

Journal of HIV/AIDS & Social Services

ISSN: 1538-1501 (Print) 1538-151X (Online) Journal homepage: https://www.tandfonline.com/loi/whiv20

HIV self-testing knowledge and attitudes at sports-based HIV prevention tournaments in Nairobi, Kenya

Caroline J. Vrana-Diaz, Danielle R. Stevens, Enouce Ndeche & Jeffrey E. Korte

To cite this article: Caroline J. Vrana-Diaz, Danielle R. Stevens, Enouce Ndeche & Jeffrey E. Korte (2019) HIV self-testing knowledge and attitudes at sports-based HIV prevention tournaments in Nairobi, Kenya, Journal of HIV/AIDS & Social Services, 18:2, 180-196, DOI: 10.1080/15381501.2019.1620663

To link to this article: https://doi.org/10.1080/15381501.2019.1620663

Published online: 09 Jun 2019.

Submit your article to this journal

Article views: 108

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=whiv20

JOURNAL OF HIV/AIDS & SOCIAL SERVICES
2019, VOL. 18, NO. 2, 180–196
https://doi.org/10.1080/15381501.2019.1620663

Routledge
Taylor & Francis Group

HIV self-testing knowledge and attitudes at sports-based HIV prevention tournaments in Nairobi, Kenya

Caroline J. Vrana-Diaz[a], Danielle R. Stevens[a], Enouce Ndeche[b], and Jeffrey E. Korte[a]

[a]Department of Public Health Sciences, Medical University of South Carolina, Charleston, SC, USA; [b]Vijana Amani Pamoja, Nairobi, Kenya

ABSTRACT

HIV remains a major health problem in sub-Saharan Africa, and innovations—such as HIV self-testing (HST)—that break down barriers to testing are required to move toward elimination. Four anonymous cross-sectional surveys were conducted assessing HST knowledge and attitudes among sports-based HIV prevention tournament attendees in Nairobi, Kenya. Results suggest HST may increase testing rates in this population. Participants expressed interest in using HST and were willing to use HST as a tool to motivate others. This poses a unique opportunity for a community intervention aimed to increase knowledge of HST, and to increase HIV testing rates using HST kits.

ARTICLE HISTORY
Received 21 August 2018
Revised 22 April 2019
Accepted 14 May 2019

KEYWORDS
Community health outreach; HIV; HIV self-testing; sports-based HIV prevention; sub-Saharan Africa

Introduction

HIV remains a major problem in sub-Saharan Africa, and a combination of approaches are required to move toward eradicating HIV. UNAIDS estimates that by the end of 2017, there were 36.9 million people living with HIV, and 70% of those living with HIV were in sub-Saharan Africa (UNAIDS, 2019). It is vital that people know their HIV status, positive individuals receive treatment quickly, and those on treatment are successfully retained to attain viral suppression. Currently, only 75% of people living with HIV know their status, which leaves 9.4 million people living with HIV that have not accessed testing services (UNAIDS, 2019). Common barriers to HIV testing include stigma, privacy concerns, low accessibility, long waits, low risk perception, lack of community involvement, and loss of employment and productivity (Deblonde et al., 2010; Mohlabane, Tutshana, Peltzer, & Mwisongo, 2016; Weihs & Meyer-Weitz, 2016). There

CONTACT Caroline J. Vrana-Diaz carolinejvranadiaz@gmail.com Department of Public Health Sciences, Medical University of South Carolina, 135 Cannon Street, Suite 303, Charleston, SC, 29425, USA
Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/whiv.
© 2019 Taylor & Francis Group, LLC

is also a gender-based testing discrepancy. Of the adult testing services in low- and middle-income countries, 70% were conducted for women, due to the integration of HIV testing into reproductive health services (World Health Organization, 2016). Therefore, there is a great need for testing services that everyone can access. Once people test for HIV, they will know their status, can make strides to protect themselves from HIV if they test negative, and can enter into HIV treatment if they test positive.

One innovation that may help break down testing barriers is HIV self-testing (HST) kits. The first at-home, over-the-counter oral rapid diagnostic HIV test was first approved in the United States in 2012 (The Henry J. Kaiser Family Foundation, 2016; US Department of Health and Human Services, 2018), and was made available throughout Kenya in May of 2017 (UNAIDS, 2017). This test is performed by swabbing a person's gums, placing the swab in a buffer solution, and waiting 20 min for the HIV test results, with 92% sensitivity and 99% specificity (OraSure Technologies, 2016). In sub-Saharan Africa, voluntary counseling and testing is the most widely recommended model of HIV testing (Harichund & Moshabela, 2018). However, HIV oral self-testing has been shown to have many benefits over traditional blood-based testing, including lowering barriers to testing including HIV-related stigma and discrimination, travel costs, economic pressures, lack of privacy and confidentiality, fear of the blood draw, and long wait times (Choko et al., 2017; Harichund & Moshabela, 2018; Stevens, Vrana, Dlin, & Korte, 2018). HST has also been shown to increase HIV testing behaviors as compared to standard HIV testing in randomized controlled trials (Gichangi et al., 2018; Johnson et al., 2017). The World Health Organization has put forth a recommendation for HST to be offered as an additional approach to HIV testing services, especially among underserved and high-risk populations (World Health Organization, 2016). Even though there are many benefits to this new testing technology, HST is not well known among the lay population. Therefore, research needs to be performed within the general population to understand their amount of knowledge and their willingness to use HST without first being presented or taught about this new technology.

Sports-based HIV prevention programs in sub-Saharan Africa have shown overall strong evidence for positive effects on HIV-related knowledge, stigma, communication, self-efficacy, and risk behaviors (Delva et al., 2010; Kaufman, Spencer, & Ross, 2013). Both peer coaches and professional soccer players as coaches have been shown to be effective in transmitting HIV prevention knowledge, perceived behaviors, and positive attitudes regarding HIV (Clark, Friedrich, Ndlovu, Neilands, & McFarland, 2006; Maro, Roberts, & Sørensen, 2008). There are many large organizations, including Grassroot Soccer, Kicking AIDS Out, the International Olympic Committee and UNAIDS (in partnership with many health organizations)

who have used sports to explore issues on HIV/AIDS (Maleka, 2017). One such organization, Vijana Amani Pamoja (VAP), offers daily after-school programs and youth soccer tournaments in low-income areas of Nairobi. Their mission is to "integrate social and economic values through soccer by creating a pro-active health environment" ("Vijana Amani Pamoja," 2016). As HIV prevalence in the slum areas of Nairobi is 12% compared to 5% among nonslum urban residents in Kenya (Madise et al., 2012), the "Kick N Test" tournaments of VAP offer free HIV testing to all attendees, coaches, and players during the tournaments. The attendees of these types of tournaments are an important population to study, yet very little research regarding HST has been done in this type of setting. Therefore, anonymous cross-sectional surveys were conducted among youth and adults ages 14 years and older who attended these tournaments in order to understand risk behaviors and perceptions of HIV testing and HST in this high-risk population.

Methods

Soccer tournaments

VAP hosts periodic free youth soccer tournaments in low-income areas around Nairobi, Kenya. During the tournaments, free HIV testing is administered, free condoms are distributed, and voluntary male medical circumcision referrals are given to participants, coaches, and spectators. At the end of the tournaments, trophies are given to the winning boys' and girls' teams, but larger trophies are given to the boys' and girls' team who had the highest number of individuals testing for HIV affiliated with their team.

Anonymous surveys were administered to attendees and participants at four VAP tournaments in low-income locations between April 2016 and April 2017 (April 2016-Maringo, June 2016-Mukuru, September 2016-Mukuru kwa Ruben, April 2017-Dandora) (Figure 1).

Instrument development

A 23 question survey was developed to assess sociodemographics, HIV risk behaviors, HIV testing behaviors, knowledge and attitudes regarding HST, and linkage and barriers to care (if HIV positive). The four HST questions were as follows: "Have you heard of HIV self-testing kits, that you can use by yourself, to test yourself for HIV?" (measuring knowledge of HST); "Would you like to be able to test yourself for HIV without anyone else being involved?" (measuring willingness to use HST); Do you feel comfortable talking to your friends and family about HIV testing?" (assessing

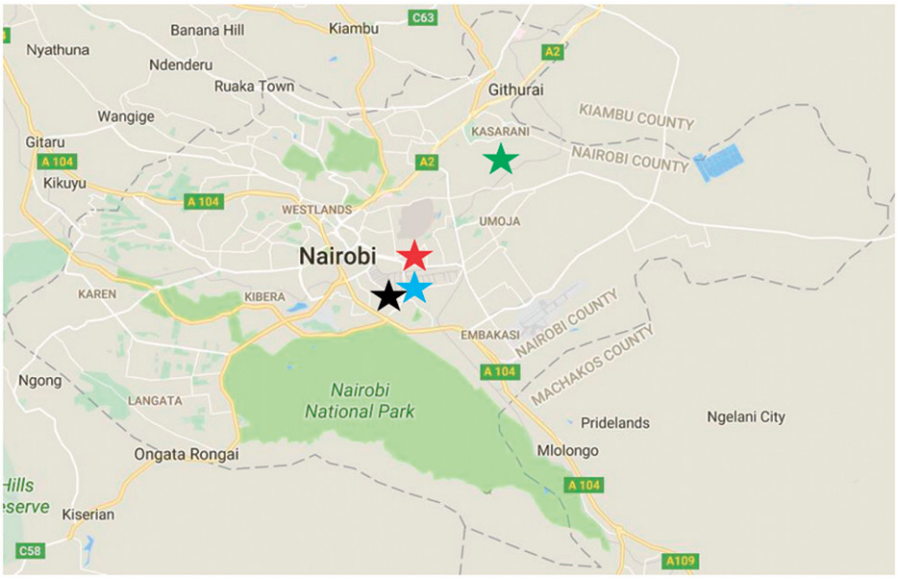


Figure 1. Locations of the four VAP tournaments. Red-Maringo, Black-Mukuru, Blue-Mukuru kwa Ruben, Green-Dandora.

potential impact of using HST kits in this population); and "If we gave you three HIV self-testing kits, would you be willing to pass them out to people that you know, who are at risk for HIV but have not been tested recently?" (measuring willingness to pass out HST kits). These surveys were designed in English for a 3rd grade reading level to assist comprehension. The researchers collaborated with an expert translator to translate the survey into Kiswahili and Sheng (a slang version of Kiswahili spoken by Nairobi youth). The survey in all three languages were pilot tested among VAP staff to assess understanding and amend any issues with cultural appropriateness.

Interested participants were eligible to complete the anonymous survey if they were able to read English, Kiswahili, or Sheng, and were over 18 years old at the Maringo tournament, or were over 14 years old at the Mukuru, Mukuru kwa Ruben, or Dandora tournaments (due to International Review Board [IRB] protocol amendments). The surveys were completely anonymous with no identifying information collected, so written informed consent was waived, but verbal informed consent was obtained. Surveys were administered on paper or on electronic tablets through the REDCap platform (Research Electronic Data Capture), a double firewall-protected system for data collection and analysis housed at the Medical University of South Carolina (Harris et al., 2009). Paper copies were entered into the REDCap system and then stored in locked cabinets. Final IRB approval was obtained through both the Medical University of South Carolina and the Kenya Medical Research Institute.

Variables

Outcomes of interest included whether participants reported hearing of HST (Heard of HST), were willing to use HST (Want HST), felt comfortable talking to their friends and family about HIV testing (Comfortable discussing HIV testing), and were willing to pass out HST kits to untested friends or family (Willing to pass out HST kits). Variables assessed for inclusion in models included participant sex, age (categorized as 14–15 years, 16–18 years, 19–23 years, and 24+ years), marital status, parental status, religion (Catholic, Muslim, Protestant, None, Other), cultural identification (Kamba, Kikuyu, Luhya, Luo, Other), number of sexual partners (0, 1, 2–5, 6–10, 11+), been diagnosed with a sexually transmitted infection (STI) apart from HIV, and whether it was against their beliefs to engage in premarital sex or condom use. We also assessed whether the participant had tested previously (ever tested before) and/or at the current VAP tournament (tested today).

Statistical analyses

SAS 9.2 (SAS Institute, Cary, NC) was used for all analysis. For descriptive statistics, chi-square tests and Cochran-Armitage tests were used (p-value <0.05 for significance). For modeling, location did not vary enough to allow for a hierarchical model, so a fixed effect logistic regression was used. Final models were determined based on factors including biological plausibility, individual variable significance in the model, and model fit (Akaike's Information Criterion and R^2 value), and 95% confidence intervals not crossing the null were used to determine significance. We noted occasional internal inconsistencies in these self-administered surveys (e.g., mentioning they have never tested for HIV before, but have received their HIV test results, etc.). Out of the possible 11 contradictions, individuals with two or fewer errors were included to maximize sample size and minimize poor data quality (88.1% of the sample was used in the analysis).

Results

Between the three tournaments in 2016, 1,134 individuals tested for HIV, 3,600 condoms were distributed, and 15 males were referred for VMMC. At the tournament in Dandora, 230 individuals tested for HIV, with 15,750 free condoms distributed, and 10 males referred for VMMC.

Table 1 shows the demographics of the participants who completed our survey. The participants were, on average, 21 years old, and were majority male, culturally identified as Kamba, Kikuyu, Luhya, Luo, or other, Catholic or Protestant, and were unmarried with no children. A slight

Table 1. Sociodemographics of survey participants attending a sports-based HIV prevention tournament around Nairobi, Kenya.

Characteristic	Maringo ($n = 123$, 12.0) *N* (%)	Mukuru ($n = 312$, 30.3) *N* (%)	Dandora ($n = 161$, 15.6) *N* (%)	Mukuru kwa Ruben ($n = 433$, 42.1) *N* (%)	Total ($n = 1{,}029$) *N* (%)	*p*-Value
Age (years)						
14–15	0 (0)	73 (24.3)	22 (16.4)	105 (25.9)	200 (21.0)	<.001
16–18	12 (10.5)	75 (25.0)	54 (40.3)	103 (25.4)	244 (25.6)	
19–23	53 (46.5)	80 (26.7)	33 (24.6)	100 (24.7)	266 (27.9)	
24+	49 (43.0)	72 (24.0)	25 (18.7)	97 (24.0)	243 (25.5)	
Gender						
Male	70 (58.9)	178 (58.9)	75 (50.0)	264 (65.4)	587 (60.1)	.01
Female	49 (41.2)	126 (41.5)	75 (50.0)	140 (34.7)	390 (39.9)	
Cultural Identification						
Kamba	7 (8.1)	39 (16.3)	9 (6.5)	70 (18.4)	125 (14.8)	<.0001
Kikuyu	10 (11.5)	31 (13.0)	38 (27.5)	69 (18.2)	148 (17.5)	
Luhya	21 (24.1)	77 (32.2)	29 (21.0)	86 (22.6)	213 (25.2)	
Luo	36 (41.4)	38 (15.9)	55 (39.9)	86 (22.6)	215 (25.5)	
Other	13 (15.0)	54 (22.6)	7 (5.1)	69 (18.2)	143 (16.9)	
Religion						
Catholic	48 (44.0)	119 (45.8)	73 (49.0)	193 (49.2)	433 (47.6)	.01
Protestant	32 (29.4)	56 (21.5)	42 (28.2)	72 (18.4)	202 (22.2)	
Muslim	7 (6.4)	26 (10.0)	9 (6.0)	37 (9.4)	79 (8.7)	
None	3 (2.8)	12 (4.6)	10 (6.7)	38 (9.7)	63 (6.9)	
Other	19 (17.4)	47 (18.1)	15 (10.1)	52 (13.3)	133 (14.6)	
Marital Status						
Married	29 (25.9)	78 (26.1)	17 (10.8)	86 (20.4)	210 (21.2)	.001
Single	140 (89.2)	83 (74.1)	140 (89.2)	335 (79.6)	779 (78.8)	
Children						
Yes	41 (35.0)	76 (25.3)	23 (14.9)	85 (20.2)	225 (22.7)	.0004
No	76 (65.0)	225 (74.8)	131 (85.1)	334 (79.8)	767 (77.3)	
Against beliefs to have sex before marriage						
Yes	67 (62.0)	177 (62.8)	73 (48.3)	208 (52.1)	525 (55.9)	.005
No	41 (38.0)	105 (37.2)	78 (51.7)	191 (47.9)	415 (44.1)	
Against beliefs to use condoms						
Yes	26 (25.0)	77 (27.6)	42 (27.3)	126 (31.1)	271 (28.8)	.54
No	78 (75.0)	202 (72.4)	112 (72.7)	279 (68.9)	671 (71.2)	
Total number of sexual partners						
0	33 (30.6)	124 (44.3)	64 (44.1)	149 (36.6)	370 (39.4)	<.0001
1	22 (20.4)	56 (20.0)	43 (29.7)	80 (19.7)	201 (21.4)	
2–5	24 (22.2)	47 (16.8)	28 (19.3)	107 (26.3)	206 (21.9)	
6–10	13 (12.0)	13 (4.6)	4 (2.9)	35 (8.6)	65 (6.9)	
11+	16 (14.8)	40 (14.3)	6 (4.1)	36 (8.9)	98 (10.4)	
Sexually Transmitted Infection (other than HIV)						
Yes	12 (10.6)	32 (11.4)	17 (11.0)	73 (17.5)	134 (13.9)	.04
No	101 (89.4)	250 (88.7)	137 (89.0)	344 (82.5)	832 (86.1)	
Ever tested for HIV						
Yes	103 (88.0)	247 (81.3)	136 (88.9)	355 (84.5)	841 (84.6)	.12
No	14 (12.0)	57 (18.8)	17 (11.1)	65 (15.5)	153 (15.4)	
Tested today or planning to test today for HIV						
Yes	64 (55.2)	177 (58.8)	108 (70.1)	301 (72.0)	650 (65.7)	.0001
No	52 (44.8)	124 (41.2)	46 (29.9)	117 (28.0)	339 (34.3)	
HIV Status						
HIV Positive	14 (15.9)	31 (16.9)	11 (8.6)	23 (7.1)	79 (10.9)	.002
HIV Negative	74 (84.1)	153 (83.2)	117 (91.4)	301 (92.9)	645 (89.1)	

majority of participants felt it was against their cultural or religious beliefs to have premarital sex, but the majority of participants did not feel it was against their beliefs to use condoms. Most people had less than 5 lifetime sexual partners, and 13.9% of participants had ever had a STI other than HIV (Table 1). Many of these demographic variables differed significantly by location (see Table 1). The vast majority (84.6%) of participants have ever tested for HIV, while 65.7% of participants either tested or were planning to test for HIV that day. HIV prevalence was 10.9% (ranged from 7.1% to 16.9%). For the four HIV self-testing knowledge and attitudes, almost half of participants had heard of HST (48.5%), while 70.4% would want to test for HIV in private (assessing willingness to use HST). The majority of participants (87.6%) were comfortable talking about HIV testing with friends and family, and 84.1% would be interested in passing out HST kits to friends and family (Table 2).

Table 2 shows the associations between sociodemographic variables and HST knowledge and attitudes. Participants who had heard of HST were more likely to be male, older, married, with children, and have more sexual partners. Those who wanted to use HST were more likely to be male, older, married, with children, Protestant or not religious, and have more sexual partners. Those who were comfortable talking about HIV testing with their friends and family were more likely to be older, married, and with children. Finally, participants who would be willing to pass out HST kits to friends and family were more likely to be older, Catholic or Protestant, have more sexual partners, and report that both premarital sex and using condoms is against their beliefs.

Table 3 includes the multivariable modeling results. In the logistic regression model for having heard of HST, participants were more likely to have heard of HST if they had 1 lifetime sexual partner or 11+ lifetime sexual partners compared to no lifetime partners [OR = 1.75 (95% CI 1.09–2.84) or OR = 2.17 (0.14–4.17), respectively] and there was a significant interaction between the participants who tested today, and having ever tested before today. Participants who tested today but didn't test before, who didn't test today but have tested before, and who didn't test today and haven't tested before all are much less likely to have heard of HST compared to those who both tested for HIV today and have tested before [OR = 0.30 (0.13–0.65), 0.54 (0.37–0.79), and 0.44 (0.23, 0.80), respectively].

When modeling wanting to use HST, gender and religion were significant fixed effects. Females were less likely to want to use HST than males [OR = 0.65 (0.44, 0.96)]. Participants who were Protestant were more likely to want to use HST compared to Catholics [OR = 1.77 (1.08, 2.95)], and those with "other" religion were less likely to want to use HST compared to Catholics [OR = 0.57 (0.35, 0.96)]. We observed a significant interaction

Table 2. Associations of HIV self-testing behaviors and sociodemographics among survey participants.

Sociodemographics, *n* (%)	Heard of HST	Want HST	Comfortable discussing HIV testing	Willing to Pass out HST kits
Sex				
Male	**288 (51.1)**	**421 (74.4)**	493 (86.3)	478 (84.3)
Female	**166 (44.0)**	**241 (64.1)**	337 (89.6)	320 (83.5)
Age (years)				
14–15	**71 (36.4)**	**120 (62.2)**	**167 (86.5)**	**153 (77.7)**
16–18	**107 (44.4)**	**162 (66.9)**	**204 (84.6)**	**196 (81.7)**
19–23	**123 (49.2)**	**187 (73.9)**	**214 (83.9)**	**221 (88.1)**
24+	**144 (62.3)**	**177 (76.3)**	**220 (94.0)**	**204 (87.9)**
Marriage				
Married	**125 (63.5)**	**157 (78.5)**	**188 (93.5)**	163 (83.2)
Not Married	**332 (43.9)**	**517 (68.5)**	**651 (85.8)**	639 (84.4)
Children				
Yes	**135 (64.3)**	**163 (76.2)**	**200 (93.5)**	181 (86.1)
No	**330 (44.2)**	**513 (68.8)**	**640 (85.5)**	625 (83.7)
Religion				
Catholic	202 (48.6)	**295 (71.3)**	378 (90.4)	**358 (86.1)**
Muslim	37 (48.7)	**49 (62.0)**	60 (78.9)	**60 (79.0)**
Protestant	96 (49.7)	**156 (80.4)**	173 (88.3)	**175 (90.2)**
None	24 (39.3)	**46 (73.0)**	56 (88.9)	**52 (83.9)**
Other	72 (54.6)	**85 (64.9)**	112 (86.8)	**101 (77.1)**
Cultural Identification				
Kamba	59 (48.4)	85 (70.3)	114 (91.9)	110 (91.2)
Kikuyu	73 (50.7)	94 (64.4)	133 (91.1)	120 (82.2)
Luhya	90 (43.7)	139 (67.8)	180 (87.0)	173 (82.4)
Luo	111 (53.1)	160 (76.9)	180 (86.1)	182 (86.3)
Other	67 (48.2)	100 (71.9)	124 (89.0)	114 (83.8)
Total # partners				
0	**131 (36.5)**	**226 (63.1)**	304 (84.7)	**286 (79.9)**
1	**108 (55.7)**	**138 (29.6)**	177 (89.4)	**167 (85.6)**
2–5	**110 (56.1)**	**162 (81.8)**	184 (92.0)	**179 (89.1)**
6–10	**30 (47.6)**	**50 (76.9)**	55 (85.9)	**53 (86.9)**
11+	**59 (51.5)**	**69 (71.9)**	85 (89.5)	**82 (85.4)**
STI				
Yes	71 (55.5)	98 (77.8)	115 (89.8)	104 (83.2)
No	387 (48.1)	564 (69.9)	713 (87.8)	684 (84.4)
Premarital Sex				
Yes	256 (50.4)	375 (73.7)	449 (88.4)	**453 (88.5)**
No	189 (47.3)	274 (68.0)	351 (86.5)	**320 (79.4)**
Condom Use				
Yes	130 (49.8)	186 (70.7)	237 (89.8)	**212 (80.3)**
No	316 (48.7)	460 (70.9)	571 (87.4)	**561 (86.0)**
Total	477 (48.5)	693 (70.4)	866 (87.6)	828 (84.2)

Note. Variables highlighted in bold have *p*-values <.05. HIV self-testing = HST.

between number of sexual partners and having heard of HST. Among those participants who had 0 lifetime sexual partners, 2–5 sexual partners, or 11+ sexual partners, those who had heard of HST were more likely to want to use HST compared to those who hadn't heard of HST [OR = 3.1 (1.74, 5.72), 4.18 (1.67, 11.6), and 1.27 (0.40, 3.90), respectively]. Among those with 1 lifetime sexual partner or 6–10 lifetime sexual partners, participants who had heard of HST were less likely to want to use HST compared to those who hadn't heard of HST [OR = 0.62 (0.29, 1.31), and 0.23

Table 3. Multivariable modeling main results of HIV self-testing knowledge and attitudes (odds ratios).

	Heard of HIV self-testing OR (95% CI)	Want HIV self-testing OR (95% CI)	Comfortable discussing HIV testing with friends and family OR (95% CI)	Willing to pass out HIV self-testing kits to friends and family OR (95% CI)
Sex (Ref = male)	0.95 [0.66,1.37]	0.65 [0.44, 0.96]	2.02 [1.10, 3.84]	0.97 [0.61, 1.56]
Age (Ref = 24+)				
14–15	0.59 [0.21,1.14]	1.07 [0.51, 2.21]	–	0.49 [0.21, 1.13]
16–18	0.70 [0.40,1.23]	1.17 [0.60, 2.27]	–	0.65 [0.28, 1.44]
19–23	0.67 [0.40,1.09]	0.97 [0.53, 1.76]	–	0.80 [0.38, 1.69]
Marriage (Ref = Married)	0.65 [0.39,1.05]	0.86 [0.46,1.55]	–	2.23 [1.13, 4.46]
Religion (Ref = Catholic)				
Protestant	–	1.77 [1.08, 2.95]	0.65 [0.32, 1.35]	1.21 [0.66, 2.31]
Muslim	–	0.82 [0.44, 1.54]	0.25 [0.11, 0.61]	0.87 [0.40, 2.08]
None	–	0.97 [0.50, 1.98]	0.74 [0.28, 2.21]	0.93 [0.42, 2.32]
Other	–	0.57 [0.35, 0.96]	0.72 [0.34, 1.58]	0.45 [0.25, 0.82]
Cultural Identification (Ref = Other)				
Kamba	0.78 [0.43, 1.39]	–	1.58 [0.52, 5.38]	–
Kikuyu	1.48 [0.85, 2.59]	–	1.01 [0.39, 2.68]	–
Luhya	0.98 [0.59, 1.62]	–	0.62 [0.26, 1.40]	–
Luo	1.45 [0.87, 2.41]	–	0.54 [0.22, 1.23]	–
Total # partners (Ref = 0)				
1	1.75 [1.09, 2.84]	–	1.85 [0.84, 4.29]	–
2–5	1.57 [0.93, 2.65]	–	1.81 [0.76, 4.57]	–
6–10	1.34 [0.64, 2.84]	–	0.80 [0.28, 2.48]	–
11+	2.17 [1.14, 4.17]	–	0.90 [0.34, 2.49]	–
Premarital sex (Ref = Against my beliefs)	–	0.74 [0.51, 1.06]	–	0.44 [0.28, 0.69]
Condom use (Ref = Against my beliefs)	–	1.23 [0.83, 1.82]	– –	–
Ever tested before (Ref = yes)	–	–	0.69 [0.35, 1.35]	0.66 [0.37, 1.20]
Tested today for HIV (Ref = yes)	–	–	–	–
Heard of HIV self-testing (Ref = no)	–	–	–	–
Tested Today*Ever Tested Before				
Tested today, tested before	REF	–	–	–
Tested today, did not test before	0.30 [0.13, 0.65]	–	–	–
Did not test today, tested before	0.54 [0.37, 0.79]	–	–	–

Did not test today, did not test before	0.44 [0.23, 0.80]	–	–	–
Lifetime Sexual Partners*Heard of HST				
0 partners, heard of HST	–	3.1 [1.74, 5.72]	–	–
1 partner, heard of HST	–	0.62 [0.29, 1.31]	–	–
2–5 partners, heard of HST	–	4.18 [1.67, 11.6]	–	–
6–10 partners, heard of HST	–	0.23 [0.04, 0.69]	–	–
11+ partners, heard of HST	–	1.27 [0.40, 3.90]	–	–
Age*Condom Use				
14–15, condoms appropriate	–	–	0.39 [0.08, 1.36]	–
16–18, condoms appropriate	–	–	0.80 [0.24, 2.33]	–
19–23, condoms appropriate	–	–	0.17 [0.03, 0.65]	–
24+, condoms appropriate	–	–	6.44 [1.18, 48.6]	–
Condom Use*Heard of HST				
Condoms appropriate, heard of HST	–	–	–	REF
Condoms appropriate, haven't heard of HST	–	–	–	1.02 [0.48, 2.14]
Condoms not appropriate, heard of HST	–	–	–	2.75 [1.32, 5.73]
Condoms not appropriate, haven't heard of HST	–	–	–	1.11 [0.58, 2.08]

(0.04, 0.69), respectively]. However, only the OR's among the participants with 0, 2–5, and 6–10 lifetime partners were statistically significant.

Gender and religion were significant fixed effects in modeling participants' comfort in discussing HIV testing. Females were more likely to be comfortable discussing HIV testing with friends and family than males [OR = 2.02 (1.10, 3.84)]. Participants who identified as Muslim were less likely to be comfortable discussing HIV testing compared to those who were Catholic [OR = 0.25 (0.11, 0.61)]. We also found a significant interaction between age and condom use. Among 14–15 year olds, 16–18 year olds, and 19–23 year olds, those who believed that condoms were appropriate were less likely to be comfortable discussing HIV testing than those who believed condoms were against their beliefs [OR = 0.39 (0.08, 1.36), 0.80 (0.24, 2.33), and 0.17 (0.03, 0.65), respectively]. Among those 24 years old and older, those who believed condoms are appropriate were more likely to be comfortable discussing HIV testing than those who believed using condoms was against their beliefs [OR = 6.44 (1.18, 48.6)].

Marriage, religion, and beliefs regarding premarital sex were significant fixed effects for passing out HST kits. Unmarried participants were more likely to be willing to pass out HST kits to friends and family than married individuals [OR = 2.2 (1.11–4.46)]. Participants who were "Other" religion were less likely to be willing to pass out HST kits compared to those participants who were Catholic [OR = 0.45 (0.25–0.82)]. Participants who believed it was not against their religion/culture to have premarital sex were less likely to be willing to pass out HST kits compared to participants where that is against their beliefs [OR = 0.44 (0.28–0.69)]. There was also an interaction between having heard of HST and condom use. Among those who had heard of HST, participants who believe that condoms were against their religious or cultural beliefs were much more willing to pass out HST kits to their friends and family compared to those who believe that condoms were appropriate to use [OR = 2.75 (1.32, 5.73)].

Discussion

The associations between sociodemographic variables and HST knowledge and attitudes were assessed among survey participants attending VAP soccer tournaments between April 2016 and April 2017 in Nairobi, Kenya. Overall, this group had very high rates of HIV testing compared to the national testing rates in Kenya (84.6% in our sample versus 53% of Kenyan women and 45% of Kenyan men, respectively) (AVERT, n.d.), as well as similar HIV prevalence to previously published statistics in Nairobi slums (10.9% compared to 12%) (Table 1) (Madise et al., 2012).

These data are a unique insight into the levels of HST knowledge and attitudes among attendees of sports-based HIV prevention program tournaments. These participants are somewhat aware of HST (48.5%), would want to test for HIV in private (70.4%), are comfortable discussing HIV testing with friends and family (87.6%), and are willing to pass out HST kits to friends and family (84.1%). This is very promising, as it shows oral HST kits could represent a desirable form of testing technology to this high-risk population. This is corroborated by studies that show high acceptability of HST, especially among young people in sub-Saharan Africa (Indravudh et al., 2017; Mokgatle & Madiba, 2017; Smith, Wallace, & Bekker, 2016; Stevens et al., 2018). However, one limitation is the price of the kits. In low- and middle-income countries, price per self-test ranges from $2 to $3 (public sector) and $8 to $16 (private sector) (Indravudh, Choko, & Corbett, 2018). This price range is out of reach of many inhabitants of sub-Saharan Africa, including Kenya, so this issue will need to be addressed.

In crude bivariate analysis (Table 2), older age, being married, having children, and having more sexual partners were consistently associated with positive HST beliefs and attitudes. Men in our surveys were more likely to want to use HST, most likely due to the lack of integration of HIV testing services into routine care (Musheke et al., 2013). Married people in Kenya are more likely to have ever tested for HIV, and more likely to have tested in the last 12 months than never married individuals, so this knowledge of HIV testing and status could translate into more knowledge and interest in HST (Staveteig, Wang, Head, Bradley, & Nybro, 2013). Many trials of HST have been performed using pregnant women and their male partners, and overall have been very acceptable (Choko et al., 2017; Masters et al., 2016). Having more lifetime sexual partners was associated with positive HIV preventive behaviors, which is promising. This is corroborated from a longitudinal study where those reporting two or more lifetime sexual partners were significantly more likely to have used HST compared to those who reported less than two lifetime sexual partners (Bil et al., 2017), and the Kenyan Demographic Health Survey showed that individuals who have had sex are more likely to have tested for HIV than those who have never had sex (Staveteig et al., 2013).

Interestingly, reporting that it is against your religious or cultural beliefs to have premarital sex was associated with a higher willingness to pass out HST kits to friends and family. This has not been previously reported. One potential explanation lies in one of the benefits to HST: privacy. A survey of black Africans living in London found that 40% of participants believed that people who disclosed their HIV status were at risk of isolation from their mosque or church (Fakoya et al., 2012). Therefore, individuals who engage in premarital sex despite it being against their religion or culture

may be motivated to conceal their HIV testing from others. Passing out HST kits would ensure friends and family had access to necessary HIV testing services and be done discreetly to prevent stigma.

When assessing level of comfort discussing HIV testing, the interaction showed that older people are both comfortable with using condoms and discussing HIV testing, which are ways to reduce their risk of HIV. Conversely, those under 24 years of age were more comfortable discussing HIV testing if they believed condoms were not appropriate, showing their preference for HIV testing as risk reduction over condoms. This finding could inform future interventions for HIV prevention, if younger people are more likely to test for HIV than use condoms.

Furthermore, we found that the group that was most likely to be willing to pass out HST kits was those who had heard of HST and who believed condoms are not appropriate to use. This group of individuals is knowledgeable about HIV testing, and if they believe condoms are not appropriate, then HIV testing is another way of HIV prevention. These individuals might be more likely to be willing to pass out a method of HIV prevention that also highlights privacy. This is important, as it shows that there could be another, more desirable option of HIV prevention in HST kits for those who do not want to use condoms.

Overall, participants who completed the survey had a high acceptability of HST, and a willingness to use this testing technology. This is consistent with a literature review on HST published in 2017, where 81%–100% of participants surveyed felt that HST was acceptable, and that the oral HST was more acceptable than the blood-based HST (Stevens et al., 2018). In one of the studies from the literature review, 94.5% of participants reported that local distribution of HST kits to neighbors without disclosing results would be acceptable (Choko et al., 2011). This is also very consistent with this data, where 84.1% of participants would be willing to pass out HST kits to friends and family. Future research should be done in other areas of Kenya and sub-Saharan Africa to compare these results to other populations of sports-based HIV prevention organizations. These organizations implement a wide variety of social services, from HIV prevention and tuberculosis prevention to anticorruption and gender empowerment; HST could be an important addition to better serve these populations.

Limitations

There are a few limitations with these data. These data are all self-report, so unconscious bias is possible. However, the completely anonymous nature of the survey should have reduced social desirability bias. There could also be incorrect responses from participants if they had issues with

comprehending certain questions. The survey was designed to be understood at a 3rd grade reading level, so there is confidence in the responses received. Furthermore, the comprehension algorithm minimized poor data quality. This survey was only available for those participants who were literate in English, Kiswahili, or Sheng, so the results from these surveys are only generalizable to those who are literate in any of these languages.

Conclusion

HST seems to be an important and novel way to increase testing rates. Overall, we found that this high-risk study population is highly motivated to test for HIV and willing to use HST on themselves and as a tool to motivate others to test. There are specific sociodemographic variables that are associated with better HST attitudes, including gender and believing it is against their religion to have premarital sex. Furthermore, some specific groups who had better HST attitudes are those who were younger and reported that condoms are not appropriate to use, and those who had both heard of HST and who believe condoms are not appropriate to use. This could be an interesting avenue for interventions to use HST, as it seems these groups are moving away from condoms as a HIV prevention tool. This research is a unique look into the attitudes toward HST in an unstudied population of attendants of sports-based HIV prevention tournaments in low-income areas of Nairobi, Kenya, and poses a unique opportunity to inform future interventions in these communities aimed to increase knowledge of HST and HIV testing rates.

Acknowledgments

We would like to thank the study staff at Vijana Amani Pamoja for their assistance, and the study participants for their time and effort, as this research would not be possible without their data.

Disclosure statement

The authors report no conflicts or declarations of interest.

Funding

South Carolina Clinical and Translational Research Institute under NIH/NCATS UL1 TR001450; the Medical University of South Carolina's Center for Global Health (CGH), National Center for Research Resources under Grants UL1RR029882 and UL1TR000062, and NCATS through Grants TL1 TR001451 & UL1 TR001450. None of these sources of support had any involvement in study design, analysis of data, writing of the report, or submission for publication.

References

AVERT. (n.d.). *HIV and AIDS in Kenya*. Retrieved April 17, 2017. From https://www.avert.org/professionals/hiv-around-world/sub-saharan-africa/kenya

Bil, J. P., Prins, M., Stolte, I. G., Dijkshoorn, H., Heijman, T., Snijder, M. B., … Zuure, F. R. (2017). Usage of purchased self-tests for HIV and sexually transmitted infections in Amsterdam, the Netherlands: Results of population-based and serial cross-sectional studies among the general population and sexual risk groups. *BMJ Open*, *7*(9), e016609. doi:10.1136/bmjopen-2017-016609

Choko, A. T., Desmond, N., Webb, E. L., Chavula, K., Napierala-Mavedzenge, S., Gaydos, C. A., … Corbett, E. L. (2011). The uptake and accuracy of oral kits for HIV self-testing in high HIV prevalence setting: A cross-sectional feasibility study in Blantyre, Malawi. *PLoS Medicine*, *8*(10), e1001102. doi:10.1371/journal.pmed.1001102

Choko, A. T., Kumwenda, M. K., Johnson, C. C., Sakala, D. W., Chikalipo, M. C., Fielding, K., … Corbett, E. L. (2017). Acceptability of woman-delivered HIV self-testing to the male partner, and additional interventions: A qualitative study of antenatal care participants in Malawi. *Journal of the International AIDS Society*, *20*(1), 21610. doi:10.7448/IAS.20.1.21610

Clark, T., Friedrich, G., Ndlovu, M., Neilands, T., & McFarland, W. (2006). An Adolescent-targeted HIV prevention project using African professional soccer players as role models and Educators in Bulawayo, Zimbabwe. *AIDS and Behavior*, *10*(S1), 77–S83. doi:10.1007/s10461-006-9140-4

Deblonde, J., De Koker, P., Hamers, F. F., Fontaine, J., Luchters, S., & Temmerman, M. (2010). Barriers to HIV testing in Europe: A systematic review. *The European Journal of Public Health*, *20*(4), 422–432. doi:10.1093/eurpub/ckp231

Delva, W., Michielsen, K., Meulders, B., Groeninck, S., Wasonga, E., Ajwang, P., … Vanreusel, B. (2010). HIV prevention through sport: The case of the Mathare Youth Sport Association in Kenya. *AIDS Care*, *22*(8), 1012–1020. doi:10.1080/09540121003758606

Fakoya, I., Johnson, A. M., Fenton, K. A., Anderson, J., Nwokolo, N., Sullivan, A. K., … Burns, F. M. (2012). Religion and HIV diagnosis among Africans living in London. *HIV Medicine*, *13*(10), 617–622. Retrieved from http://web.b.ebscohost.com.ezproxy-v.musc.edu/ehost/pdfviewer/pdfviewer?vid=0&sid=33e99267-db15-4fba-ab89-7c2667e7c73f%40sessionmgr104

Gichangi, A., Wambua, J., Mutwiwa, S., Njogu, R., Bazant, E., Wamicwe, J., … Korte, J. E. (2018). Impact of HIV self-test distribution to male partners of ANC clients. *Journal of Acquired Immune Deficiency Syndromes*, *74*(4), 467–473. doi:10.1097/QAI.0000000000001838

Harichund, C., & Moshabela, M. (2018). Acceptability of HIV self-testing in sub-Saharan Africa: Scoping study. *AIDS and Behavior*, *22*(2), 560–568. doi:10.1007/s10461-017-1848-9

Indravudh, P. P., Choko, A. T., & Corbett, E. L. (2018). Scaling up HIV self-testing in sub-Saharan Africa: A review of technology, policy and evidence. *Current Opinion in Infectious Diseases*, *31*(1), 14–24. doi:10.1097/QCO.0000000000000426

Indravudh, P. P., Sibanda, E. L., d'Elbée, M., Kumwenda, M. K., Ringwald, B., Maringwa, G., … Taegtmeyer, M. (2017). 'I will choose when to test, where I want to test.' *AIDS*, *31*, S203–S212. doi:10.1097/QAD.0000000000001516

Johnson, C. C., Kennedy, C., Fonner, V., Siegfried, N., Figueroa, C., Dalal, S., … Baggaley, R. (2017). Examining the effects of HIV self-testing compared to standard HIV testing

services: A systematic review and meta-analysis. *Journal of the International AIDS Society*, *20,* 21594. doi:10.7448/IAS.20.1.21594

Kaufman, Z. A., Spencer, T. S., & Ross, D. A. (2013). Effectiveness of sport-based HIV prevention interventions: A systematic review of the evidence. *AIDS and Behavior*, *17*, 987–1001. doi:10.1007/s10461-012-0348-1

Madise, N. J., Ziraba, A. K., Inungu, J., Khamadi, S. A., Ezeh, A., Zulu, E. M., … Mwau, M. (2012). Are slum dwellers at heightened risk of HIV infection than other urban residents? Evidence from population-based HIV prevalence surveys in Kenya. *Health & Place*, *18*(5), 1144–1152. doi:10.1016/j.healthplace.2012.04.003

Maleka, E. N. (2017). Monitoring and evaluation of sport-based HIV/AIDS awareness programmes: Strengthening outcome indicators. *SAHARA J: Journal of Social Aspects of HIV/AIDS Research Alliance*, *14*(1), 1–21. doi:10.1080/17290376.2016.1266506

Maro, C. N., Roberts, G. C., & Sørensen, M. (2008). Using sport to promote HIV/AIDS education for at-risk youths: An intervention using peer coaches in football. *Scandinavian Journal of Medicine & Science in Sports*, *19*(1), 129–141. doi:10.1111/j.1600-0838.2007.00744.x

Masters, S. H., Agot, K., Obonyo, B., Napierala Mavedzenge, S., Maman, S., & Thirumurthy, H. (2016). Promoting partner testing and couples testing through secondary distribution of HIV self-tests: A randomized clinical trial. *PLOS Medicine*, *13*(11), e1002166. doi:10.1371/journal.pmed.1002166

Mohlabane, N., Tutshana, B., Peltzer, K., & Mwisongo, A. (2016). Barriers and facilitators associated with HIV testing uptake in South African health facilities offering HIV Counselling and Testing. *Health SA Gesondheid*, *21*, 86–95. doi:10.1016/j.hsag.2015.11.001

Mokgatle, M. M., & Madiba, S. (2017). High acceptability of HIV self-testing among technical vocational education and training college students in Gauteng and North West Province: What are the implications for the scale up in South Africa? *PLoS One*, *12*(1), e0169765. doi:10.1371/journal.pone.0169765

Musheke, M., Ntalasha, H., Gari, S., McKenzie, O., Bond, V., Martin-Hilber, A., & Merten, S. (2013). A systematic review of qualitative findings on factors enabling and deterring uptake of HIV testing in Sub-Saharan Africa. *BMC Public Health*, *13*(1), 220. doi:10.1186/1471-2458-13-220

OraSure Technologies. (2016). *OraQuick*. Retrieved January 1, 2017, from www.oraquick.com

Harris, P. A., Thielke, R., Taylor, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). Research Electronic Data Capture (REDCap) – a metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics*, *42*, 377–381. doi:10.1016/j.jbi.2008.08.010

Smith, P., Wallace, M., & Bekker, L.-G. (2016). Adolescents' experience of a rapid HIV self-testing device in youth-friendly clinic settings in Cape Town South Africa: A cross-sectional community based usability study. *Journal of the International AIDS Society*, *19*(1), 21111. doi:10.7448/IAS.19.1.21111

Staveteig, S., Wang, S., Head, S. K., Bradley, S. E. K., & Nybro, E. (2013). *Demographic Patterns of HIV Testing Uptake in Sub-Saharan Africa: DHS Comparative Reports 30*. Retrieved from https://dhsprogram.com/pubs/pdf/CR30/CR30.pdf

Stevens, D. R., Vrana, C. J., Dlin, R. E., & Korte, J. E. (2018). A global review of HIV self-testing: Themes and implications. *AIDS and Behavior*, *22*(2), 497–512. doi:10.1007/s10461-017-1707-8

The Henry J. Kaiser Family Foundation. (2016). *HIV Testing in the United States*. Retrieved from http://www.kff.org/hivaids/fact-sheet/hiv-testing-in-the-united-states/

UNAIDS (2017). *Kenya launches self-test kits and PrEP*. Retrieved from http://www.unaids.org/en/resources/presscentre/featurestories/2017/may/20170505_kenya

UNAIDS (2019). *Global HIV & AIDS statistics — 2018 fact sheet*. Retrieved January 15, 2019, from http://www.unaids.org/en/resources/fact-sheet

US Department of Health and Human Services. (2018). *A timeline of HIV and AIDS*. Retrieved from https://www.hiv.gov/hiv-basics/overview/history/hiv-and-aids-timeline

Vijana Amani Pamoja. (2016). Retrieved January 1, 2017, from http://vijanaamanipamoja.org/

Weihs, M., & Meyer-Weitz, A. (2016). Barriers to workplace HIV testing in South Africa: a systematic review of the literature. *AIDS Care*, *28*(4), 495–499. doi:10.1080/09540121.2015.1109586

World Health Organization (2016). *Guidelines on HIV self-testing and partner notification: Supplement to consolidated guidelines on HIV testing services*. Retrieved from http://apps.who.int/iris/bitstream/10665/251655/1/9789241549868-eng.pdf