Characteristics of Male Partners Accessing Assisted Partner Services in Western Kenya

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Abstract

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APS involves notifying and testing sexual or drug injecting partners of people living with HIV (PLHIV) also known as index participants. Using data from an implementation science study in Western Kenya, we aim to analyze the characteristics in HIV exposed male partners named by female index participants to assess characteristics associated with male partner APS uptake and HIV testing. We analyzed data from HIV positive female indexes and their male partners from 31 facilities in Western Kenya from May 2018 to March 2020. We compared socio-demographic characteristics by APS enrollment (enrolled vs not enrolled) as well as HIV status (newly HIV positive, known HIV positive, HIV negative). We used multivariate binomial regressions to assess associations between characteristics and enrollment and HIV status. 1,724 female index clients enrolled and 5,141 male partners were elicited. Of these, 4,422 (86%) male partners enrolled into the study. APS uptake did not vary by age, marital status, education, income and county for female indexes whose male partners refused APS. Further, age, relationship status and occupation were statistically significantly associated in male partners who refused. Of the enrolled male partners, 1,291 (29.3%) were known HIV positive, 2,590 (58.8%) HIV negative and 524 (11.9%) were newly HIV positive. Male partners who newly tested positive for HIV were more likely to have four or more sexual partners (aRR 1.7, 95% CI 0.0-66.5). All other

characteristics were not associated with male partners newly testing positive for HIV. APS has high acceptability among male partners regardless of age, relationship status and occupation. 91.8% of newly HIV positive and 98.7% of known HIV positive male partners initiated ART. Findings from this study suggest that APS scale-up can aid in reaching the ambitious UNAIDS 95-95-95 goal in terms of testing and HIV care cascade in sub-Saharan Africa.

Introduction

For decades sub-Saharan Africa (SSA) has carried the world's burden for human immunodeficiency virus (HIV) with 71% of the global burden for infection while only accounting for 12% of the global population (1). In SSA, 80% of all people living with HIV (PLHIV) are concentrated in 12 countries mostly in southern and eastern Africa, Kenya being one of the twelve (10). Global trends show that while HIV prevalence is on the rise, acquired immune deficiency syndrome (AIDS) related deaths have significantly declined thanks to antiretroviral treatment (ART) (1). However, in order to receive this treatment as well as access HIV care, knowledge of one's HIV status is essential (2). The United Nation's 95-95-95 is a global strategy to control the HIV epidemic by having 95% of PLHIV know their status, 95% of those diagnosed getting antiretroviral treatment (ART), and 95% of those on ART being virally suppressed (7) This remains a challenge in Kenya where 20% of the estimated 1.3 million PLHIV are unaware of their HIV-positive status (13). Additionally, Kenya's adult HIV prevalence is above 5% meaning that a majority of sexually active individuals are at a high risk for developing the disease (1). Furthermore, men are more likely to be diagnosed with advanced stages of disease and have less ART coverage than women (9). Low rates of male testing and treatment drive HIV transmission to increase in their female partners (5). Reaching men with HIV testing and ART is an important priority (9). In order to address the gap between men and women for HIV testing and ART uptake, the World Health Organization (WHO) recommends nations should scale up assisted partner services (APS) (11).

Assisted partner services (APS) is a public health strategy implemented to reduce the spread of HIV by having trained service providers disclose consenting PLHIV ("index participant's")

status to their named sexual and/or drug injecting partners (3,2). Partners who test positive are encouraged to link to HIV treatment and care (3,2). This approach has the ability to identify undiagnosed PLHIV who are not yet linked to HIV care or treatment and continue to be a threat to spreading HIV vertically or through sexual and/or drug injecting partners (5). Previous research has shown that APS is an effective method of diagnosing PLHIV and linking them to HIV care (4). Recent research studies in SSA have shown that APS has identified a substantial number of individuals who are HIV positive, presenting a HIV positivity rate of 30%-63% when testing sexual partners of index participants as well as high median CD4 cell counts at diagnosis (4). In Zimbabwe, 6 months after APS was implemented the HIV positivity rate rose from 10% to over 30% where it was sustained (14). Whereas the HIV positivity rate at HIV facilities not using APS was a mere 4.1% (14). This indicates through APS, partners are being tested at earlier stages of their disease compared to those who are identified by facility-based testing and that APS is able to reach a population with high HIV prevalence (4). According to the UNAIDS, boys and men in SSA with HIV are less likely to know their HIV status than women and girls by 20% and are less likely to access treatment by 27% (12). The report also states that within key populations in SSA, HIV prevalence is consistently higher among men than women (12).

APS has had success in reaching male partners through their female HIV-positive partners since women have higher testing rates for HIV compared to men due to fewer testing opportunities (5). Premilitary analysis from an APS scale-up study has shown for every 100 men that are contacted and tested, 12-18 males are identified as newly HIV positive (4). This is a significant improvement compared to Kenya's average HIV testing service (HTS) yield of <2% (4). Despite this, not all men are reached, tested, and diagnosed with APS. Very limited data exists on the

characteristics of male partners that receive these services in SSA. Research that does exist, fails to show the proportion of men named by their female index partners who are unable to be traced, tested or diagnosed.

A cluster randomized controlled trial conducted in Western Kenya aimed to evaluate the effectiveness of APS when integrated with routine HIV testing services. Using secondary data from this study our objectives were to assess the characteristics associated with APS uptake among male partners of female index participants who are enrolled in APS versus those who are unenrolled. This will help understand what men are likely to be traced and agree to tested compared to those who are unable to be traced and tested. With this information, strategies can be developed into the APS program design to increase enrollment of the latter group. Additionally, we aim to identify the socio-demographic predictors of male partners who newly test positive, and partners who tested negative for HIV. By understanding which partners newly test HIV positive, APS will be better equip to achieve the first "95" in the United Nation's global strategy.

Methods

Study Design

This is a secondary analysis using program data from the APS Scale-up study in Western Kenya's Homa Bay and Kisumu County encompassing 31 study sites. We analyzed data on male partners of the female index clients.

Study Procedures

Female index participants were recruited at 31 health facilities in Western Kenya. Females (≥ 15 years old) who newly test positive for HIV were given information on the study, APS, and the study procedure. Those who consented to receiving APS were enrolled into the study and provided contact information for their recent (within the last 3 years) male sexual partners (≥ 18 years old). Male partners were contacted, informed of their HIV exposure, and offered HIV testing. Providers contacted partners up to three times by phone; if unsuccessful or if no phone number was provided, partners were physically traced in the community. Providers attempted to notify partners up to two more times if unsuccessful. After six unsuccessful attempts or if the partner refuses to meet with the provider, they were classified as lost to follow-up. Before being tested, partners were given the option to enroll into the study however, even if partners decline APS they are still able to receive HIV testing.

When initiating APS, providers offered partners HIV tests, asked about HIV testing history and provided HIV counseling. Those with a prior diagnosis were asked about current HIV care and if partners were out of care they are informed where to access care as well as the benefits. After testing, all participants who were HIV positive are linked to care if they were not already.

Providers made phone calls to HIV positive study participants to follow up, link them to care, and measure retention at 6 weeks and 6 months. For male partners, APS providers called to first explain the study and conduct exposure notification. If the partner didn't answer after 3 calls, a home tracing was done. For male partners with an unknown phone number, home tracing was done without a phone call. Progress was self-reported by the study participant. At 12 months post enrollment participants had a physical clinical care visit to the comprehensive care center

where HIV viral load testing was done. At all follow-up timepoints, three attempts were made to reach the participant over the phone; if unsuccessful they were physically traced.

Study Sites

HTS and APS were implemented at 31 health facilities in Homa Bay and five Kisumu County wards.

Study Population

As of March 2020, 1724 female index participants and 3201 male partners were recruited. Recruitment began in May and November of 2018 in the Western Kenyan counties of Homa Bay and Kisumu.

Inclusion Criteria for Female Index Participants

Females aged ≥ 18 years old or emancipated minors (girls ≥ 15 years old who were married), who are HIV positive and not currently enrolled in care or on treatment, willing to provide contact information of ≥ 1 male sex partner, consent to study and are willing to participate in the study and at low risk of IPV.

Inclusion Criteria for Male Partners

Males aged ≥ 18 years old, sexual partner of female index in the last 3 years, consent to the student and are willing to participate in the study.

Data Collection

An open-source Open Data Kit (ODK) platform was used to collect study data through questionnaires that are administered on tablets or Android smartphones. Encrypted data for storage on these devices is transferred to another secure and encrypted Kenya National AIDS and Sexually Transmitted Infection Control Programme (NASCOP) server. At the University of Washington (UW), the study database is backed up daily to a secure server.

Data Analysis

We summarized continuous variables using mean and inter-quartile range (IQR) and categorical variables using percentages. Socio-demographics of female indexes and male partners were compared by enrollment status (enrolled, not enrolled) using a chi-squared test. Socio-demographics of enrolled male partners were compared by HIV status (newly diagnosed HIV positive and HIV negative) using a chi-squared test. Demographics that both improved model fit and were statistically significant ($p<0.05$) in the univariate regression were included in the multivariate model. We used a multivariate binomial regression and Generalized Estimating Equations (GEE) to cluster the model by female index participant since they could have multiple partners. The analysis was performed using Stata Software version 16.1.

Results

From May 2018 to March 2020, 1,724 female index clients enrolled in APS. The mean age for female index clients was 29 (IQR 15, 71) (**Table 1a**). A majority of male partners were elicited from female indexes in monogamous marriages (59.0%), 6.3% were in polygamous marriages, 18.1% were single/never married and 16.6% were divorced, separated or widowed. Additionally, 72.2% of female indexes reported not living with their male partner(s). The average number of

partners for female indexes was 4 (range of 1 to 9). IPV was relatively low (1.1%) among female indexes.

Characteristics associated with male partner enrollment

Overall 5,141 male partners were elicited from enrolled female indexes. Of that, 4,422 were enrolled into the study. The mean age for male partners was 37 (IQR 15, 80) Characteristics of male partners as reported by their female index client are shown in (**Table 1b**. A majority of male partners elicited were reported to have a boyfriend/girlfriend (65.8%) and 24.9% were married. Most male partners were reported to be employed (80.6%) either formally or self-employed, 8.3% were unemployed and 2.5% reported being students.

Table 1. Characteristics of Male Partners Elicited and their female index partners by male partner enrollment status (N=5,141)

Table 1a. Characteristics of Female Index Clients by male partner enrollment status		Not Enrolled Male Partners **N=719**	Enrolled Male Partners **N=4,422**	p-value
		N(col %)	**N(col %)**	
Age(mean, IQR)		28 (15-71)	29 (15-71)	0.04
Marital Status				0.00
	Single/Never Married	158 (22.0)	770 (17.4)	
	Married (Monogamous/Cohabiting)	374 (52.0)	2,661 (60.2)	
	Married (Polygamous)	29 (4.0)	297 (6.7)	
	Divorced/Separated/Widowed	158 (22.0)	694 (15.7)	
Highest Education Completed				0.41
	Did Not Complete Primary School	192 (26.7)	1,214 (27.5)	
	Primary School	367 (51.0)	2,119 (47.9)	
	Secondary School	115 (16.0)	792 (17.9)	
	Post-Secondary School	45 (6.3)	297 (6.7)	

Occupation				0.00
	Employed	290 (40.3)	1,851 (41.9)	
	Self-Employed	281 (39.1)	1,890 (42.8)	
	Unemployed	111 (15.4)	345 (7.8)	
	Student	37 (5.2)	336 (7.6)	
Income (Kenyan Shilling- KSh)				0.46
	0 to 10,000 KSh	519 (82.2)	3,583 (81.0)	
	10,000 to 50,000 KSh	128 (17.8)	839 (19.0)	
# of Partners (mean, IQR)		3 (1-9)	4 (1-9)	0.00
Lived with Partner				0.00
	No	479 (66.6)	3,233 (73.1)	
	Yes	240 (33.4)	1,189 (26.9)	
Experienced IPV				0.04
	No	706 (98.2)	4,308 (99.0)	
	Yes	12 (1.8)	42 (1.0)	
Female partner risk behavior				
Any risk Behavior				0.00
	No	281 (39.1)	2,304 (52.1)	
	Yes	438 (60.9)	2,118 (47.9)	
Inconsistent Condom Use				0.00
	No	552 (76.8)	3,521 (79.6)	
	Yes	167 (23.2)	901 (20.4)	
No Condom Use in Last Sex				0.87
	No	608 (84.6)	3,750 (84.8)	
	Yes	111 (15.4)	672 (15.2)	
Ever Used PrEP				0.49
	No	719 (100.0)	4,419 (99.9)	
	Yes	0 (0.0)	3 (0.1)	
IUD Sharing Needle				0.01
	No	718 (99.9)	4,422 (100.0)	
	Yes	1 (0.1)	0 (0.0)	
Recent STI				0.25
	No	709 (98.6)	4,381 (99.1)	
	Yes	10 (1.4)	41 (0.9)	
Recurrent PrEP				0.42

Use				
	No	719 (100.0)	4,418 (99.9)	
	Yes	0 (0.0)	4 (0.1)	
Multiple Sexual Partners				0.00
	No	623 (86.7)	4,161 (94.1)	
	Yes	75 (11.8)	261 (5.9)	
Sex Under Influence of Drugs				0.35
	No	717 (99.7)	4,398 (99.5)	
	Yes	2 (0.3)	24 (0.5)	
High Sexual HIV Risk				0.06
	No	687 (95.5)	4,284 (96.9)	
	Yes	32 (4.5)	138 (3.1)	
HIV Positive Sexual Partner				0.42
	No	705 (98.0)	4,354 (98.5)	
	Yes	14 (2.0)	68 (1.5)	
Transactional Sex				0.00
	No	714 (99.3)	4,416 (99.9)	
	Yes	5 (0.7)	6 (0.1)	
County				0.00
	Homa Bay	269 (37.4)	2,584 (58.5)	
	Kisumu	450 (62.6)	1,838 (41.6)	

Table 1b. Characteristics of Male Partners elicited as reported by the female index client		Unenrolled Male Partners **N=719**	Enrolled Male Partners **N=4,422**	p-value
		N(col %)	**N(col %)**	
Age(mean, IQR)		36 (17-75)	37 (15-80)	0.93
Type of partner				0.01
	Married	210 (29.2)	1,071 (24.2)	
	Committed Relationship	457 (63.6)	2,926 (66.2)	
	Other	52 (7.2)	425 (9.6)	
Occupation				0.00
	Employed	367 (54.3)	2,182 (52.1)	
	Self-Employed	146 (21.6)	1,231 (29.4)	
	Unemployed	57 (8.4)	356 (8.3)	
	Student	21 (3.1)	100 (2.4)	

	Other	85 (12.6)	332 (7.9)	
How Partner Learned of Index HIV+ Status				0.25
	Health provider	1 (0.5)	14 (1.3)	
	Partner (less than 2 months ago)	8 (4.0)	58 (5.2)	
	Partner (over 2 months ago)	14 (7.1)	74 (6.6)	
	Other	8 (4.0)	14 (1.3)	
Does Partner Know Their HIV Status?				0.00
	No	30 (4.2)	219 (5.0)	
	Yes	31 (4.3)	166 (3.8)	
	Don't Know	658 (91.5)	4,037 (91.2)	

IQR, interquartile range; STI, sexually transmitted infection

In multivariate regression, male partners who refused APS were more likely to have female index client who were unemployed (adjusted relative risk (aRR) 1.5, 95% CI: 1.2-1.9), reported risk behaviors such as had a recent STI, (aRR: 1.6, 95% CI: 0.8, 3.2), multiple sex partners (aRR: 1.8 95% CI: 1.4, 2.3), and transactional sex (aRR: 3.6 95% CI: 1.8, 7.1) (Table 2a). However, male partners who did not report any risk behavior (aRR: 1.6 95% CI: 1.3, 1.9) were more likely to refuse APS.

Table 2. Association between APS refusal and demographics of female index clients and male partners in Kenya

Table 2a. Characteristics		**RR (95% CI)**	**aRR (95% CI)**
Female Index			
Age (years)			
	≤ 25	Reference	
	>25	1.0 (0.8, 1.2)	--
Marital Status			
	Single/Never Married	Reference	Reference
	Married (Monogamous/Cohabiting)	0.7 (0.6, 0.9)	0.8 (0.7, 1.0)
	Married (Polygamous)	0.5 (0.3, 0.8)	0.7 (0.4, 1.0)

	Divorced/Separated/Widowed	1.1 (0.8, 1.4)	1.3 (1.0, 1.6)
Highest Education Completed			
	Did not Complete Primary School	Reference	
	Primary School	1.1 (0.9, 1.3)	--
	Secondary School	0.9 (0.7, 1.2)	--
	Post-Secondary School	1.0 (0.7, 1.4)	--
Occupation			
	Employed	Reference	Reference
	Self-Employed	1.0 (0.8, 1.1)	0.9 (0.8, 1.1)
	Unemployed	1.8 (1.4, 2.3)	1.5 (1.2, 1.9)
	Student	0.7 (0.5, 1.1)	0.7 (0.5, 1.1)
Income (Kenyan Shilling- KSh)			
	0 to 10,000 KSh	Reference	
	10,000 to 50,000 KSh	1.0 (1.0, 1.0)	--
Lived with Partner			
	No	Reference	
	Yes	1.3 (1.1, 1.5)	--
Experienced IPV			
	No	Reference	
	Yes	1.7 (0.9, 3.3)	--
Risk Behavior			
	Yes	Reference	Reference
	No	0.6 (0.5, 0.7)	1.6 (1.3, 1.9)
Inconsistent Condom Use			
	No	Reference	
	Yes	1.2 (0.9, 1.4)	--
No Condom in Last Sex			
	No	Reference	
	Yes	1.0 (0.8, 1.3)	--
IUD Sharing Needle			
	No	Reference	
	Yes	N/A	--
Recent STI			
	No	Reference	
	Yes	1.4 (0.6, 3.3)	--
HIV Positive Sexual Partner			
	No	Reference	

	Yes	1.2 (0.7, 2.1)	--
Transactional Sex			--
	No	Reference	Reference
	Yes	3.3 (1.4, 7.9)	3.6 (1.8, 7.1)
Multiple Sex Partner			
	No	Reference	Reference
	Yes	2.1 (1.6, 2.6)	1.8 (1.4, 2.3)
County			
	Homa Bay	Reference	--
	Kisumu	0.5 (0.4, 0.6)	--
	Male Partners		
Age (years)			
	≤ 25	Reference	Reference
	>25	0.9 (0.7, 1.1)	0.9 (0.8, 1.2)
Relationship Status			
	Married	Reference	Reference
	Boyfriend/Girlfriend	1.0 (1.0, 1.1)	1.0 (1.0, 1.1)
	Other	1.1 (1.0, 1.1)	1.1 (1.0, 1.1)
Occupation			
	Employed	Reference	Reference
	Self-Employed	0.8 (0.5, 1.3)	0.8 (0.6, 1.2)
	Unemployed	0.7 (0.4, 1.1)	0.6 (0.4, 0.9)
	Student	0.8 (0.5, 1.3)	0.7 (0.4, 1.1)
	Other	1.4 (0.8, 2.2)	1.2 (0.8, 1.8)

RR, Relative Risk; aRR, Adjusted Relative Risk

Characteristics of enrolled male partners

Of the 4,404 enrolled male partners (17 male partners were not included due to their unknown HIV status), 1,291 (29.3%) already knew their HIV status (Known Positive), 2,590 (58.8%) tested HIV negative and 524 (11.9%) were diagnosed newly HIV positive (**Table 3**). The mean age for enrolled male partners was 36 (IQR 15, 78). A majority of the male partners were in a monogamous marriage (76.5%), an additional 5.7% were in a polygamous marriage, 13% identified as single/never married and 4.8% were divorced, separated, or widowed. Newly HIV positive and known HIV positive partners had higher proportions of polygamous marriages (8.8% and 7.3% respectively) compared to HIV negative partners (4.2%). While 11.8% of newly

HIV positive partners and 6.7% of known positives were single or never married compared to 16.4% of HIV negative partners. Most of the enrolled male partners reported completing primary school (29.3%) and had employment (90.6%) either formally or self-employed. 59.8% reported a monthly income of 0-10,000 KSh. At 12 months of follow up men reported low IPV and the majority were on ART (Known HIV positive (98.7%), newly HIV positive (91.8%)).

Table 3. Demographic predictors of male partners by HIV status (Newly Positive, Known Positive, Negative) (N=4,404*)

Characteristics		Newly Positive (N=524)	Known Positive (N=1,291)	Negative (N=2,590)	p-value
		N(col %)	N(col %)	N (col%)	
Overall		524 (11.9)	1,291 (29.3)	2,590 (58.8)	
Age (mean, IQR)		37 (15-74)	39 (16-78)	35 (16-76)	0.00
Marital Status					0.00
	Single/Never Married	62 (11.8)	86 (6.7)	424 (16.4)	
	Married (Monogamous/Cohabiting)	385 (71.6)	1,034 (80.1)	1,951 (75.3)	
	Married (Polygamous)	46 (8.8)	95 (7.3)	108 (4.2)	
	Divorced/Separated/ Widowed	31 (5.9)	76 (5.9)	106 (4.1)	
Highest Education Completed					0.00
	Did not Complete Primary School	110 (21.0)	236 (18.3)	417 (16.1)	
	Primary School	200 (38.1)	558 (43.2)	1,026 (39.6)	
	Secondary School	143 (27.3)	354 (27.4)	793 (30.6)	
	Post-Secondary School	71 (13.6)	143 (11.1)	354 (13.7)	
Occupation					0.00
	Employed	217 (41.3)	524 (40.6)	959 (37.0)	
	Self-Employed	260 (49.7)	671 (52.0)	1,360 (52.6)	
	Unemployed	38 (7.3)	83 (6.4)	197 (7.6)	
	Student	37 (1.7)	13 (1.0)	73 (2.8)	
Income (Kenyan					0.08

Shilling- KSh)					
	0 to 10,000 KSh	298 (56.8)	753 (58.3)	1,584 (61.2)	
	10,000 to 50,000 KSh	226 (43.2)	538 (41.7)	1,005 (38.8)	
# of Partners					0.23
	0-3	313 (60.8)	687 (56.1)	2 (66.7)	
	4+	201 (39.2)	538 (43.9)	1 (33.3)	
Risk Behavior					0.00
	No	312 (59.5)	--	1,570 (60.6)	
	Yes	212 (40.5)	--	1,020 (39.4)	
Inconsistent Condom Use					0.00
	No	413 (78.8)	--	2,080 (80.3)	
	Yes	111 (21.2)	--	510 (19.7)	
Condom Use in Last Sex					0.00
	No	430 (82.0)	--	2,119 (81.8)	
	Yes	94 (18.0)	--	472 (18.2)	
Ever Used PrEP					0.00
	No	524 (100.0)	--	2,563 (99.0)	
	Yes	0 (0.0)	--	27 (1.0)	
IDU Sharing Needle					0.00
	No	521 (99.4)	--	2,589 (100.0)	
	Yes	3 (0.6)	--	1 (0.0)	
Recent STI					0.00
	No	523 (99.8)	--	2,564 (99.0)	
	Yes	1 (0.2)	--	26 (1.0)	
Recurrent PEP USE					0.12
	No	524 (100.0)	--	2,584 (99.8)	
	Yes	0 (0.0)	--	6 (0.2)	
Sex Under Influence of Drugs					0.00
	No	524 (100.0)	--	2,573 (99.3)	
	Yes	0 (0.0)	--	17 (0.7)	
Multiple Sexual Partner					0.00
	No	468 (89.5)	--	2,320 (89.6)	
	Yes	56 (10.5)	--	270 (10.4)	
High HIV Sexual Risk					0.00

	No	516 (98.5)	--	2,566 (99.1)	
	Yes	8 (1.5)	--	24 (0.9)	
HIV Positive Sexual Partner					0.00
	No	486 (92.7)	--	2,379 (91.8)	
	Yes	38 (7.3)	--	211 (8.2)	
Transactional Sex					0.23
	No	523 (99.8)	--	2,584 (99.8)	
	Yes	1 (0.2)	--	6 (0.2)	
IPV Reported					0.11
	No	523 (99.8)	1,289 (99.9)	2,590 (100.0)	
	Yes	1 (0.2)	2 (0.1)	0 (0.0)	
On ART (6 week follow-up)					0.00
	No	42 (8.2)	17 (1.3)	0 (0.0)	
	Yes	470 (91.8)	1,259 (98.7)	1 (100.0)	

*Unknown HIV results were not included (N=17)

In a multivariate regression restricted to newly diagnosed HIV positive male partners and HIV-negative male partners, those who newly tested positive for HIV were more likely to have four or more sexual partners (aRR 1.7, 95% CI: 0.0-66.5) compared to male partners with less than four sexual partners. All other characteristics such as age, marital status, education occupation, income, risk behaviors, county and ART uptake were not associated with male partners newly testing positive for HIV.

Table 4. Association between HIV status (Newly HIV Positive and HIV Negative) and demographics of male partners in Kenya

Characteristics		RR (95% CI)	aRR (95% CI)
Age (years)			
	≤ 25	Reference	Reference
	>25	0.9 (0.9, 1.0)	1.0 (0.9, 1.0)
Marital Status			
	Single/Never Married	Reference	Reference
	Married (Monogamous/	0.9 (0.9, 1.0)	1.0 (0.9, 1.0)

	Cohabiting)		
	Married (Polygamous)	0.8 (0.7, 0.9)	0.8 (0.7, 0.9)
	Divorced/ Separated/ Widowed	0.9 (0.8, 1.0)	0.9 (0.8, 1.0)
Highest Education Completed			
	Did not Complete Primary School	Reference	Reference
	Primary School	1.1 (1.0, 1.1)	1.1 (1.0, 1.1)
	Secondary School	1.1 (1.0, 1.1)	1.1 (1.0, 1.2)
	Post-Secondary School	1.1 (1.0, 1.1)	1.1 (1.0, 1.1)
Occupation			
	Employed	Reference	
	Self-Employed	1.0 (1.0, 1.1)	--
	Unemployed	1.0 (1.0, 1.1)	--
	Student	1.1 (1.0, 1.2)	--
Income (Kenyan Shilling- KSh)			
	0 to 10,000 KSh	Reference	
	10,000 to 50,000 KSh	1.0 (0.9, 1.0)	--
Risk Behavior			
	No	Reference	Reference
	Yes	1.0 (1.0, 1.0)	1.0 (1.0, 1.0)
Inconsistent Condom Use			
	No	Reference	
	Yes	1.0 (0.9, 1.0)	--
Condom Use in Last Sex			
	No	Reference	
	Yes	1.0 (1.0, 1.0)	--
Ever Used PrEP			
	No	Reference	
	Yes	N/A	--
IDU Sharing Needle			
	No	Reference	
	Yes	0.3 (0.1, 1.6)	--
Recent STI			
	No	Reference	
	Yes	1.2 (1.1, 1.3)	--
Number of Partners			
	0-3	Reference	Reference
	4+	1.7 (0.2, 18.7)	1.7 (0.0, 66.5)

Sex under the Influence of Drugs			
	No	Reference	
	Yes	N/A	--
Multiple Sexual Partners			
	No	Reference	
	Yes	1.0 (0.9 1.0)	--
High Sexual HIV Risk			
	No	Reference	
	Yes	1.0 (0.9 1.0)	--
HIV Positive Sexual Partner			
	No	Reference	
	Yes	1.0 (1.0, 1.1)	--
Transactional Sex			
	No	Reference	
	Yes	1.0 (0.8, 1.4)	--
County			
	Homa Bay	Reference	
	Kisumu	1.0 (0.9, 1.0)	--
On ART			
	No	Reference	
	Yes	N/A	--

Discussion

As investment and diversification of HIV testing increases, the number of PLWH continues to decline (4). APS is shown to be an effective strategy in eliciting subgroups that remain undiagnosed such as men who are systematically missed by HTS (4,5). However, there are currently no studies that look at the male partner characteristics of those who are elicited by APS. In this paper, we address that gap by assessing the efficacy of APS enrollment through characteristics of female index participants and their male partners. Overall, there was high male enrollment into APS across demographics of both female indexes and male partners with 86% of partners elicited, enrolling into APS regardless of age, relationship status and occupation.

This is a reassuring finding that we aren't systematically missing any segment of the male partner population. However, there were a few characteristics female indexes possessed which were associated with male partner refusal of APS such as being divorced, widowed or separated (aRR: 1.3 95% CI: 1.0, 1.6) or not reporting a risk behavior (aRR: 1.6 95% CI: 1.3, 1.9). We found that a majority of male partners were elicited female indexes who completed primary school (48.4%) as their highest form of education, were employed in some capacity (83.9%) and had low household income with 81.2% stating their monthly income being 0 to 10,000 KSh (Kenyan Shilling).

Further, male partners were largely elicited from female indexes who were in monogamous marriages (59.0%), 6.3% were in polygamous marriages, 18.1% were single/never married and 16.6% were divorced, separated or widowed. Female indexes who were divorced, separated, or widowed were associated with a 30% decrease in enrollment in their male partners. This may be because female indexes feel less inclined to disclose information about their previous partners, or do not have up-to-date contact information for their former partner. Further research is needed to understand this dynamic. A majority of male partners were in a relationship (65.8%), followed by marriage (24.9%). However, other than female indexes who were divorced, separated, or widowed, neither female or male relationship status showed no statistically significant association with APS enrollment in male partners. This is not consistent with previous research which has found that married index clients typically have higher rates of APS referral among partners. In a study conducted in Tanzania, researchers found that index clients who were married were 2.5 times more likely to successfully refer their partner to HIV testing compared to those who weren't (15). Additionally, a 2014 study conducted in Western Kenya looking at

barriers related to APS found that marital status was associated with increased HIV testing, married couples having the highest testing outcomes (16).

Key populations such as female sex workers are disproportionately affected by HIV and comprise around 36% of the new adult HIV infection annually (11). Our study found that male partners elicited from female sex workers were 3 times more likely to refuse APS services. A study conducted in Nigeria looking at APS in key populations (including female sex workers) contradicts this finding as its results show partners that were elicited from female sex workers had high uptake of HIV testing (84.1%) (11). However, our findings may not accurately describe the population as the proportion of female index partners who participated in transactional sex was low (<1%). Due to low study power, further studies are needed to examine this association. Additionally, age, marital status, education, income and county were not associated with APS refusal after controlling for potential confounders.

Unfortunately, this study did not capture reasons for APS refusal in male partners. However, other literature has cited stigma as a potential barrier in APS acceptability. Stigma has played a major role in impeding participation of HIV prevention and care (17,18). Understanding the toll it has taken on men, who are less likely to engage in HIV care, is vital to meet the UN 95-95-95 goal. Qualitative research from Mozambique looking at the gendered relationship between HIV stigma and HIV testing found that compared to women, men had a lowered uptake in HIV testing (17). Furthermore, men who indicated HIV stigma as a barrier had lower odds of HIV testing by 35%, an association that was not observed in women (17). Another study based in Uganda conducted interviews and focus groups with PLIHV and found gender constructs around

HIV stigma (18). Conceptions of masculinity linked with societal expectations of men contributed to their heighten sense of stigma around HIV and increased distance from HIV care (18). Further qualitative data is needed to assess the role stigma plays in APS acceptability for male partners.

Our study found that male partners who tested newly positive versus negative for HIV possessed relatively the same characteristics, with the exception of number of sexual partners. In a multivariate regression, male partners who newly tested positive for HIV were around twice as likely to have four or more sexual partners (aRR 1.7, 95% CI: 0.0-66.5) compared to male partners with less than four sexual partners. A South African study researching concurrent sexual partners and HIV risk found that men who had multiple partners overlapping in the past 6 months were 50% more likely to be HIV positive (19). Additionally, we found virtually all newly HIV positive male partners were on ART at 12 months post follow up (91.8%). These figures are encouraging as they show APS has high linkage to care for newly HIV positive. These numbers take us closer to the UN 95-95-95 goal of having 95% of diagnosed PLHIV getting ART. Although literature surrounding ART initiation and real-world APS are limited, these results support a previous study that partner notification yields high ART initiation. A HIV testing and ART initiation study in Eswatini found that through partner notification 95% of index's HIV positive partners initiated ART after being enrolled into the study (20). Further research show be conducted to explore the relationship between APS enrollment and ART initiation.

These findings should be viewed in light of study limitations. Key outcomes such as ART uptake were self-reported by study participants which may lead to reporting bias as results might not be an accurate depiction. Male partners who were known HIV positives did not provide information on their risk behavior resulting in Table 4 only including associations between HIV negative and newly HIV positive partners. Further study of risk behaviors with known HIV positive partners is needed to get an accurate picture of how association varies by HIV status. Additionally, male clients who have sex with men were not enrolled in this study despite the fact that they are a key population who should have access to APS. This is something that should be explored in future studies.

Strengths of this study include the power to use a large-scale implementation study to analyze APS acceptability instead of a clinical trial. To our knowledge this study was the first to assess socio-demographic characteristics associated with APS uptake and ART initiation among male partners. Findings from this study suggest that APS scale-up can aid in reaching the ambitious UN 95-95-95 goal in terms of testing and HIV care cascade in SSA.

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