activity and condom use at the first sex; those who reported sexual experience were asked additional questions about prior sexual activity. Adolescent demographics were also collected via this survey. The

sexual experience section of the instrument is the focus of this article.

The majority of survey items were drawn from the questionnaire used during feasibility testing of the same game-based intervention in 2017 (Sabben et al., 2019; Winskell et al., 2018) and supplemented with new questions to address the length of the study, its longitudinal nature and the older age of adolescents. Item validity, understandability and reliability were confirmed prior to deployment for this study via cognitive interviews, instrument and delivery platform piloting, and temporal reliability testing assessed over a two-week interval. Adolescents were able to refuse to answer any of the non-demographic questions. Where gate questions were used (e.g. 'Have you ever had sex?'), a refusal to answer did not prevent the subsequent questions from being shown. Only a 'no' bypassed further questions on that topic.

Adolescents underwent HIV and HSV-2 testing after completion of the behavioural survey, following national HIV testing guidelines and a modified testing algorithm (Mudhune et al., 2022). HIV testing involved parallel antibody-based rapid test kits followed by confirmatory DNA Polymerase Chain Reaction testing for discordant results. HSV-2 testing was carried out using HSV-type 2 IgG enzyme-linked immunosorbent assay.

Statistical analysis

Survey data, identified solely using random participant identifiers (PTID), were downloaded daily from study tablets onto a password-protected and encrypted computer and uploaded to the HIPAA-compliant LabKey Server data management system (Nelson et al., 2011). Biological data, also identified via PTID, were compiled from rapid-test and laboratory reports and uploaded to LabKey. Datasets were imported into SAS SoftwareTM, Version 9.4 and merged by PTID; adolescents who had been terminated from the study following baseline were excluded from analyses. Outlier values for age at the first sex and age at menarche were excluded from analyses.

Descriptive statistics were calculated for adolescent demographics and for all measures of sexual behaviour and behavioural intentions, substance use and parent-child communication about a range of topics. Socio-economic status was extrapolated from questions on house building materials and categorised into higher and lower groups. Cross-group comparisons were conducted for these measures by self-reported prior sexual experience and by gender using Wilcoxon rank sum tests, Fisher's exact tests, chi-square tests of association and two-sample *t*-tests, as appropriate for each measure and the distribution of the data.

Table 1. Demographics characteristic and biological testing by adolescent gender (*n* = 996).

Characteristics	Total (<i>n</i> = 996)	Female (<i>n</i> = 499)	Male (<i>n</i> = 497)
Age (years), mean (SD)	14.0 (0.6)	14.0 (0.5)	14.0 (0.6)
Attending school, <i>n</i> (%)	992 (99.6)	498 (99.8)	494 (99.4)
Socio-economic status, <i>n</i> (%)			
Higher	507 (51.1)	254 (51.1)	253 (51.1)
Lower	398 (48.9)	243 (48.9)	242 (48.9)
Missing	4 (–)	2 (–)	2 (–)
Household overnight hunger due to lack of food, <i>n</i> (%)			
Never	647 (65.0)	322 (64.5)	325 (65.4)
Rarely	190 (19.1)	95 (19.0)	95 (19.1)
Sometimes	132 (13.3)	65 (13.0)	67 (13.5)
Often	27 (2.7)	17 (3.4)	10 (2.0)
Household full day and night hunger due to lack of food, <i>n</i> (%)			
Never	584 (58.6)	290 (58.1)	294 (59.2)
Rarely	220 (22.1)	110 (22.0)	110 (22.1)
Sometimes	155 (15.6)	77 (15.4)	78 (15.7)
Often	15 (3.0)	22 (4.4)	15 (3.0)
Living situation, <i>n</i> (%)			
Both parents	547 (54.9)	263 (52.7)	284 (57.1)
Mother only	276 (27.7)	148 (29.7)	128 (25.8)
Father only	60 (6.0)	34 (6.8)	26 (5.2)
Grandparents	72 (7.2)	31 (6.2)	41 (8.3)
Other living situation	41 (4.1)	23 (4.6)	18 (3.6)
Religion, <i>n</i> (%)			
Catholic	356 (35.7)	169 (34.1)	187 (37.9)
Protestant/ Anglican	293 (29.4)	164 (33.1)	129 (26.2)
Seventh Day Adventist	243 (24.4)	117 (23.6)	126 (25.6)
Muslim	31 (3.1)	14 (2.8)	17 (3.5)
Other local religion	21 (2.1)	11 (2.2)	10 (2.0)
No religion	33 (3.3)	14 (2.8)	19 (3.9)
Missing	19 (–)	10 (–)	9 (–)
Attendance at religious services, <i>n</i> (%)			
Once per week	777 (78.0)	401 (80.4)	376 (75.7)
1–2 times per month	77 (7.7)	30 (6.0)	47 (9.5)
A few times per year	83 (8.3)	37 (7.4)	46 (9.3)
Once per year or less	22 (2.2)	13 (2.6)	9 (1.8)
Never	37 (3.7)	18 (3.6)	19 (3.8)
Circumcised, <i>n</i> (%) [<i>N</i> = 480]			
Yes	419 (87.3)		419 (87.3)
No	56 (11.9)		56 (11.9)
I don't know	4 (0.8)		4 (0.8)
Reached menarche, <i>n</i> (%) [<i>N</i> = 479]	205 (42.8)	205 (42.8)	
Living with HIV, <i>n</i> (%)	16 (1.6)	10 (2.0)	6 (1.2)
HSV-2 results, <i>n</i> (%)			
Positive	22 (2.2)	7 (1.4)	15 (3.0)
Indeterminate	23 (2.3)	7 (1.4)	16 (3.2)
Negative	951 (95.5)	491 (97.2)	466 (93.8)

Results

Baseline characteristics

For the 996 adolescents enrolled (499 female and 497 male), the mean age was 14.0 years (SD = 0.6) (Table 1).

Among the adolescents, 99.6% were enrolled in school, and 54.9% living with both parents. There were no statistical differences in any of the demographics by gender. Among male adolescents, 87.3% (*n* = 419) indicated they were circumcised; 42.8% (*n* = 205) of female adolescents reported having started their menses. Table 1 also shows blood test results for HIV and HSV-2. 1.6% of the adolescents (*n* = 16) tested positive for HIV, 62.5% of whom were female (*n* = 10). Twenty-two adolescents (2.2%) tested positive for HSV-2, an additional 23 (2.3%) receiving indeterminate results. While there was no statistical difference in HIV serostatus by gender, there was an association

between HSV-2 status and gender (χ^2 , (2, $N = 996$) = 6.8, $p = 0.03$), with female adolescents more likely to test negative and male adolescents to have positive or 'indeterminate' results.

Comparing adolescents by reported sexual experience

We compared the demographics of adolescents who reported prior sexual experience ($n = 152$, 15.3% of all adolescents) with those who indicated none ($n = 839$) (Table 2).

Adolescents reporting having reached sexual debut were more likely to have a lower socio-economic status

Table 2. Characteristics of adolescents and associations with self-reported prior sexual activity ($n = 991$)

Characteristics	Previous sex ($n = 152$)	No previous sex ($n = 839$)	p -value
Age (years), mean (SD)	13.6 (0.54)	13.5 (0.53)	
Socio-economic status, n (%)			0.01 ^a
Higher	63 (41.4)	441 (52.8)	
Lower	89 (58.6)	394 (47.2)	
Missing		4 (-)	
Household overnight hunger due to lack of food, n (%)			
Never	78 (51.3)	505 (60.2)	
Rarely	40 (26.3)	178 (21.2)	
Sometimes	24 (15.8)	129 (15.4)	
Often	10 (6.6)	27 (3.2)	
Household full day and night hunger due to lack of food, n (%)			0.02 ^a
Never	84 (55.3)	561 (66.9)	
Rarely	33 (21.7)	156 (18.6)	
Sometimes	28 (18.4)	102 (12.2)	
Often	7 (4.6)	20 (2.4)	
Living situation, n (%)			0.01 ^b
Both parents	67 (44.1)	477 (56.9)	
Mother only	49 (32.2)	225 (26.8)	
Father only	11 (7.2)	49 (5.8)	
Grandparents	13 (8.6)	59 (7.0)	
Other living situation	12 (7.9)	29 (3.4)	
Religion, n (%)			
Catholic	60 (39.7)	295 (35.2)	
Protestant/Anglican	40 (26.5)	251 (29.9)	
Seventh Day Adventist	35 (23.2)	207 (24.7)	
Muslim	4 (2.7)	27 (3.2)	
Other local religion	4 (2.7)	17 (2.0)	
No religion	4 (2.7)	28 (3.3)	
Missing	5 (-)	14 (-)	
Attendance at religious services, n (%)			
Once per week	110 (72.4)	663 (79.0)	
1–2 times per month	11 (7.2)	66 (7.9)	
A few times per year	15 (9.9)	67 (8.0)	
Once per year or less	6 (4.0)	16 (1.9)	
Never	10 (6.6)	27 (3.2)	
Parental monitoring, n (%)			0.032 ^a
Never	48 (31.6)	196 (23.4)	
Rarely	23 (15.1)	103 (12.3)	
Sometimes	31 (20.4)	172 (20.5)	
Often	48 (31.6)	365 (43.5)	
Missing	2 (-)	3 (-)	
Any previous alcohol or drug use, n (%)	12 (7.9)	32 (3.8)	0.02 ^a
Living with HIV, n (%)	0 (0.0)	16 (1.9)	
HSV-2 results, n (%)			
Positive	5 (3.3)	17 (2.0)	
Indeterminate	3 (2.0)	20 (2.4)	
Negative	144 (94.7)	802 (95.6)	

Note: p -values reported where $p < 0.05$. χ^2 or Fisher's exact tests used to assess the association between categorical variables; the specific test is denoted for each value as indicated in the legend.

^a p -value for χ^2 test.

^b p -value for Fisher's exact test.

(χ^2 , (1, $N = 987$) = 6.7, $p = 0.01$), less likely to report no or low household food insecurity, as measured by someone in the household going a full day and night without food (χ^2 (3, $N = 991$) = 9.5, $p = 0.008$), less likely to live with both parents, and more likely to report other living arrangements (Fisher's exact $p < 0.01$). There was no difference in religion or religiosity between the two groups. Among female adolescents specifically, those with a lower socio-economic status (χ^2 (1, $N = 493$) = 4.1, $p = 0.04$) or who reported any degree of full day/night hunger in their household (χ^2 (3, $N = 495$) = 10.4, $p = 0.02$), were more likely to have had sex, as were those reporting less frequent attendance at religious services (Fisher's exact $p = 0.002$). For their male counterparts, sexual experience was associated with not living in two-parent households (χ^2 (4, $N = 496$), $p = 0.04$). Although HSV-2 was employed as a biological indicator of sexual activity to validate self-reported data, there was no association between HSV-2 results and reported sexual experience; 17 of the 22 positive results were among adolescents reporting no prior sex.

Adolescents who had reached sexual debut were more likely to report no or rare parental monitoring ('How often does your parent or caregiver ask you where you are going or who you will be with?') (χ^2 (3, $N = 986$) = 8.7, $p = 0.03$); this relationship held for male adolescents (χ^2 (3, $N = 495$), $p = 0.002$). While only 4.4% of all adolescents reported having previously 'taken alcohol or any type of drugs (e.g. bhang, miraa, khat, kuber, cocaine)' ($n = 44$), substance use was more common among adolescents who had reached sexual debut (χ^2 (1, $N = 991$) = 5.1, $p = 0.02$).

Sexually active adolescents were also less likely to report conversations with an adult about their future goals (χ^2 (1, $N = 991$) = 8.8, $p = 0.003$) (Table 3), but more likely to report conversations about condoms (defined in the survey as 'A condom is a thin rubber covering worn by a man on his erect penis when he has sex', and therefore referring to male condoms)

Table 3. Reported prior discussion of a range of topics with an adult by previous experience of sex ($n = 991$).

Discussion topic	Total ($n = 991$)	Previous sex ($n = 152$)	No previous sex ($n = 839$)	p -value
Goals for the future, n (%)	803 (81.1)	110 (72.4)	693 (82.6)	0.003 ^a
Alcohol and drugs, n (%)	364 (36.7)	53 (34.9)	311 (37.1)	
How to avoid pregnancy, n (%)	540 (54.5)	78 (51.3)	462 (55.1)	
How to avoid HIV/AIDS, n (%)	643 (64.9)	95 (62.5)	548 (65.3)	
Condoms, n (%)	132 (13.3)	30 (19.7)	102 (12.2)	0.01 ^a
Deciding when to have sex, n (%)	176 (17.8)	36 (23.7)	140 (16.7)	0.04 ^a
Romantic relationships, n (%)	196 (19.8)	42 (27.6)	154 (18.4)	0.008 ^a

^a p -value for χ^2 test.

(χ^2 (1, $N = 991$) = 6.4, $p = 0.01$), deciding when to have sex (χ^2 (1, $N = 991$) = 4.3, $p = 0.04$), or romantic relationships (χ^2 (1, $N = 991$) = 12.6, $p = 0.008$), as well as recent conversations (within the last 6 weeks) about condoms (χ^2 (1, $N = 991$) = 19.1, $p < 0.0001$) or romantic relationships (χ^2 (1, $N = 991$) = 12.6, $p = 0.0004$).

While over half of all adolescents reported conversations with adults about avoiding pregnancy and HIV/AIDS, there were no significant differences between the two groups on these topics.

Prior sexual activity and condom usage

Among the 152 adolescents (15.3% of all adolescents, 13.7% of female, $n = 68$, and 16.9% of male adolescents, $n = 84$) who reported prior sexual activity, 41.4% (36.8% of female, $n = 25$, and 44.2% of male adolescents, $n = 38$) indicated that they had experienced willing sex (defined in the survey as 'no one forced, threatened, or tricked you') while 21.7% (22.1% of female, $n = 15$, and 20.9% of male adolescents, $n = 18$) reported having experienced unwilling sex. Among those who indicated previous sex (or refused to answer the question), 7.9% ($n = 12$) reported both willing and unwilling sex and 46.1% ($n = 70$) neither. For participants who only reported unwilling sex ($n = 21$, 13.4% of those reporting previous sex), no further questions were asked about their sexual experiences.

Table 4. Reported sexual activity among adolescents indicating previous willing sexual experience or refusing the gate question ($n = 64$).

Characteristics	Total ($n = 64$)	Female ($n = 25$)	Male ($n = 39$)	p -value
First sexual experience was willing, n (%)	37 (57.8)	12 (48.0)	25 (64.1)	
Age at first willing sex, median (IQR)	11 (9-13)	11 (8-13)	11 (9-12)	
Condom use at first willing sex, n (%)				
Yes	16 (25.0)	6 (24.0)	10 (25.6)	
No	39 (60.9)	15 (60.0)	24 (61.5)	
Unsure	9 (14.1)	4 (16.0)	5 (12.8)	
Age of partner at first willing sex, n (%)				
Younger than me	6 (9.4)	1 (4.0)	5 (12.8)	
About the same age	35 (54.7)	12 (48.0)	23 (59.0)	
3–5 years older	4 (6.3)	3 (12.0)	1 (2.6)	
5–10 years older	8 (12.5)	2 (8.0)	6 (15.4)	
More than 10 years older	11 (17.2)	7 (28.0)	4 (10.3)	
Any previous partner >5 years older, n (%)	16 (25.0)	9 (36.0)	7 (18.0)	
Number of previous partners, median (IQR)	1 (1-3)	1 (1-3)	2 (1-3)	
Recent sexual activity ^a , n (%)	15 (23.4)	6 (24.0)	9 (23.1)	
Planned condom use during next sexual encounter, n (%)				0.04 ^b
Definitely yes	43 (67.2)	17 (68.0)	26 (66.7)	
Maybe yes	10 (15.6)	1 (4.0)	9 (23.1)	
Maybe no	1 (1.6)	1 (4.0)	0 (0.0)	
Definitely no	10 (15.6)	6 (24.0)	4 (10.3)	
Experience of transactional sex, n (%)	11 (17.5)	6 (24.0)	5 (13.2)	

^aIn the past 6 weeks.

^b p -value for Fisher's exact test.

Adolescents who reported willing sex (or did not answer the question) ($n = 64$) were asked further questions about their experiences (Table 4).

The majority (57.8%, $n = 37$) indicated that their first experience had been willing, with a larger proportion of male adolescents (64.1%, $n = 25$) than female (48%, $n = 12$) responding in this manner. The majority (60.9%, $n = 39$) reported no condom use at first willing sex, while 14.1% ($n = 9$) were unsure whether a condom had been used. Proportions of adolescents reporting condom use at first willing sex and uncertainty about condom use were similar across genders. Most commonly, adolescents had their first willing sexual encounter with a partner around the same age as themselves (54.7%, $n = 35$). Female adolescents were twice as likely to report a previous partner more than 5 years older than them (36.0%, $n = 9$), although the difference was not statistically significant. Adolescents reported between 1 and 20 different partners, with a median of two previous partners (IQR = 1-3) for young men and of one (IQR = 1-3) for young women.

Among adolescents who indicated prior willing sexual activity, 23.4% ($n = 15$) reported recent sexual activity, defined as 'willingly had sex in the past 6 weeks'. Proportions were no different across genders. When asked if they planned to use a condom during their next sexual encounter, 67.2% ($n = 43$) indicated that they definitely would do so. There was an association between gender and intention to use a condom at next sex (Fisher's exact $p = 0.04$), with young women less likely to indicate that they intended condom use. Lastly, 17.5% ($n = 11$) of those reporting prior willing sex indicated that they had previously engaged in transactional sex (or 'had sex in order to get things you wanted, such as a mobile phone, clothes, lifts in someone's car, or money?'); this was somewhat more common among female (24.0%, $n = 6$) than male adolescents (13.2%, $n = 5$), however, the difference was not statistically significant.

Planning for sexual debut

Adolescents who reported no prior sexual activity ($n = 839$) were asked additional questions to assess their intention and readiness to begin engaging in sexual activity (Table 5).

Male adolescents expected to be, on average, one year younger than their female counterparts the first time they have sex. While most adolescents indicated that they either 'definitely' (62.3%, $n = 508$) or 'maybe yes' (17.3%, $n = 141$) planned to use a condom during that first sexual encounter, young women were more likely to indicate that they did not plan on condom use (χ^2 (3, $N = 815$) = 12.5, $p = 0.006$).

Table 5. Readiness to engage in sexual activity among adolescents indicating no previous sexual experience by gender ($n = 839$).

	Total ($n = 839$)	Female ($n = 427$)	Male ($n = 412$)	p -value
Expected age at first sex, median (IQR)	25 (20-30)	25 (21-30)	24 (20-29)	
Planned condom use during first sexual encounter, n (%)				
Definitely yes	508 (62.3)	232 (56.5)	276 (68.3)	0.006 ^a
Maybe yes	141 (17.3)	80 (19.5)	61 (15.1)	
Maybe no	48 (5.9)	28 (6.8)	20 (5.0)	
Definitely no	118 (14.5)	71 (17.3)	47 (11.6)	
I think I am mature enough to have sex				0.03 ^a
Definitely yes	102 (12.2)	41 (9.6)	61 (14.8)	
Maybe yes	92 (11.0)	40 (9.4)	52 (12.6)	
Maybe no	210 (25.0)	112 (26.2)	98 (23.8)	
Definitely no	431 (51.4)	232 (54.3)	199 (48.3)	

^a p -value for χ^2 test.

Most adolescents (51.4%, $n = 431$) indicated they were 'definitely not' mature enough to have sex, while 12.2% ($n = 102$) responded 'definitely yes'. There was an association between gender and perceived maturity for sex, with proportionately fewer female adolescents reported feeling mature enough to have sex ($\chi^2(3, N = 835) = 8.7, p = 0.03$).

Discussion

In this cohort of young adolescents, aged between 12 and 14 years, we determined that one in every seven adolescents was already sexually experienced. This suggests that early sexual debut, i.e. prior to age 15, is at least as prevalent among this cohort as recorded in studies from other sub-Saharan African countries, e.g. Tanzania (8.6%) and Malawi (17.7%) (Seff, Steiner, & Stark, 2021). Since most of the participants in the present study are not yet 15, the prevalence of early sexual debut in our cohort will likely increase. In Kenya, as in many sub-Saharan countries, serial Demographic Health Surveys indicate that there has been an increase in reported median age at the first sex (KNBS, 2014), mainly attributed to increased adolescent sexual and reproductive health education efforts. Despite this, early sexual debut is still reported in varying proportions and is often country- or region-specific (Amo-Adjei & Tuoyire, 2018; Kushal, Amin, Reza, Hossain, & Shawon, 2021), hence, indicative of cultural and contextual factors affecting sexual activity among young adolescents.

We evaluated known covariates of early sexual debut, including food security, socioeconomic status, living situation, parental monitoring, substance use and adult-child discussions on various topics. The direction of relationships with known covariates was mostly in line with research from older adolescents (Durowade et al., 2017; Furlanetto et al., 2020; Gavin et al., 2015; Kassahun et al., 2019; Lohman & Billings, 2008; Pengpid & Peltzer, 2021), despite this being a

younger cohort of mostly school-going adolescents. Other studies have shown that younger adolescents have different protective factors from older adolescents relating to delayed age of sexual debut (Lammers, Ireland, Resnick, & Blum, 1998). In contrast to findings from older adolescents, we noted that having had conversations with parents on condom use, when to have sex, and romantic relationships was more prevalent among sexually experienced adolescents. We could not ascertain a temporal relationship, or if this communication was in response to the parents' belief that their children were already sexually active and needed further education. It is recommended that sex education be age appropriate and customised according to the development and needs of the adolescent (Goldfarb & Lieberman, 2021).

Majority of the adolescents reported conversations with adults on avoiding pregnancy and HIV/AIDS, although this was not associated with sexual experience. With Kisumu being an HIV/AIDS hotspot in Kenya, it is likely that parents are sensitising their children on the need to avoid infection. Most adolescents reported being in school, which has been shown to affect sexual and reproductive health knowledge and delay sexual debut (Santelli et al., 2015), hence could have affected our findings. However, among those reporting willing sex, lack of condom use at first sex was high (three in every five). This suggests a knowledge, attitude, or skill gap on condom use or lack of access to condoms. Our study further shows that only one in eight adolescents has had a discussion on condom use with an adult. Despite evidence of wide discussion on HIV/AIDS and pregnancy, it is likely that the depth of such discussions did not touch on condom use.

Some covariates were noted to be significant within one gender only: socio-economic status, food insecurity and religiosity among female adolescents; and living situation and infrequent parental monitoring among male adolescents. We also noted that female adolescents were less likely to plan to use a condom at next sex or, for those who were not sexually experienced, at first sex. This could result from the hypothesised knowledge gap already noted or a preconception that condoms are largely a male-controlled method. These disparities point to the need to tailor sexual and reproductive health programming for adolescents by gender, based on localised evidence.

In our study, HSV-2 testing suggested that a proportion of the adolescents were engaging in unprotected sex. HSV-2 positivity rate has been shown to increase with age, ranging from 10% among older adolescents to 62.5% among those above 30 years (Akinyi et al., 2017) and we expect our endline HSV-2 repeat test to reflect this as an increasing proportion of adolescents engages in sexual activity. Low prevalence of HSV-2 in this age group was expected but still

remains an objective indicator of sexual activity, despite the fact that HSV-2 results were not associated with reported sexual activity in this study. In fact, 17 of the 22 participants who tested positive for HSV-2 did not report prior sexual activity, suggesting some level of inaccurate reporting of sexual activity. Despite the low numbers, rates of positive or indeterminate HSV-2 tests were significantly higher in male compared to female adolescents. It should be noted that the 1.6% HIV positivity rate was expected, given an adult HIV prevalence rate of 17.5% (NASCOP, 2020) in our catchment area and nationwide perinatal HIV transmission rate of 8.7% (Achwoka et al., 2018).

One in five sexually experienced adolescents reported having experienced unwilling sex, with one in eight reporting experience of unwilling sex only. Additionally, two in five adolescents who reported prior willing sex indicated that their first sexual experience was not willing. We did not collect further details on unwilling sex; however, this remains a concerning indicator of the proportion of unwilling sexual encounters, particularly for female adolescents, in our study. Similar proportions of forced first sexual intercourse have been reported in other sub-Saharan African countries, mainly affecting young women (Koenig et al., 2004; Williams et al., 2008).

We provide insight into adolescents who are not sexually active and their psychological preparedness for sexual debut. Most adolescents who were not sexually experienced did not feel they were mature enough to have sex. At this age, adolescents are largely unprepared for sexual debut and predisposed to abstinence. The vast majority of this group intended to delay sexual debut and use condoms. Expectedly, a higher proportion of male adolescents felt mature enough to engage in sex even at this young age.

Our study was limited by reliance on self-report of sexual activity and risk behaviours, which can result in social desirability bias. To reduce this bias, the survey was self-administered using a tablet and headphones, hence considerable privacy was accorded to the respondents. This does not completely eliminate this bias, as inconsistencies in self-reporting of sexual activity were reflected in our data in the disparities that exist between HSV-2 results and self-reported sexual activity. Secondly, the proportions of those reporting sexual activity were low, leading to lower figures in any sub-categorisation of the data. This is likely to have resulted in reduced power to identify any significant findings. Third, our survey allowed respondents to refuse to answer any question. This approach might have addressed adolescent discomfort; however, it resulted in data incompleteness.

In conclusion, our findings indicate that sexually active young adolescents are likely engaging in unprotected sex, despite communication on HIV/AIDS, pregnancy and romantic relationships with adults. Condom

use discussion was rare and associated with sexual experience. Socio-economic status, living situation and parental monitoring remain significant factors associated with sexual experience among young adolescents. Adolescents reporting multiple sexual partners and not using condoms could pose a major personal and public health risk. Early adolescence presents an opportunity to provide age- and developmentally appropriate safer sex information and skills-building to delay sexual debut and increase self-efficacy for risk-reduction and risk-avoidance behaviours.

Acknowledgements

The authors thank all of the study staff at KEMRI HIV research division in Kisumu for their support in conducting this study and in recruiting study participants. This manuscript was approved by the Deputy Director, KEMRI CGHR.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the National Institute of Mental Health of the US National Institutes of Health, under grant award number 5R01MH118982 and the Emory Center for AIDS Research, under grant P30 AI050409. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Author contributions

VM and GS designed the analysis and drafted the manuscript; they contributed to the study design. KW, RB, KO, CM, EK, RN, JA, MM and BH edited and reviewed the manuscript. RB contributed to the overall study design, and data analysis plan. BH and MM conducted data analysis. CM, EK, RN, KO and JA collected data and contributed towards the study design. KW is the PI of the study and contributed to study design, data analysis and revised the manuscript. All authors read and approved the final manuscript.

Data availability statement

The data that support the findings of this study are available from the corresponding author, VM, upon reasonable request after study completion.

ORCID

Victor Mudhune  <http://orcid.org/0000-0003-4841-4555>

Kate Winskell  <http://orcid.org/0000-0001-7772-3037>

Robert A. Bednarczyk  <http://orcid.org/0000-0002-6812-0928>

Ken Ondenge  <http://orcid.org/0000-0002-1001-126X>

Richard Ndivo  <http://orcid.org/0000-0002-3201-7953>

Judith Arego  <http://orcid.org/0000-0001-9027-9997>

Marissa Morales  <http://orcid.org/0000-0002-1313-8813>

Gaëlle Sabben  <http://orcid.org/0000-0003-1812-3415>

References

- Achwoka, D., Mandala, J., Muriithi, M., Zeng, Y., Chen, M., Dirks, R., ... Torpey, K. (2018). Progress toward elimination of perinatal HIV transmission in Kenya: Analysis of early infant diagnosis data. *International Journal of STD & AIDS*, 29(7), 632–640.
- Ajuwon, A. J., Olaleye, A., Faromoku, B., & Ladipo, O. (2006). Sexual behavior and experience of sexual coercion among secondary school students in three states in North Eastern Nigeria. *BMC Public Health*, 6(1), 1–10.
- Akinyi, B., Odhiambo, C., Otieno, F., Inzaule, S., Oswago, S., Kerubo, E., ... Zeh, C. (2017). Prevalence, incidence and correlates of HSV-2 infection in an HIV incidence adolescent and adult cohort study in western Kenya. *PLoS One*, 12(6), e0178907.
- Amo-Adjiei, J., & Tuoyire, D. A. (2018). Timing of sexual debut among unmarried youths aged 15–24 years in sub-Saharan Africa. *Journal of Biosocial Science*, 50(2), 161–177.
- Baumgartner, J. N., Geary, C. W., Tucker, H., & Wedderburn, M. (2009). The influence of early sexual debut and sexual violence on adolescent pregnancy: A matched case-control study in Jamaica. *International Perspectives on Sexual and Reproductive Health*, 35(1), 21–28.
- Bengesai, A. V., Khan, H. T. A., & Dube, R. (2018). Effect of early sexual debut on high school completion in South Africa. *The Journal of Biosocial Science*, 50(1), 124–143.
- Durowade, K. A., Babatunde, O. A., Omokanye, L. O., Elegbede, O. E., Ayodele, L. M., Adewoye, K. R., Adetokunbo, S., Olomofe, C. O., Fawole, A. A., & Adebola, O. E. (2017). Early sexual debut: Prevalence and risk factors among secondary school students in Ido-ekiti, Ekiti state, South-West Nigeria. *African Health Sciences*, 17(3), 614–622.
- Fatusi, A., & Wang, W. (2009). Multiple sexual partnership mediates the association between early sexual debut and sexually transmitted infection among adolescent and young adult males in Nigeria. *The European Journal of Contraception & Reproductive Health Care*, 14(2), 134–143.
- Fongkaew, W., Fongkaew, K., & Suchaxaya, P. (2007). Early adolescent peer leader development in HIV prevention using youth-adult partnership with schools approach. *Journal of the Association of Nurses in AIDS Care*, 18(2), 60–71.
- Furlanetto, M. F., Ghedin, D. M., Gonçalves, T. R., & Marin, A. H. (2020). Individual and contextual factors associated with sexual initiation among adolescents. *Psicologia: Reflexão e Crítica*, 32. <https://doi.org/10.1186/s41155-019-0138-z>
- Galambos, N. L., & Leadbeater, B. J. (2000). Trends in adolescent research for the new millennium. *International Journal of Behavioral Development*, 24(3), 289–294.
- Gavin, L. E., Williams, J. R., Rivera, M. I., & Lachance, C. R. (2015). Programs to strengthen parent-adolescent communication about reproductive health. *American Journal of Preventive Medicine*, 49(2), S65–S72.
- Goldfarb, E. S., & Lieberman, L. D. (2021). Three decades of research: The case for comprehensive sex education. *Journal of Adolescent Health*, 68(1), 13–27.
- Houlihan, C. F., Baisley, K., Bravo, I. G., Kapiga, S., de Sanjosé S., Chantalucha, J., ... Watson-Jones, D. (2016). Rapid acquisition of HPV around the time of sexual debut in adolescent girls in Tanzania. *International Journal of Epidemiology*, 45(3), 762–773.
- Kaestle, C. E., Halpern, C. T., Miller, W. C., & Ford, C. A. (2005). Young age at first sexual intercourse and sexually transmitted infections in adolescents and young adults. *American Journal of Epidemiology*, 161(8), 774–780.
- Kassahun, E. A., Gelagay, A. A., Muche, A. A., Dessie, A. A., & Kassie, B. A. (2019). Factors associated with early sexual initiation among preparatory and high school youths in Woldia town, northeast Ethiopia: A cross-sectional study. *BMC Public Health*, 19(1), 1–8.
- Kenya National Bureau of Statistics (KNBS). (2014). *Kenya demographic and health survey 2014*. <http://dhsprogram.com/pubs/pdf/FR308/FR308.pdf>
- Koenig, M. A., Zablotska, I., Litalo, T., Nalugoda, F., Wagman, J., & Gray, R. (2004). Coerced first intercourse and reproductive health among adolescent women in Rakai, Uganda. *International Family Planning Perspectives*, 30, 156–163.
- Kushal, S. A., Amin, Y. M., Reza, S., Hossain, F. B., & Shawon, M. S. R. (2021). Regional and sex differences in the prevalence and correlates of early sexual initiation among adolescents aged 12–15 years in 50 countries. *Journal of Adolescent Health*, 70(4), 607–616.
- Lammers, C., Ireland, M., Resnick, M., & Blum, R. (1998). Influences on adolescents' decision to postpone sexual debut: A survival analysis of virginity among youth ages 13 to 18. *Journal of Adolescent Health*, 22(22), 131.
- Lohman, B. J., & Billings, A. (2008). Protective and risk factors associated with adolescent boys' early sexual debut and risky sexual behaviors. *Journal of Youth and Adolescence*, 37(6), 723–735.
- Mmbaga, E. J., Leonard, F., & Leyna, G. H. (2012). Incidence and predictors of adolescent's early sexual debut after three decades of HIV interventions in Tanzania: A time to debut analysis. *PLoS One*, 7(7), e41700. <https://doi.org/10.1371/journal.pone.0041700>
- Moore, A. M., Awusabo-Asare, K., Kumi-Kyereme, A., Madise, N., & John-Langba, J. (2007). Coerced first sex among adolescent girls in sub-Saharan Africa: Prevalence and context. *African Journal of Reproductive Health*, 11(3), 62–82.
- Mudhune, V., Sabben, G. L., Ondenge, K., Mbede, C., Morales, M., Lyles, R. H., ... Komro, K. (2022). The efficacy of a smartphone game to prevent HIV among young Africans: Protocol for a randomized controlled trial in the context of COVID-19. *JMIR Research Protocols*, 11(3), e35117.
- National AIDS and STI Control Programme (NASCOP). (2020). *Preliminary KENPHIA 2018 report*. Nairobi: Government Printers.
- Nelson, E. K., Piehler, B., Eckels, J., Rauch, A., Bellew, M., Hussey, P., ... Igra, M. (2011). LabKey Server: An open source platform for scientific data integration, analysis and collaboration. *BMC Bioinformatics*, 12(1), 71. <https://doi.org/10.1186/1471-2105-12-71>
- Nkata, H., Teixeira, R., & Barros, H. (2019). A scoping review on sexual and reproductive health behaviors among Tanzanian adolescents. *Public Health Reviews*, 40(1), 1–15.
- Parkes, A., Wight, D., Henderson, M., & West, P. (2010). Does early sexual debut reduce teenagers' participation in tertiary education? Evidence from the SHARE longitudinal study. *Journal of Adolescence*, 33(5), 741–754.
- Pengpid, S., & Peltzer, K. (2021). Sexual risk behaviour and its correlates among adolescents in Mozambique: Results from a national school survey in 2015. *SAHARA-J: Journal of Social Aspects of HIV/AIDS*, 18(1), 26–32.
- Polis, C. B., Litalo, T., Wawer, M., Serwadda, D., Kigozi, G., Nalugoda, F., ... Gray, R. (2009). Coerced sexual debut and lifetime abortion attempts among women in Rakai, Uganda. *International Journal of Gynecology & Obstetrics*, 104(2), 105–109.

- Sabben, G., Akelo, V., Mudhune, V., Ondeng'e, K., Ndivo, R., Stephenson, R., & Winskell, K. (2019). A smartphone game to prevent HIV among young Africans: Protocol for a randomized pilot study of a mobile intervention. *JMIR Research Protocols*, 8(3), e11209.
- Santelli, J. S., Song, X., Holden, I. K., Wunder, K., Zhong, X., Wei, Y., ... Gray, R. H. (2015). Prevalence of sexual experience and initiation of sexual intercourse among adolescents, rakai district, Uganda, 1994–2011. *Journal of Adolescent Health*, 57(5), 496–505.
- Seff, I., Steiner, J. J., & Stark, L. (2021). Early sexual debut: A multi-country, sex-stratified analysis in sub-Saharan Africa. *Global Public Health*, 16(7), 1046–1056.
- Walker, R., Drakeley, S., Welch, R., Leahy, D., & Boyle, J. (2021). Teachers' perspectives of sexual and reproductive health education in primary and secondary schools: A systematic review of qualitative studies. *Sex Education*, 21(6), 627–644.
- Wellings, K., Collumbien, M., Slaymaker, E., Singh, S., Hodges, Z., Patel, D., & Bajos, N. (2006). Sexual behaviour in context: A global perspective. *The Lancet*, 368(9548), 1706–1728.
- Williams, C. M., McCloskey, L. A., & Larsen, U. (2008). Sexual violence at first intercourse against women in Moshi, northern Tanzania: Prevalence, risk factors, and consequences. *Population Studies*, 62(3), 335–348.
- Winskell, K., Sabben, G. I., Akelo, V., Ondeng'e, K., Obong'o, C., Stephenson, R., ... Mudhune, V. (2018). A smartphone game-based intervention (Tumaini) to prevent HIV among young Africans: Pilot randomized controlled trial. *JMIR MHealth and UHealth*, 6(8), e10482. <https://doi.org/10.2196/10482>
- Winskell, K., Sabben, G. I., & Obong'o, C. (2019). Interactive narrative in a mobile health behavioral intervention (Tumaini): theoretical grounding and structure of a smartphone game to prevent HIV among young Africans. *JMIR Serious Games*, 7(2), e13037. <https://doi.org/10.2196/13037>.
- Yurgelun-Todd, D. (2007). Emotional and cognitive changes during adolescence. *Current Opinion in Neurobiology*, 17(2), 251–257.
- Zulaika, G., Nyothach, E., van Eijk, A. M., Obor, D., Mason, L., Wang, D., ... Ngere, I. (2021). Factors associated with the prevalence of HIV, HSV-2, pregnancy, and reported sexual activity among adolescent girls in rural western Kenya: A cross-sectional analysis of baseline data in a cluster randomized controlled trial. *PLoS Medicine*, 18(9), e1003756.
- Zuma, K., Setswe, G., Ketye, T., Mzolo, T., Rehle, T., & Mbelle, N. (2010). Age at sexual debut: A determinant of multiple partnership among South African youth. *African Journal of Reproductive Health*, 14(2), 47–54.