ORIGINAL RESEARCH ARTICLE

Delaying sexual debut as a strategy for reducing HIV epidemic in Kenya

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Abstract

The study purpose was to determine the association between sexual debut and HIV sero-status, and factors contributing to a positive HIV sero-status. Retrospective cross-sectional data from the Kenya Demographic and Health Survey-2003 were used. Data on women aged 15-49 (n=3,273) and men aged 15-54 (n=2,917) accepting HIV testing were retained from three datasets. Stata version 10.1 was used for analyses, $p<0.05$. Nine percent of women and 5% of men tested positive for HIV, of whom 46% and 49%, $p<0.001$ were aged 16-21 respectively. After adjusting for confounding, women and men who had sexual debut aged 16-21 were 2.31 (95% CI: 1.52-3.51), $p<0.001$ and 1.83 (95% CI: 1.07-3.13), $p<0.05$ times more likely to test positive for HIV compared to those who never had sex respectively. Early sexual debut continues to be a major risk factor for acquiring HIV infection later in life, suggesting earlier interventions could have a major impact towards fighting the disease. (*Afr J Reprod Health 2013; 17[2]: 46-57*).

Résumé

Le but de l'étude était de déterminer l'association entre l'activité sexuelle et situation sérologique du VIH et les facteurs qui contribuent à un effet positif de la situation sérologique du VIH. Nous nous sommes servis des données transversales rétrospectives de l'Enquête démographique et de santé au Kenya -2003. Les données sur les femmes âgées de 15-49 ans (n = 3273) et les hommes âges de 15-54 ans (n = 2917) qui ont accepte le dépistage du VIH ont été retenus à partir de trois ensembles de données. La version Stata 10.1 a été utilisé pour les analyses, p <0,05. Les analyses ont révélé la présence du VIH chez neuf pour cent des femmes et 5% des hommes, dont 46% et 49%, p <0,001 étaient âgés de 16 à 21 ans respectivement. Après l'ajustement pour les facteurs confondants, les femmes et les hommes qui ont eu leurs premiers rapports sexuels a l'âge de 16 à 21 ans étaient 2,31 (IC à 95%: 1,52 à 3,51), p <0,001 et 1,83 (IC à 95%: 1.7 à 3.13), p <0,05 fois plus susceptibles d'avoir le résultat positif dans les analyses pour déterminer la présence du VIH par rapport à ceux qui n'ont jamais eu des rapports sexuels, respectivement. L'initiation au rapport sexuel précoce continue d'être un facteur de risque majeur de contracter l'infection du VIH plus tard dans la vie, ce qui suggère que les interventions antérieures pourraient avoir un impact majeur vers la lutte contre la maladie. (*Afr J Reprod Health 2013; 17[2]: 46-57*).

Keywords: HIV/AIDS, HIV sero-status, Risk factors, Education, Kenya

Introduction

In Kenya, HIV/AIDS is still a serious health challenge. In 2006, there were 55,000 new infections with a majority of the infections being recorded among those aged 15-24 years[1]. Research documents that infection with HIV and other sexually transmitted infections (STIs) is on the rise among adolescents with girls being more vulnerable relative to boys [2-5]. As a way to combat HIV/AIDS, the Ministry of Education (MOE) introduced an HIV/AIDS curriculum to be taught in schools at the primary and secondary levels[6]. The learning goals outlined in the HIV/AIDS curriculum focus on prevention and control of HIV and related STIs. These goals stress: 1) acquisition of knowledge about HIV/AIDS and

STIs by learners; 2) decision making relating to both social and personal behavior that lowers the risk of infection; 3) being compassionate to those infected; and 4) active involvement in activities both in school and out of school[6-8]. However, early sexual debut in Kenya continues to be a major hindrance towards the control of HIV and STIs later in life.

Sexual debut

Kenya is one of the countries in Sub-Saharan Africa where the HIV/AIDS pandemic still poses huge challenges to social and economic development activities. According to the Kenya AIDS Indicator Survey (KAIS)[9], at the end of 2007, the national HIV prevalence was 7.1% among adults aged 15-64 (or 1.42 million people were infected with HIV). Among those aged 15-24, the HIV prevalence stood at 3.8%, while more women compared to men, particularly those aged 15-24 were infected with HIV (5.6% and 1.4%, respectively)[9]. These findings show that the youth and especially young women are more vulnerable to HIV infection. Some of the factors cited as driving the spread of the disease include early sexual debut, inconsistent condom use, lack of knowledge about HIV/AIDS, multiple sexual partners, and transactional sex [3,9,10].

Existing research has shown that early sexual debut is significantly associated with the risk of acquiring HIV infection. Studies exploring the risk factors for HIV infection among youth found that the likelihood of being infected with HIV increased significantly among men and women who had experienced early sexual debut[11-14]. According to the KAIS[9], by age 15, 20% of young women and 22.4% of men reported having had sex at least once in their lifetime, while 95.2% of women and 92.8% of men reported having sex at least once by age 24. The vulnerability of the youth is compounded by a number of factors including social and economic pressures, which significantly increase propensity of engaging in sex at an early age. Multiple studies have reported that the youth, particularly young women are more likely to face pressure to engage in sex from older partners, peers, and in some cases family members[12,15,16].

Engaging in sex with older partners has also been associated with increased risk of acquiring STIs, including HIV. For example, findings from a study by Konde-Lule, Wawer, Sewankambo et al.[12] indicated that, adolescent girls with older partners had higher HIV prevalence compared to their peers who did not have such partners. On the other hand, due to economic constraints, young women are forced to engage in transactional sex in exchange for money and/or gifts, while for young men, pressure from their peers to have sex with as many women as possible is associated with early sexual debut[15,16]. In cases involving transactional sex, most of the young women preferred older partners to peers because they are stable and better providers.

Early sexual debut is also associated with the increased likelihood of engaging in risky sexual practices. Studies have shown that early sexual debut is correlated with risky sexual practices, such as inconsistent condom use and multiple sexual partners[9,13,14,16,17]. According to the KAIS [9], condom use at first sexual encounter was significantly low among young women (26.3%) and men (28.5%) aged 15-24. Lack of knowledge about HIV/AIDS and imbalance in gender-power relations are some of the factors that have attributed to risk taking behaviors among the youth. The WHO[10] reports that many young men and women lack basic knowledge about how HIV is transmitted and how to protect themselves against getting infected.

Imbalance in gender-power relations is a consequence of socio-cultural norms and practices, which force women into subservient status to men. Research indicates that in many parts of Africa, the domination of women by men undermines their ability to make not only decisions concerning the household, but also decisions about their sexual and reproductive needs[10,18,19]. This means that many women are unable to negotiate for safer sex even in cases where the partners are engaged in risky sexual behavior. The problem is further compounded in cases involving young women and older partners due to their inexperience in sexual issues, which increases their vulnerability to STIs and HIV infection. According to the WHO, young men and women are more likely to be associated

with risky sexual behavior, including inconsistent condom use and multiple sexual partners[10]. This is because many of the young people lack the skills and education that are critical for reducing their vulnerability to STIs, including HIV. This paper seeks to determine the association between HIV sero-status and age at sexual debut. We further seek to determine the factors that are associated with a positive HIV sero-status and an individual's age at sexual debut.

Methods

Data source

Data for this study were from the retrospective cross-sectional Kenya Demographic and Health Survey (KDHS-2003) conducted between April 18, 2003-September 15, 2003[3]. Unlike the previous surveys, the KDHS-2003 was the first to collect data on respondents HIV sero-status in addition to the survey data.

Variables and measures

The main outcome measure for this study was HIV sero-status. This variable primarily sought to find out if one tested positive or negative for HIV after taking a voluntary test for HIV. HIV sero-status variable was coded "0" if one tested negative for HIV and "1" if one tested positive for HIV. The main predictor was age at sexual debut, which was coded "0" if the respondent reported to have never had any sexual contact, "1" if the respondent age at sexual debut was 8-15 years, "2" 16-21 years, "3" 22-40 years, and "4" after marriage.

Confounding effect was controlled for by using several variables, which were selected through a multivariate stepwise forward method and manual selection. Circumcision was coded "0" if one was circumcised, and "1" if one was uncircumcised. Wealth was generated based on the household's socioeconomic status. This information was collected using the household asset information using the household questionnaire that featured items on household ownership goods, dwelling characteristics, water source, toilet facilities, and household socioeconomic status (CBS, 2004) wealth was coded "0" if one was poorest, "1"

poor, "2" moderate, "3" rich and "4" richest. Exposure to STIs was coded as "0" if respondent tested negative or did not show any signs of STIs and "1" if respondent tested for or indicated signs of an STI. Area of residence was identified from 400 clusters (129 urban and 271 rural) in the national master sampling frame (CBS, 2004). Residence was coded "0" if one resided in an urban area and "1" in rural area. Perceived risk of acquiring HIV was coded "0" if respondents had considered themselves to have no risk, "1" if they considered themselves to have small risk, "2" if they considered themselves to have moderate risk, and "3" if they considered themselves to have high risk for acquiring HIV. Religion was coded "0" if one was affiliated or identified themselves as Protestants, "1" Roman Catholic, "2" Muslim, and "3" other religions.

Province captured information on the eight administrative regions in Kenya. This was coded "0" if an individual came from Nairobi province, "1" from Central province, "2" from Coast province, "3" from Eastern province, "4" from Nyanza province, "5" from Rift Valley province, "6" from Western province, and "7" from North Eastern province. Occupation was coded "0" if one worked in agriculture or was self-employed, "1" worked as a teacher or as a manager, "2" worked in sales, "3" other occupations, and "4" not working. Education was coded "0" if one had less than a primary education (nursery/kindergarten), "1" if one had a primary education (grade 1-8), "2" if one had a post primary, vocational, or secondary education (grade 9-12), and "3" if one had a college or university education. Lastly, having multiple sexual partners was coded "0" if one did not have multiple sexual partners, and "1" if one had multiple sexual partners.

Data Analysis

For this analysis, three datasets were merged together (the male, female, and HIV datasets). Only those individuals who were randomly selected for an HIV test (n=8,800) and accepted (n=6,360) to be tested [3] were included in the analysis. Data were weighted and adjusted for sampling design in order to attain linearized

standard errors "robustness." The final sample retained for analysis was 6,190 (n=3,273 women [53%] and n=2,917men [47%]).

Data analysis utilized a statistical software (Stata version, 10.1), which is regarded to be highly appropriate due to its unique features for making adjustments to the standard errors, especially when analyzing data collected through stratification, clustering and involving multiple weights procedures[20-22]. Descriptive statistics and bivariate analysis were used to describe the sample, with bivariate analysis also being used to determine the joint significance between the independent variables and the main outcome measure of interest (HIV sero-status). Univariate logistic regressions were performed to determine the unadjusted odds ratios (ORs) at 95% confidence intervals (CI) with p values set at 0.05. Finally, multivariate logistic regression analyses were performed to determine the association between the predictor and the main outcome measure[23] among women and men after controlling for confounding.

Results

Descriptive analysis

Table 1 presents the descriptive statistics for the variables used in the study. There were more women (9%) than men (5%) who tested positive for HIV. More young men aged 8-15 engaged in early sexual encounters (41%) compared to women (27%). However, this was opposite for men and women aged 16-21 where 38% and 39%, respectively reported engaging in early sexual debut. Very few men (2%) experienced sexual debut at union/marriage compared to women (14%).

Bivariate analysis

Table 2 describes the various associations between the independent variables and the main outcome measure. Among those who tested positive for HIV, 45% and 41% were men and women aged 8-15, while 49% and 46% men and women who were aged 16-21, p = 0.001 respectively. This indicates that the most affected groups were men and women who had their sexual debut during

their late childhood and at the adolescent phase of their lives. Among men and women who tested positive for HIV, a higher percentage were from the richest wealth bracket (40%, *p* = 0.05) and (32%, *p* = 0.001) , from rural areas (64%, *p* = 0.001) and (70%, *p* = 0.01), perceived themselves to have a small risk of acquiring HIV (57%, *p*=0.08) and (44%, *p* = 0.001), and were residents of Nyanza province (41% and 33%, *p* = 0.001) respectively. Also, the majority of men and women who tested positive for HIV had experienced their sexual debut aged 8-21 and 16-40 respectively (see Figure 1).

Multivariate analysis: Effect of sexual debut on HIV sero-status

Two types of multivariate analyses were conducted, unadjusted logistic multivariate regression analysis and adjusted logistic multivariate regression analysis. In the unadjusted logistic analysis, there was significant association between HIV sero-status and age at sexual debut among both women and men (see Table 3-unadjusted). Women who had their sexual debut aged 8-15 were 7.97 (95% CI: 3.74-16.99), p =0.001 times more likely to have tested positive for HIV compared to those who never had sex. Women who had their sexual debut aged 16-21 were 2.47 (95% CI: 1.70-3.59), p = 0.001 times more likely to have tested positive for HIV compared to those who never had sex. Furthermore, those who had their sexual debut at marriage were 1.31 (95% CI: 1.07-1.61), p = 0.01 times more likely to have tested positive for HIV compared to those who never had sex. For men, those who had their sexual debut aged 8-15 were 5.05 (95% CI: 2.06-12.37), p = 0.001 times more likely to have tested positive for HIV compared to those who never had sex. Lastly, men who had their sexual debut aged 16-21 were 2.44 (95% CI: 1.56-3.80), p = 0.001 times more likely to have tested positive for HIV compared to those who never had sex.

After adjusting for confounding, there was a slight attenuation in the odds ratios. However, there was still significant association between HIV sero-status and age at sexual debut among both women and men (see Table 3-adjusted). Women

Table 1: Study population characteristics reported using percentage and number, KDHS-2003

	WOMEN		MEN	
	%	**N**	**%**	**N**
HIV sero-status		**n=3,273**		**n=2,917**
Negative	91	2996	95	2784
Positive	09[β]	277	05[β]	133
Age at sexual debut		**n=3,268**		**n=2,907**
Never had sex	16	539	15	457
08-15 years	27	795	41	1083
16-21 years	39	1238	38	1115
22-40 years	04	125	04	151
At marriage	14	571	02	101
Circumcision		**n=3,260**		**n=2,914**
Circumcised	33	1115	83	2455
Uncircumcised	67	2155	17	459
Wealth		**n=3,273**		**n=2,917**
Poorest	17	557	16	474
Poor	20	586	18	495
Middle	20	598	19	521
Rich	21	640	22	611
Richest	22	892	25	816
STIs		**n=3,271**		**n=2,897**
No	97	3153	97	2820
Yes	03	118	03	77
Residence		**n=3,273**		**n=2,917**
Urban	22	981	23	847
Rural	78	2292	77	2070
Perceived risk of acquiring HIV		**n=3,213**		**n=2,885**
No Risk	35	1159	35	1047
Small Risk	40	1259	50	1434
Moderate Risk	16	510	10	273
High Risk	09	285	05	131
Religion		**n=3,269**		**n=2,916**
Protestant	67	2076	61	1686
Roman Catholic	25	776	27	749
Muslim	06	357	06	301
Other Religions	02	60	06	180
Province		**n=3,273**		**n=2,917**
Nairobi	08	355	09	328
Central	14	522	14	465
Coast	08	384	06	290
Eastern	15	382	16	376
Nyanza	16	465	16	417
Rift Valley	24	568	25	510
Western	13	445	12	385
North Eastern	02	152	02	146
Occupation		**n=3,269**		**n=2,908**
Agriculture/Self Employed	31	930	34	904
Professional/Teacher/Manager	04	145	07	223
Sales	14	466	08	243
Other	13	442	27	798
Not Working	38	1286	24	740
Education		**n=3,273**		**n=2,917**
Less than Primary School	13	513	06	246
Primary School	58	1742	56	1542
Post Primary/Vocational/Secondary	24	811	28	837
College/University	05	207	10	292
Multiple sexual partners		**n=3,269**		**n=2,916**
No	88	2876	73	2153
Yes	12	393	27	763

[β]Exact AIDS prevalence for women (8.8%) and men (4.75%)

Table 2: Bivariate analysis, percentage and number of the association between selected characteristics and HIV sero-status, KDHS-2003

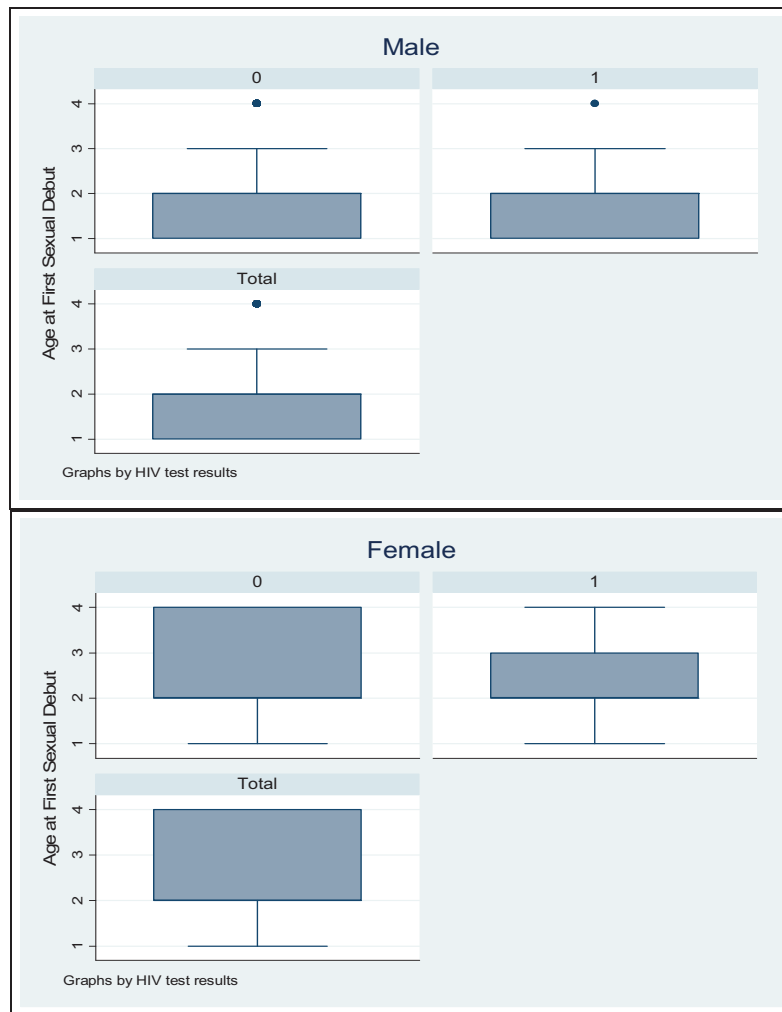| HIV sero-status	WOMEN			MEN		
	Negative	Positive		Negative	Positive	
	% (n)	% (n)	p-values	% (n)	% (n)	p-values
Age at sexual debut	**n=2,993**	**n=275**		**n=2,775**	**n=132**	
Never had sex	17 (530)	03 (9)		16 (451)	03 (6)	
08-15 years	26 (693)	41 (102)		40 (1030)	45 (53)	
16-21 years	38 (1111)	46 (127)	***	38 (1047)	49 (68)	***
22-40 years	04 (118)	02 (7)		04 (148)	02 (3)	
At marriage	15 (541)	08 (30)		02 (99)	01 (2)	
Circumcision	**n=2,993**	**n=277**		**n=2,782**	**n=132**	
Circumcised	34 (1054)	22 (61)	***	84 (2380)	52 (75)	***
Uncircumcised	66 (1939)	78 (216)		16 (402)	48 (57)	
Wealth	**n=2,996**	**n=277**		**n=2,784**	**n=133**	
Poorest	17 (538)	08 (19)		17 (459)	15 (15)	
Poor	20 (540)	20 (46)		18 (475)	16 (20)	
Middle	20 (556)	16 (42)	***	19 (510)	10 (11)	*
Rich	21 (575)	24 (65)		22 (584)	19 (27)	
Richest	22 (787)	32 (105)		24 (756)	40 (60)	
STIs	**n=2,994**	**n=277**		**n=2,764**	**n=133**	
No	97 (2897)	92 (256)	**	98 (2700)	91 (120)	***
Yes	03 (97)	08 (21)		02 (64)	09 (13)	
Residence	**n=2,996**	**n=277**		**n=2,784**	**n=133**	
Urban	21 (865)	30 (116)	**	22 (785)	36 (62)	***
Rural	79 (2131)	70 (161)		78 (1999)	64 (71)	
Perceived risk of acquiring HIV	**n=2,937**	**n=276**		**n=2,752**	**n=133**	
No Risk	36 (1099)	21 (60)		35 (1014)	25 (33)	
Small Risk	40 (1136)	44 (123)	***	50 (1355)	57 (79)	0.08
Moderate Risk	16 (455)	20 (55)		10 (261)	10 (12)	
High Risk	08 (247)	15 (38)		05 (122)	08 (9)	
Religion	**n=2,992**	**n=277**		**n=2,783**	**n=133**	
Protestant	66 (1883)	71 (193)		61 (1606)	62 (80)	
Roman Catholic	25 (705)	25 (71)	*	27 (712)	28 (37)	0.57
Muslim	07 (348)	02 (9)		06 (294)	03 (7)	
Other Religions	02 (56)	02 (4)		06 (171)	07 (9)	
Province	**n=2,996**	**n=277**		**n=2,784**	**n=133**	
Nairobi	08 (316)	11 (39)		09 (305)	15 (23)	
Central	14 (483)	12 (39)		14 (455)	06 (10)	
Coast	08 (358)	06 (26)		07 (278)	06 (12)	
Eastern	16 (358)	10 (24)	***	16 (369)	05 (7)	***
Nyanza	14 (385)	33 (80)		15 (367)	41 (50)	
Rift Valley	25 (531)	19 (37)		25 (493)	18 (17)	
Western	13 (413)	09 (32)		12 (371)	09 (14)	
North Eastern	02 (152)	0 (0)		02 (146)	0 (0)	
Occupation	**n=2,992**	**n=277**		**n=2,776**	**n=132**	
Agriculture/Self Employed	32 (864)	26 (66)		34 (871)	28 (33)	
Professional/Teacher/Manager	04 (131)	04 (14)		07 (204)	14 (19)	
Sales	14 (408)	21 (58)	***	08 (228)	10 (15)	***
Other	12 (385)	20 (57)		26 (743)	41 (55)	
Not Working	38 (1204)	29 (82)		25 (730)	07 (10)	
Education	**n=2,996**	**n=277**		**n=2,784**	**n=133**	
Less than Primary School	14 (493)	06 (20)		07 (242)	03 (4)	
Primary School	57 (1569)	66 (173)	*	56 (1475)	55 (67)	0.43
Post Primary/Vocational/Secondary	24 (743)	23 (68)		28 (789)	33 (48)	
College/University	05 (191)	05 (16)		09 (278)	09 (14)	
Multiple sexual partners	**n=2,993**	**n=276**		**n=2,783**	**n=133**	
No	89 (2664)	75 (212)	***	73 (2060)	70 (93)	0.60
Yes	11 (329)	25 (64)		27 (723)	30 (40)	

* *p*<0.05; ***p*<0.01; ****p*<0.001

Figure 1: Weighted age at sexual debut by HIV sero-status, men and women
HIV sero-status: 0-negative; 1-positive; total-both negative and positive
Age at sexual debut: 1 (8-15 years); 2 (16-21 years); 3 (22-40 years); 4 (at marriage).
Note: 0 (never had sex) not shown is the referent group.

who had their sexual debut aged 8-15 were 5.88 (95% CI: 2.54-13.64), p = 0.001 times more likely to have tested positive for HIV compared to those who never had sex. Among those who had their sexual debut aged 16-21, they were 2.31 (95% CI: 1.52-3.51), p = 0.001 times more likely to have tested positive for HIV compared to those who never had sex. However, there was a slight increase in the odds ratio among those women who had their sexual debut at marriage. They were

1.45 (95% CI: 1.16-1.81), p = 0.001 times more likely to have tested positive for HIV compared to those who never had sex. Among men, those who had their sexual debut aged 8-15 were 3.19 (95% CI: 1.06-9.59), p = 0.05 times more likely to have tested positive for HIV compared to those who never had sex. Those who had their sexual debut aged 16-21 were 1.83 (95% CI: 1.07-3.13), p = 0.05 times more likely to have tested positive for HIV compared to those who never had sex.

Table 3: Unadjusted and adjusted odds ratios and 95% confidence intervals of HIV sero-status and sexual debut in a multivariate logistic regression model, KDHS-2003

	Women						Men					
	Unadjusted			Adjusted			Unadjusted			Adjusted		
HIV sero-status	ORs	95% CIs	PV§	ORs	95% CIs	PV§	ORs	95% CIs	PV§	ORs	95% CIs	PV§
Age at sexual debut												
Never had sex	Ref.			Ref.			Ref.			Ref.		
08-15 years	7.97	3.74-16.99	***	5.88	2.54-13.64	***	5.05	2.06-12.37	***	3.19	1.06-9.59	*
16-21 years	2.47	1.70-3.59	***	2.31	1.52-3.51	***	2.44	1.56-3.80	***	1.83	1.07-3.13	*
22-40 years	1.39	0.96-2.00	0.08	1.33	0.90-1.97	0.15	1.28	0.79-2.10	0.32	1.10	0.63-1.93	0.73
At marriage	1.31	1.07-1.61	**	1.45	1.16-1.81	***	1.33	0.87-2.02	0.19	1.36	0.82-2.26	0.23
Circumcision												
Circumcised	Ref.			Ref.			Ref.			Ref.		
Uncircumcised	1.86	1.34-2.59	***	1.63	1.13-2.36	**	4.92	3.20-7.54	***	3.69	2.29-5.94	***
Wealth												
Poorest	Ref.			Ref.			Ref.			Ref.		
Poor	2.37	1.19-4.72	*	1.87	0.92-3.79	0.08	1.00	0.47-2.11	0.99	1.27	0.57-2.87	0.56
Middle	1.36	1.00-1.84	0.05	1.37	0.99-1.89	0.05	0.78	0.46-1.33	0.37	0.99	0.55-1.77	0.96
Rich	1.39	1.16-1.66	***	1.35	1.10-1.64	**	1.00	0.80-1.24	0.99	1.16	0.88-1.53	0.30
Richest	1.35	1.17-1.57	***	1.26	1.04-1.52	*	1.17	1.01-1.37	*	1.20	0.93-1.54	0.16
STIs												
No	Ref.			Ref.			Ref.			Ref.		
Yes	2.65	1.40-5.02	**	1.83	0.91-3.65	0.09	3.95	2.01-7.73	***	1.86	0.82-4.24	0.14
Residence												
Urban	Ref.			Ref.			Ref.			Ref.		
Rural	0.60	0.44-0.83	**	0.76	0.48-1.22	0.25	0.49	0.33-0.74	***	0.78	0.39-1.58	0.49
Perceived risk of acquiring HIV												
No Risk	Ref.			Ref.			Ref.			Ref.		
Small Risk	1.93	1.37-2.74	***	1.39	0.96-2.01	0.09	1.60	1.00-2.56	0.05	1.29	0.78-2.13	0.33
Moderate Risk	1.47	1.17-1.84	***	1.16	0.92-1.48	0.21	1.16	0.83-1.63	0.38	0.94	0.67-1.30	0.69
High Risk	1.46	1.22-1.74	***	1.20	0.99-1.47	0.07	1.35	1.03-1.77	*	0.97	0.69-1.37	0.87

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	OR	CI	P	OR	CI	P	OR	CI	P	OR	CI	P
Religion												
Protestant	Ref.			Ref.			Ref.			Ref.		
Roman Catholic	0.91	0.66-1.24	0.53	0.87	0.63-1.20	0.39	1.03	0.67-1.58	0.89	0.96	0.62-1.49	0.84
Muslim	0.53	0.39-0.74	***	0.73	0.50-1.05	0.09	0.72	0.47-1.11	0.14	1.11	0.68-1.80	0.68
Other Religions	1.02	0.70-1.51	0.90	1.17	0.77-1.77	0.46	1.03	0.81-1.31	0.83	1.27	1.00-1.61	*
Province												
Nairobi	Ref.			Ref.			Ref.			Ref.		
Central	0.61	0.37-1.02	0.06	1.05	0.56-1.95	0.89	0.25	0.12-0.52	***	0.53	0.22-1.27	0.16
Coast	0.72	0.52-1.01	0.06	1.00	0.70-1.43	0.10	0.72	0.50-1.04	0.08	0.95	0.64-1.39	0.78
Eastern	0.78	0.64-0.94	**	0.95	0.76-1.17	0.61	0.57	0.42-0.77	***	0.81	0.57-1.14	0.22
Nyanza	1.13	1.00-1.28	*	1.27	1.11-1.45	***	1.13	0.97-1.31	0.11	1.22	1.05-1.43	*
Rift Valley	0.89	0.79-1.00	*	1.00	0.90-1.12	0.94	0.84	0.73-0.96	**	0.96	0.83-1.11	0.56
Western	0.88	0.80-0.97	*	0.97	0.87-1.08	0.57	0.87	0.76-0.99	*	1.03	0.89-1.19	0.73
North Eastern[λ]	-	-	-	-	-	-	-	-	-	-	-	-
Occupation												
Agriculture/Self Employed	Ref.			Ref.			Ref.			Ref.		
Professional/Teacher/Mgr[$]	1.14	0.58-2.24	0.71	1.31	0.54-3.11	0.54	2.29	1.23-4.25	**	2.30	0.97-5.42	0.06
Sales	1.36	1.11-1.68	**	1.20	0.96-1.49	0.12	1.26	0.90-1.76	0.18	1.10	0.76-1.59	0.61
Other	1.27	1.10-1.47	***	1.18	1.01-1.38	*	1.23	1.04-1.45	*	1.06	0.86-1.31	0.57
Not Working	0.97	0.89-1.07	0.58	1.06	0.96-1.17	0.23	0.75	0.60-0.94	*	0.76	0.60-0.98	*
Education												
Less than Primary School	Ref.			Ref.			Ref.			Ref.		
Primary School	2.40	1.33-4.33	**	1.34	0.70-2.55	0.37	2.16	0.72-6.46	0.17	1.65	0.54-5.06	0.38
Post Pry/Voct/Sec[#]	1.40	1.02-1.92	*	0.98	0.69-1.40	0.92	1.59	0.90-2.84	0.11	1.32	0.72-2.43	0.37
College/University	1.27	0.97-1.67	0.08	0.92	0.65-1.30	0.62	1.28	0.85-1.93	0.23	0.94	0.58-1.50	0.78
Multiple sexual partners												
No	Ref.			Ref.			Ref.			Ref.		
Yes	2.66	1.96-3.61	***	1.53	1.09-2.14	*	1.12	0.73-1.73	0.6	0.85	0.51-1.42	0.53

* $p<0.05$; ** $p<0.01$; *** $p<0.001$ | [$] P-Value | Ref: Reference category | ORs: Odds Ratios | CIs: Confidence Intervals | [λ] Predicts failure perfectly and was dropped from the analysis | [#]Post Primary/Vocational/Secondary | [$]Manager

Discussion

The objectives of this study were to examine the association between HIV sero-status and age at sexual debut and to determine the factors associated with a positive HIV diagnosis. Our study findings corroborate those of previous research, which showed that early sexual debut was significantly associated with the risk of acquiring HIV infection[12-14]. The risk of HIV infection was particularly higher among women who had sexual debut aged 8-15 compared to men of the same age category. These findings suggest that younger women are more at risk of acquiring HIV compared to their male counterparts. Similarly, women who experienced their first sexual encounter at marriage were more likely to test positive of HIV infection; however, among men the results were not statistically significant, partly explained by the small sample size in the sub-analysis. These findings are congruent with previous studies which showed that women were more vulnerable to be infected with HIV regardless of whether they were in marital or steady relationships[1, 10, 18, 24]. One of the factors attributed to this outcome is the imbalance in gender-power relations that undermine women's ability to make decisions not only about the household, but also about their sexual and reproductive needs. We also found that circumcision was a significant predictor of the risk of acquiring HIV, with respondents who were uncircumcised significantly being more likely to be HIV positive. This finding corroborates those of previous studies on the impact of circumcision on HIV status, which showed that circumcision had a protective effect against HIV infection[25, 26]. Similar to other studies[12, 15, 16], we found that socioeconomic factors were also associated with the risk of acquiring HIV. Women in the poorest and middle wealth brackets were more likely to be infected with HIV relative to those in the poor wealth bracket; however, the results were only marginally significant. Women in the rich and richest wealth brackets were significantly associated with being HIV positive.

This finding is not consistent with previous research which suggests that young women from poor economic backgrounds are more likely to engage in transactional sex with partners for economic reasons; hence, increasing the risk of acquiring HIV[27]. While similar findings have been explained among older women in Ghana[28]. We could not find a plausible explanation for our findings among younger women and further research is needed to investigate this scenario.

Having multiple sexual partners was also an important predictor of the risk of acquiring HIV, with the risk of infection being higher among women. Previous studies have also found that young people, especially women were more likely to be associated with risky sexual behavior including having multiple sexual partners[9, 10, 13,14,16,17]. These studies suggest one of the plausible factors associated with increased risk of HIV infection among young people is the lack of skills and education on how to deal with circumstances and issues that increase their vulnerability to HIV infection and other STIs.

Our findings suggest that there is need for HIV prevention initiatives to design strategies targeted at young people with a special focus on creating awareness about the need of delaying sexual debut. In cases where they decide to have sex, they need to understand the consequences of engaging in risky sexual behavior. Our findings also point to the importance of educating young people about issues of sexual and reproductive health, including HIV/AIDS and other STIs. In this regard, introducing comprehensive sexual education in all schools can be an important tool for delaying sexual debut and reducing the spread of HIV including STIs among young people[29-32].

These findings must be interpreted in light of several *limitations*. Firstly, the sample size among those aged 8-15 and 16-21 who tested HIV positive was small. However, this limitation is beyond the control of the researchers due to the nature of the data – those that were randomly selected and offered HIV test. In addition, it was not clear if 23% males and 12% of females who experienced earlier sexual debut aged 8-14 years was voluntary or due to sexual abuse. Secondly, the self-reported nature of the data, particularly on sexual behavior characteristics may be subject to a variety of biases including; recall bias with regard to the number of past sexual partners and social desirability bias, which may encourage men to

exaggerate the number of partners and time of sexual debut. In addition women may underreport their own additional partners or time of sexual debut. Thirdly, the data lacked variables related to socio-cultural factors; therefore, we were unable to assess the impact of these factors on the probability of being infected with HIV. Lastly, the cross-sectional nature of the data did not allow for trend analysis to be conducted in order to make causal references between the outcome variable and the predictor variables.

Conclusions

The findings from this study have important policy implications geared toward transforming and scaling-up the current policies as they relate to the implementation of sexual education in Kenyan schools. In Kenya, research evidence shows that the current curriculum being taught in schools is deficient since it only focuses on the "abstinence-until-marriage" approach and fails to acknowledge that young people are becoming sexually active at a relatively young age. As a result, it does not effectively protect young people against HIV infection or address their overall sexual and reproductive health needs.

As demonstrated by the findings from this study, individuals who experienced early sexual debut at a young age were more likely to be infected with HIV and associated with risky sexual behaviors, such as having multiple sexual partners. The study findings underscore the importance of introducing a comprehensive sexual education in all Kenyan schools, which is an important tool for equipping young people with skills and information about their sexual and reproductive health. Based on the results from the provinces, the government and HIV program managers should pay special attention to Nyanza province. This is because women and men from this province who engaged in earlier sexual debut were significantly associated with being HIV positive later in life. The government needs to design and implement targeted policies and integrated programs that will mitigate factors responsible for exposing young people in Nyanza province more vulnerable to HIV infection and engagement in earlier sexual debut.

Contribution of authors

All authors contributed in writing of this research paper, and approved the manuscript. Elijah O. Onsomu (EOO) conceived and designed the study. He was also responsible for data acquisition and statistical analyses. James K. Kimani (JKK), Benta A. Abuya (BAA), DaKysha Moore (DM), Vanessa Duren-Winfield (VDW), and George Harwell (GH) contributed in the conceptualization and design of the study. Ahmed A. Arif (AAA) contributed in the design of the study and assisted with statistical analyses. EOO, JKK, BAA, AAA, DM, VDW and GH reviewed and edited the manuscript.

References

1. National AIDS Control Council (NACC). HIV/AIDS data booklet; 2006.
2. Buvé A, Caraël M, Hayes RJ, Auvert B, Ferry B, Robinson NJ, et al. The multicenter study on factors determining the differential spread of HIV in four African cities: summary and conclusions. AIDS. 2001; 15(Suppl 4):S127-S31.
3. Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya], and ORC Macro. 2004. Kenya Demographic and Health Survey 2003. Calverton, Maryland: CBS, MOH, and ORC Macro. Available at: http://www.measuredhs.com/pubs/pdf/FR151/FR151.pdf. Accessed 10 February 2008.
4. Glynn JR, Caraël M, Auvert B, Kahindo M, Chege J, Musonda R, 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(sup 4):S51-S60.
5. Njue C, Nzioka C, Ahlberg B, Pertet AM, Voeten HA. If you don't abstain, you will die of Aids: AIDS education in Kenyan public schools. AIDS Educ Prev. 2009; 21(2):169-79.
6. Maticka-Tyndale E. Sustainability of gains made in a primary school HIV prevention programme in Kenya into secondary school years. J Adolesc. 2010; 33(4):563-73.
7. Ministry of Education (MOE). Sector Strategic Plan 2003-2007. Nairobi, Kenya: Government Printer; 2003.
8. Mwebi BM. One teacher's practice in a Kenyan classroom: overcoming barriers to teaching of

HIV/AIDS curriculum, in Barbara Slater Stern (Editor) Curriculum and Teaching Dialogue: v. 9, Pt. 1 &2, Publisher: Information Age Publishing, Charlotte, NC, 2008; 79-95.

9. Kenya AIDS Indicator Survey (KAIS). Final report – September 2009; 2007. Available at: http://www.aidskenya.org/Knowledge-Centre/Publications. Accessed 08 January 2011.

10. World Health Organization (WHO). Preventing HIV/AIDS in young people: A systematic review of the evidence from developing countries; 2006. Available at whqlibdoc.who.int/trs/WHO_TRS_938_eng.pdf. Accessed 22 February 2011.

11. Bakilana A. Age at sexual debut in South Africa. Afr J AIDS Res. 2005; 4(1):1-5.

12. Konde-Lule JK, Wawer MJ, Sewankambo NK, Serwadda D, Kelly R, Li C, et al. Adolescents, sexual behavior and HIV-1 in rural Rakai District, Uganda. AIDS. 1997; 11(6):791-9.

13. Pettifor AE, Rees HV, Kleinschmidt I, Steffenson AE, MacPhail C, Hlongwa-Madikizela L, et al. Young people's sexual health in South Africa: HIV prevalence and sexual behaviors from a nationally representative household survey. AIDS. 2005; 19(14):1525-34.

14. Pettifor AE, van der Straten A, Dunbar MS, Shiboski SC, Padian NS. Early age of first sex: a risk factor for HIV infection among women in Zimbabwe. AIDS. 2004; 18(10):1435-42.

15. Maticka-Tyndale E, Gallant M, Brouillard-Coyle C, Holland D, Metcalfe K, Wildish J, et al. The sexual scripts of Kenyan young people and HIV prevention. Cult Health Sex. 2005; 7(1):27-41.

16. Tenkorang EY, Maticka-Tyndale E. Factors influencing the timing of first sexual intercourse among young people in Nyanza, Kenya. Int Fam Plan Perspect. 2008; 34(4):177-88.

17. White R, Cleland J, Carael W. Links between premarital sexual behavior and extramarital intercourse: a multi-site analysis. AIDS. 2000; 14(15):2323-31.

18. Lugalla JLP, Emmelin MAC, Mutembei AK, Comoro CJ, Killewo JZJ, Kwesigabo G, et al. The social and cultural contexts of HIV/AIDS transmission in the Kagera region, Tanzania. J Asian Afr Stud. 1999; 34(4):377-402.

19. National AIDS Control Council (NACC). Mainstreaming gender into the Kenya national HIV/AIDS strategic plan, 2000-2005 / the Gender and HIV/AIDS Technical Sub-Committee of the National AIDS Control Council; 2002.

20. Lumley T. Analysis of complex survey samples. Journal of Statistical Software. 2004; 9(1):1-19.

21. StataCorp. Stata Statistical Software: Release 10. College Station, Texas, StataCorp LP; 2007.

22. Wears RL. Advanced statistics: statistical methods for analyzing cluster and cluster-randomized data. Acad Emerge Med. 2002; 9:330-41.

23. Hosmer DW, Lemeshow S. Applied logistic regression. New York, NY: John Wiley & Sons, Inc.; 1989.

24. Carpenter LM, Kamali A, Ruberantwari A, Malamba SS, Whitworth JAG. Rates of HIV-1 transmission within marriage in rural Uganda in relation to the HIV sero-status of the partners. AIDS. 1999; 13(9):1083-89.

25. Agot KE, Ndinya-Achola JO, Kreiss JK, Weiss NS. Risk of HIV-1 in rural Kenya: a comparison of circumcised and uncircumcised men. Epidemiology. 2004; 15(2):157-63.

26. Bailey RC, Moses S, Parker CB, Agot K, Maclean I, Krieger JN, et al. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomized controlled trial. Lancet, 2007; 369(9562):643-56.

27. Gregson S, Nyamukapa CA, Garnett GP, Mason PR, Zhuwau T, Caraël M, et al. Sexual mixing patterns and sex-differentials in teenage exposure to HIV infection in rural Zimbabwe. Lancet. 2002;359 (9321):1896-903.

28. Awusabo-Asare K, Annim SK. Wealth status and risky sexual behaviour in Ghana and Kenya. Appl Health Econ Health Policy. 2008; 6(1):27-39.

29. Agbemenu K, Schlenk EA. An integrative review of comprehensive sex education for adolescent girls in Kenya. J Nurs Scholarsh. 2011; 43(1):54-63.

30. Alford S, Cheetham N, Hauser D. Science and success in developing countries: holistic programs that work to prevent teen pregnancy, HIV &sexually transmitted infections. Washington, DC: Advocates for Youth. 2005; Available at: http://www.advocatesforyouth.org /programsthatwork/developing/index.htm. Accessed 15 January 2011.

31. Berry S, Noble R. HIV and AIDS in Uganda. 2007; Available at: http://www.avert.org/aidssuganda.htm. Accessed 20 December 2010.

32. Kiragu SW. Exploring sexuality education and the burdened teacher: a participatory approach in rural primary school in Kenya. Pastoral Care in Education. 2007; 25(3):5-15.