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Community-Based HIV Testing for Urban Youth in Western Kenya

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Abstract

Youth aged 15-24 years comprise 48% of new HIV infections and 15% of persons living with HIV in Kisumu County, Kenya. We assessed factors associated with HIV infection among youth participating in the Community Health Initiative (CHI) implemented in an urban informal settlement in 2018. Predictors of HIV infection were assessed by multivariable logistic regression. CHI engaged 4,441 youth through community health campaigns and home-based HIV testing. HIV prevalence was 3.5% overall and 7.1% among young women aged 20-24. There were 24 youth newly identified as HIV-positive out of 157 total HIV-positive youth. HIV-positive status was positively associated with being female (aOR=2.46; 95% CI 1.57, 3.84) and aged 20-24 (aOR=2.40; 95% CI 1.52, 3.79), and inversely associated with secondary school education or higher (aOR=0.27; 95% CI 0.16, 0.44). Our findings highlight the need for HIV prevention programs specially tailored for youth to further reduce new HIV infections in this priority population.

Keywords

HIV; adolescents; youth; community-based testing; education; sexual behavior

INTRODUCTION

Globally, youth aged 15 to 24 years comprised 32% of new infections in 2018.[1] Young women aged 20-24 comprise 20% of new infections globally and 26% of new infections in sub-Saharan Africa in 2018.[1] In Kenya, youth represented 12% of the approximately 1·5 million persons living with HIV (PLWH) in 2017.[2,3] Of an estimated 184,700 HIV-positive youth in 2017, 62,500 were male and 122,200 were female.[4] Of an estimated 52,767 new HIV infections in 2017, 17,667 (33.5%) were among youth.[2]

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Kisumu County in western Kenya had an estimated HIV prevalence of 17.5% in 2018, which was 3.6 times higher than the national prevalence and was the second highest prevalence of all 47 counties in Kenya.[3] Of 112,862 PLWH ≥15 years old in 2017, 16,771 (14.9%) were youth aged 15-24.[2] Furthermore, Kisumu was one of five counties in 2017 with an overall HIV incidence of 0.26% or higher.[4] Of the 3,396 new HIV infections among persons ≥15 years old in Kisumu, 1,630 (48.0%) were among youth.[2]

Individuals residing in urban settings in Kenya have certain health advantages, including easier access to healthcare facilities that offer HIV testing services. However, urban residents also have higher HIV acquisition risk than those living in more rural areas.[4–6] Residents of peri-urban areas and urban informal settlements, that is, slums, often have higher rates of morbidity and mortality than individuals living in more privileged urban neighborhoods and rural regions.[7]

The Community Health Initiative (CHI) was implemented to increase HIV testing and antiretroviral therapy (ART) coverage among residents of an informal settlement in Kisumu County.[8] We describe the characteristics of youth participating in the CHI program and assess factors associated with HIV infection among youth participants.

METHODS

The CHI program was implemented by Family AIDS Care & Education Services (FACES) in the urban informal settlement of Obunga located in Kisumu, Kenya, from December 2017 through September 2018.[8] The program entailed community mobilization and sensitization, community mapping, household census, multi-disease community health campaigns (CHCs) and tracking activities to offer home-based HTS.[8] CHCs locations were determined using the household distribution data gathered during the CHI census. Enumerated residents who did not attend a CHC were tracked to offer home-based HIV testing services (HTS), using Global Positioning System (GPS) data collected during the census. The CHI program engaged all individuals in the coverage area, as described in a previous publication.[8] The current analysis focuses specifically on youth participants.

HTS eligibility criteria for CHCs and tracking activities were based on the 2015 Kenya national HIV testing guidelines.[9] Individuals aged ≥15 years not previously identified as HIV-positive and who had not been tested within the past three months, unless they reported a recent risk, were eligible for HTS. Individuals newly identified as HIV-positive were referred for care at health facilities of their choice and offered same-day linkage to ART initiation at CHCs, in accordance with the 2016 Kenya national treatment guidelines.[10]

All individuals attending CHCs and successfully engaged during tracking completed a survey prior to accessing services. The survey collected data on demographic characteristics, HIV testing history and sexual behaviors. Survey data were collected and managed using a custom SQL application and database. HTS data were collected in a Microsoft Access database during CHCs and in a custom SQL database during tracking activities.

Statistical analysis of anonymized survey, testing and linkage data was performed using STATA Statistical Software: Release 12 (StataCorp LP, College Station, TX). We generated

frequency distributions for categorical variables, and medians and interquartile ranges (IQR) for continuous variables. Comparisons of characteristics by HIV status, overall and by sex, were conducted using Chi-square tests for categorical variables and Wilcoxon rank sum tests for continuous variables. We calculated HIV yield, defined as the proportion of newly identified PLWH out of the total number of persons tested. We also calculated the previously unidentified fraction (PUF), defined as the proportion of newly identified PLWH out of all previously identified and newly identified PLWH.[8,11]

Comparisons of the PUF were conducted by sex, age group and program activity using two-sample tests of proportions. For analyses, the broader youth age group of 15-24 was stratified as follows: adolescents (ages 15-19), adolescent girls (ages 15-19), adolescent boys (ages 15-19), young adults (ages 20-24), young women (ages 20-24) and young men (ages 20-24). Model selection was conducted by first selecting variables based on *a priori* knowledge and bivariate analysis using a p-value ≤0.20 cut-off level. Due to the rarity of the outcome (HIV+) in this population we also excluded variables only asked to a sub-set of adolescents in order to assess predictors that can be generalized for the whole population. The final multivariate logistic regression models assessed associations between HIV-positive status and demographic and behavioral risk factors, including sex, age, highest education level completed (at time of participation), marital status, program activity, ever had sex and forced sexual contact; and predictors of newly identified as HIV-positive, including the above variables and first-time tester. Adjusted odds ratios (aORs) and 95% confidence intervals (CIs) were used to evaluate the strength of associations between variables and HIV-positive status, and precision and statistical significance of modeled estimates, respectively. All comparison tests (Chi-square, Wilcoxon rank sum, and two-sample tests of proportions) and models used $\alpha<0.05$ significance level.

Program data were analyzed with approval from institutional review boards of the University of California San Francisco, Kenya Medical Research Institute and U.S. Center for Disease Control and Prevention.

RESULTS

CHI enumerated 5,635 youth overall and engaged 4,441 through CHCs and home-based HTS, as presented in Figure 1. More than half (59.0%) were female, young adults aged 20-24 (56.0%), unmarried (68.9%), completed at least a primary school education (83.7%) and reached through CHCs (80.6%), as shown in Table I. More than two-thirds (71.2%) of youth reported ever having sex. The median age at first sexual intercourse was 16 years (IQR 15-17); 287 (14.8%) female youth and 263 (21.6%) male youth reported sexual intercourse before age 15. Among youth sexually active in the past three months, 1796 (66.7%) had sex without condoms. Forced sexual contact was reported by 86 (1.9%) youth.

Of the 3,579 youth who were eligible for HTS, 3,483 (97.3%) accepted testing. Of those tested, 1,995 (57.3%) were female youth, 1,488 (42.7%) were male youth and 769 (22.1%) were first-time testers, as presented in Table I. Among first-time testers, 362 (47.1%) were male youth and 525 (68.3%) were adolescents. Male compared to female youth were more likely to be first-time testers (24.3% vs. 20.4%; $\chi^2=7.70$; p=0.006). Among eligible youth,

adolescents were more likely to accept HTS than young adults (98.0% vs. 96.7%, χ^2=5.41; p=0.020); there was no difference in HTS acceptance between female and male youth (96.9% vs. 97.9%, χ^2=3.37; p=0.066). Individuals ineligible for HTS included 133 youth previously identified as HIV-positive, 311 who tested within the past three months, 270 for reasons unknown and 148 with missing eligibility data. Of youth previously identified as HIV-positive, 127 (95.5%) were currently on ART, 4 (3.0%) were not currently on ART and 2 (1.5%) did not provide information on their ART status.

There were 24 youth newly identified as HIV-positive, of whom three were adolescent girls, 19 were young women and two were young men. HIV yield was 0.7% overall, and was 0.3% among adolescent girls, 1.7% among young women and 0.3% among young men. All youth newly identified as HIV-positive attended a CHC and 23 (95.8%) initiated same-day ART as part of the campaign.

There was a total of 157 HIV-positive youth, as shown in Table I. HIV prevalence overall was 3.5%, and was 1.9% among adolescent girls, 1.6% among adolescent boys, 7.1% among young women and 1.4% among young men. Female compared to male youth were more likely to be HIV-positive (χ^2=38.13; p<0.001), as were young adults than adolescents (χ^2=31.06; p<0.001), married than unmarried youth (χ^2=53.98; p<0.001), youth who did not complete primary school than those who did (χ^2=20.93; p<0.001), youth reached at CHCs than tracking (χ^2=8.87; p=0.003), youth who ever had sex than those who had not (χ^2=20.35; p<0.001) and youth who experienced forced sexual contact than those who had not (χ^2=12.38; p=0.002). The PUF was 15.3% overall among all youth and was 14.3% among adolescent girls, 17.4% among young women and 15.4% among young men. The PUF was higher among female than male youth (16.9% vs. 7.4%; z=−1.25; p=0.211) and higher among young adults than adolescents (17.2% vs. 8.6%; z=−1.25; p=0.210).

Multivariable analysis of predictors of HIV-positive status and being newly identified as HIV-positive are presented in Table II. HIV-positive status was positively associated with being female (aOR=2.46; 95% CI 1.57, 3.84) and aged 20-24 years (aOR=2.40; 95% CI 1.52, 3.79), and inversely associated with completing primary school/some secondary school (aOR=0.55; 95% CI 0.36, 0.81) and completing secondary school/post-secondary education (aOR=0.27; 95% CI 0.16, 0.44) as compared to having completed none/some primary education. Female youth were more likely to be newly identified as HIV-positive compared to male youth (aOR=6.75; 95% CI 1.52, 29.98), as were young adults compared to adolescents (aOR=4.64; 95% CI 1.19, 18.12).

DISCUSSION

HIV prevalence was 3.5% and PUF was 15.3% among youth participants of CHI, a community-based hybrid HIV testing approach that was implemented for the first time in an urban setting. HIV prevalence and PUF were highest among young women participating in CHI. Our results align with other countries where female youth, especially young women, are at higher risk for HIV infection.[1]

More than 97% of eligible youth accepted HIV testing and one-fifth were first-time testers. Among youth newly identified as HIV-positive, 96% initiated ART the same day as part of the campaign. CHI surpassed the UNAIDS 90% testing and treatment targets among youth and took a step towards achieving the UNAIDS Fast Track commitments to end AIDS by 2030.[12,13]

All youth who were newly identified as HIV-positive attended a CHC. This finding may reflect the fact that youth who perceived themselves to be at higher risk for HIV infection actively sought out testing at CHCs, whereas youth who perceived themselves to be at lower risk were tested during tracking activities. Studies of motivations for HIV testing have shown that perceived risk for HIV infection may drive testing among youth.[6] Our finding might also indicate that CHCs are more efficient at reaching youth who are unaware that they are HIV-positive.

HIV-positive status was associated with education level. Youth who completed primary school and/or had some secondary school education were less likely to be HIV-positive. The association was even stronger for youth who completed at least a secondary school education. Staying in school has been shown to decrease risk of HIV acquisition.[14–16] Prior studies report that young women in Kenya who attend school were less likely to initiate sex and to experience a pregnancy.[17] Additionally, the cost of education poses a significant burden to families. When faced with paying school fees so that their children can complete their education, families will often prioritize boys over girls.[18] In focus group discussions, adolescents from urban informal settlements in Kisumu shared that a primary motivation for their peers to engage in intergenerational transactional sex was to obtain money to pay school fees, either for themselves or for their siblings.[18]

Early sexual initiation may be a contributing factor to the high HIV prevalence among youth. The proportion of youth participants reported having sex before age 15 was similar to that reported by youth in the 2014 Kenya Demographic and Health Survey (KDHS).[19] Approximately 15% of CHI female participants and 22% of CHI male participants had sex before age 15 compared to 12% and 21%, respectively, among 2014 KDHS respondents nationally.[19,20]

We acknowledge several limitations with the CHI program. At early CHCs, we could not document eligibility status for some attendees due to technical difficulties with the electronic HTS data collection tool. Several CHCs were held during the rainy season in the months of April and May, which likely deterred some people from attending on days with heavy rainfall and flooding. Furthermore, we could not distinguish whether HIV infections were acquired through mother-to-child transmission or sexual contact.

The CHI program led to the identification of a high proportion of youth living with HIV. Lower testing coverage among youth, especially adolescent boys and young men, is a pattern observed in Kenya and other countries in sub-Saharan Africa.[19–22] Novel approaches, including community-based HTS programs such as CHI, are needed to make HIV testing more accessible and acceptable to male youth as well as continuing to meet the needs of adolescent girls and young women.

Our findings show that youth in Kenya, especially young women, continue to be at high risk for HIV. The high frequency of risk behaviors such as sexual initiation at an early age and engaging in sex without condoms highlight the importance of expanding HIV testing and prevention services for youth, including pre-exposure prophylaxis. HIV prevention programs specially tailored for youth, especially ones designed to encourage youth to remain in school, are needed to further reduce new HIV infections in this priority population.

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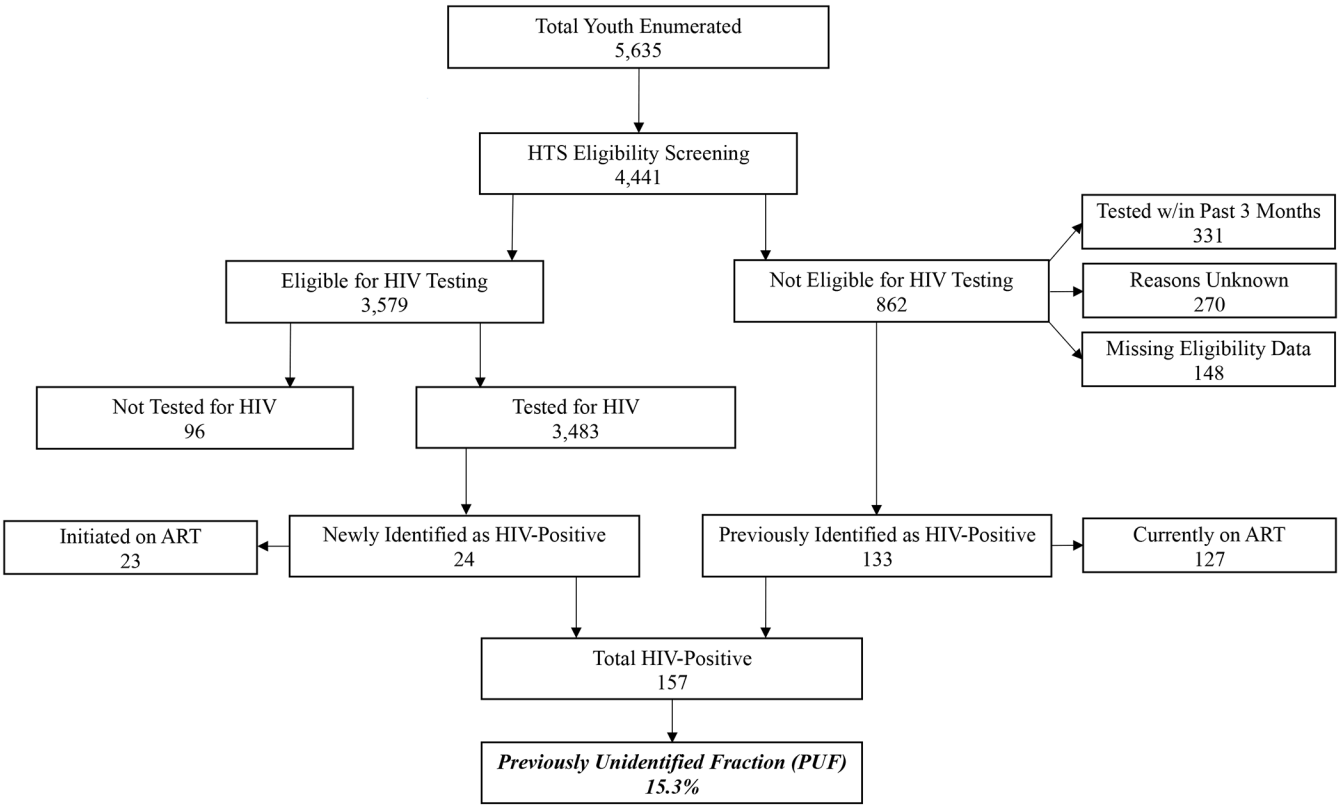

Figure 1:
Youth 15-24 years of age, Community Health Initiative, Kisumu, Kenya, 2018

Table I:

Characteristics of youth participants by HIV status, Community Health Initiative, Kisumu, Kenya, 2018

	Overall (N=4,441)				Female (N=2,620)				Male (N=1,821)			
Characteristics	**HIV− (n=4,284)**	**HIV+ (n=157)**	**χ^2 / z-score[1]**	**p-value**	**HIV− (n=2,490)**	**HIV+ (n=130)**	**χ^2 / z-score[1]**	**p-value**	**HIV− (n=1,794)**	**HIV+ (n=27)**	**χ^2 / z-score[1]**	**p-value**
Sex												
Female	2,490 (58.1)	130 (82.8)	38.13	<0.001	-	-			-	-		
Male	1,794 (41.9)	27 (17.2)			-	-			-	-		
Age												
15-19	1,918 (44.8)	35 (22.3)	31.06	<0.001	1,064 (42.7)	21 (16.2)	35.97	<0.001	854 (47.6)	14 (51.9)	0.19	0.661
20-24	2,366 (55.2)	122 (77.7)			1,426 (57.3)	109 (83.8)			940 (52.4)	13 (48.2)		
Education												
None/some primary	675 (15.8)	43 (27.4)	20.89	<0.001	393 (15.8)	34 (26.2)	14.74	0.002	282 (15.7)	9 (33.3)	6.22	0.101
Completed primary/ some secondary	2,226 (52.0)	84 (53.5)			1,347 (54.1)	73 (56.2)			879 (49.0)	11 (40.7)		
Completed secondary/ post-secondary	1,379 (32.2)	30 (19.1)			749 (30.1)	23 (17.7)			630 (35.1)	7 (25.9)		
Missing	4 (0.1)	0 (0.0)			1 (<0.1)	0 (0.0)			3 (0.2)	0 (0.0)		
Marital status												
Married	1,268 (29.6)	90 (57.3)	53.97	<0.001	1,040 (41.8)	85 (65.4)	28.36	<0.001	228 (12.7)	5 (18.5)	0.98	0.614
Not married	2,991 (69.8)	67 (42.7)			1,438 (57.8)	45 (34.6)			1,553 (86.6)	22 (81.5)		
Missing	25 (0.6)	0 (0.0)			12 (0.5)	0 (0.0)			13 (0.7)	0 (0.0)		
Program activity												
Community Health Campaign	3,437 (80.2)	141 (89.8)	8.88	0.003	2,087 (83.8)	123 (94.6)	10.92	0.001	1,350 (75.2)	18 (66.7)	1.05	0.306
Tracking	847 (19.8)	16 (10.2)			403 (16.2)	7 (5.4)			444 (24.8)	9 (33.3)		
First-time tester (N=3,482)[2]												
Yes	768 (22.2)	1 (4.2)	4.51	0.034	406 (20.6)	1 (4.6)	3.44	0.063	362 (24.4)	0 (0.0)	0.64	0.422
No	2,690 (77.8)	23 (95.8)			1,567 (79.4)	21 (95.5)			1,123 (75.6)	2 (100.0)		
Alcohol use												
Never	3,939 (91.9)	142 (90.4)	1.01	0.800	2,363 (94.9)	119 (91.5)	3.23	0.357	1,576 (87.9)	23 (85.2)	0.26	0.968

	Overall (N=4,441)				Female (N=2,620)				Male (N=1,821)			
Characteristics	**HIV− (n=4,284)**	**HIV+ (n=157)**	**χ^2 / z-score[1]**	**p-value**	**HIV− (n=2,490)**	**HIV+ (n=130)**	**χ^2 / z-score[1]**	**p-value**	**HIV− (n=1,794)**	**HIV+ (n=27)**	**χ^2 / z-score[1]**	**p-value**
Monthly or less	205 (4.8)	10 (6.4)			88 (3.5)	8 (6.2)			117 (6.5)	2 (7.4)		
More than monthly	135 (3.2)	5 (3.2)			36 (1.4)	3 (2.3)			99 (5.5)	2 (7.4)		
Missing	5 (0.1)	0 (0.0)			3 (0.1)	0 (0.0)			2 (0.1)	0 (0.0)		
Ever had sex												
Yes	3,024 (70.6)	137 (87.3)	20.35	<0.001	1,827 (73.4)	119 (91.5)	21.35	<0.001	1,197 (66.7)	18 (66.7)	0.03	0.985
No	1,255 (29.3)	20 (12.7)			660 (26.5)	11 (8.5)			595 (33.2)	9 (33.3)		
Missing	5 (0.1)	0 (0.0)			3 (0.1)	0 (0.0)			2 (0.1)	0 (0.0)		
Age at first sex (median (IQR)) (N=3,161)	16.0 (15.0–17.0)	16.0 (15.0–17.5)	−0.69	0.490	16.0 (15.0–18.0)	16.0 (15.0–17.0)	0.44	0.660	16.0 (15.0–17.0)	16.5 (15.0–18.0)	−1.33	0.183
Any sex, past 3 months (N=3,161)												
Yes	2,694 (89.1)	123 (89.8)	0.06	0.799	1,664 (91.1)	111 (93.3)	0.67	0.412	1,030 (86.1)	12 (66.7)	5.45	0.020
No	330 (10.9)	14 (10.2)			163 (8.9)	8 (6.7)			167 (13.9)	6 (33.3)		
Condomless sex, past 3 months (N=2,817)												
Yes	1,729 (64.2)	67 (54.5)	4.80	0.028	1,143 (68.7)	65 (58.6)	4.91	0.027	586 (56.9)	2 (16.7)	7.81	0.005
No	965 (35.8)	56 (45.5)			521 (31.3)	46 (41.4)			444 (43.1)	10 (83.3)		
Number of sex partners, past 3 months (median (IQR)) (N=2,817)	1 (1–1)	1 (1–1)	1.13	0.257	1 (1 – 1)	1 (1–1)	−1.59	0.111	1 (1–1)	1 (1–1)	0.61	0.544
Ever experienced forced sexual contact												
Yes	77 (1.8)	9 (5.7)	12.38	0.002	62 (2.5)	9 (6.9)	9.26	0.010	15 (0.8)	0 (0.0)	0.23	0.633
No	4,206 (98.2)	148 (94.3)			2,427 (97.5)	121 (93.1)			1,779 (99.2)	27 (100.0)		
Missing	1 (<0.1)	0 (0.0)			1 (<0.1)	0 (0.0)			0 (0.0)	0 (0.0)		

[1] Chi-square (χ^2) for categorical variables / Wilcoxon rank sum (z-score) for continuous variables

[2] One tester did not respond to question

Table II:

Multivariate analysis of predictors of HIV-positive status and newly identified as HIV-positive, youth participants, Community Health Initiative, Kisumu, Kenya, 2018

HIV-Positive Status						
	Overall (N=4,408)[1]		Female (N=2,604)[1]		Male (N=1,796)[1]	
Characteristics	**aOR (95% CI)**	**p-value**	**aOR (95% CI)**	**p-value**	**aOR (95% CI)**	**p-value**
Sex						
Male	ref	ref	-	-	-	-
Female	2.46 (1.57, 3.84)	<0.001	-	-	-	-
Age						
15-19	ref	ref	ref	ref	ref	ref
20-24	2.40 (1.52, 3.79)	<0.001	3.28 (1.92, 5.76)	<0.001	0.78 (0.29, 2.14)	0.635
Education						
None/some primary	ref	ref	ref	ref	ref	ref
Completed primary/some secondary	0.55 (0.36, 0.81)	0.002	0.61 (0.40, 0.95)	0.027	0.35 (0.14, 0.87)	0.025
Completed secondary/post-secondary	0.27 (0.16, 0.44)	<0.001	0.27 (0.16, 0.48)	<0.001	0.33 (0.11, 1.01)	0.052
Married						
No	ref	ref	ref	ref	ref	ref
Yes	1.40 (0.94, 2.08)	0.094	1.25 (0.82, 1.92)	0.304	1.78 (0.57, 5.54)	0.316
Program activity						
Community Health Campaign	ref	ref	ref	ref	ref	ref
Tracking	0.662 (0.38, 1.24)	0.137	0.41 (0.18, 0.90)	0.026	1.54 (0.68, 3.50)	0.303
Ever had sex						
No	ref	ref	ref	ref	ref	ref
Yes	1.43 (0.82, 2.52)	0.205	1.64 (0.80, 3.37)	0.173	1.33 (0.51, 3.43)	0.560
Ever experienced forced sexual contact[2]						
No	ref	ref	ref	ref	-	-
Yes	2.47 (1.18, 5.16)	0.017	2.61 (0.01, 5.56)	<0.001	-	-
Newly-Diagnosed as HIV-Positive[3]						
	Overall (N=3,451)[1]		Female (N=1,978)[1]		Male (N=1,473)[4]	
Characteristics	**aOR (95% CI)**	**p-value**	**aOR (95% CI)**	**p-value**	**aOR (95% CI)**	**p-value**
Sex						
Male	ref	ref	-	-	-	-
Female	6.75 (1.52, 29.98)	0.012	-	-	-	-
Age						
15-19	ref	ref	ref	ref	-	-
20-24	4.64 (1.19, 18.12)	0.027	4.43 (1.11, 17.71)	0.035	-	-
Education						
None/some primary	ref	ref	ref	ref	-	-

HIV-Positive Status						
	Overall (N=4,408)[1]		Female (N=2,604)[1]		Male (N=1,796)[1]	
Characteristics	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value
Completed primary/some secondary	0.50 (0.18, 1.37)	0.177	0.61 (0.21, 1.79)	0.369	-	-
Completed secondary/post-secondary	0.38 (0.03, 1.92)	0.184	0.41 (0.12, 1.41)	0.892	-	-
Married						
No	ref	ref	ref	ref	-	-
Yes	1.03 (0.40, 2.64)	0.954	0.93 (0.35, 2.48)	0.892	-	-
First-time tester						
No	ref	ref	ref	ref	-	-
Yes	0.25 (0.03, 1.92)	0.184	0.28 (0.04, 2.14)	0.221	-	-
Ever had sex						
No	ref	ref	ref	ref	-	-
Yes	1.69 (0.34, 8.42)	0.521	1.61 (0.32, 8.18)	0.550	-	-
Ever experienced forced sexual contact						
No	ref	ref	ref	ref	-	-
Yes	1.77 (0.23, 13.80)	0.227	1.87 (0.24, 14.70)	0.550	-	-

[1] Utilized complete case analysis for all models

[2] Ever experienced forced sex excluded from male model due to perfect prediction of outcome (all HIV-positive male youths responded “no”)

[3] Program activity not included in newly diagnosed as HIV-positive models as all new positives attended community health campaigns

[4] Male youth were not analyzed in a separate model because too few were newly diagnosed as HIV-positive