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Factors Associated with Uptake of HIV Test Results in a Nationally Representative Population-Based AIDS Indicator Survey

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Abstract: Population-based surveys with HIV testing in settings with low testing coverage provide opportunities for participants to learn their HIV status. Survey participants (15-64 years) in a 2007 nationally representative population-based HIV serologic survey in Kenya received a voucher to collect HIV test results at health facilities 6 weeks after blood draw. Logistic regression models were fitted to identify predictors of individual and couple collection of results. Of 15,853 adults consenting to blood draw, 7,222 (46.7%) collected HIV test results (46.5% men, 46.8% women). A third (39.5%) of HIV-infected adults who were unaware of their infection and 48.2% of those who had never been tested learned their HIV status during KAIS. Individual collection of HIV results was associated with older age, with the highest odds among adults aged 60-64 years (adjusted odds ratio [AOR], 1.6, 95% confidence interval [CI] 1.2-2.1); rural residence (AOR 1.8, 95%CI 1.2-2.6); and residence outside Nairobi, with the highest odds in the sparsely populated North Eastern province (AOR 8.0, 95%CI 2.9-21.8). Of 2,685 married/cohabiting couples, 18.5% collected results as a couple. Couples in Eastern province and in the second and middle wealth quintiles were more likely to collect results than those in Nairobi (AOR 3.2, 95%CI 1.1-9.4) and the lowest wealth quintile (second AOR 1.5, 95%CI 1.1-2.3; middle AOR 1.6, 95% CI 1.2-2.3, respectively. Many participants including those living with HIV learned their HIV status in KAIS. Future surveys need to address low uptake of results among youth, urban residents, couples and those with undiagnosed HIV infection.

Keywords: AIDS indicator survey, HIV, HIV test results, Kenya, population-based.

INTRODUCTION

Many countries with generalized HIV epidemics routinely conduct nationally-representative, population-based surveys [e.g., Demographic and Health Surveys (DHS) or AIDS Indicator Surveys (AIS)] with an HIV testing component to quantify HIV prevalence, plan prevention, care and treatment services and evaluate the national HIV program [1, 2]. In recent years, discourse on the ethics of HIV testing in population-based surveys has highlighted the right of survey participants to learn their HIV status in order to access increasingly available HIV health services [3, 4]. These arguments stem from the belief that research and survey participants have rights to appropriate information before, during and after studies to help them make informed choices and access appropriate services [5].

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In 2009, a UNAIDS/WHO consultation on Ethics in HIV Surveillance recommended use of HIV surveillance approaches that maximize beneficial outcomes for individuals and communities [6]. Additionally, countries were advised to make informed decisions on how best to balance the benefits and risks of returning HIV and other test results to participants. In 1995, the United States (U.S.) discontinued unlinked anonymous testing (UAT) for HIV infection among mothers and infants due to availability of HIV treatment and subsequently ended funding of all UAT surveys of HIV [7].

In developing countries, reporting biological results to survey participants needs to be balanced against several factors, including where tests are performed, social meaning of the disease, the physical and social contexts in which reporting occurs and the health care delivery system [4]. Past surveys in Kenya and elsewhere have used several approaches to help survey participants learn their HIV status. These approaches include referral for free voluntary counseling and testing (VCT) services, mobile VCT, and travel reimbursement to HIV testing sites [2, 8]. In the 2003

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Kenya DHS, participants were either referred to the nearest VCT site or to a mobile VCT site in regions with no VCT services to learn their HIV status [9]. The survey did not effectively measure uptake of VCT services among survey participants, however, available data indicate that females (15-49 years) who accessed VCT had a higher HIV prevalence (13%) compared to the national female HIV prevalence (9%) while male participants who accessed VCT had HIV prevalence similar to the national male HIV prevalence (5%).

Surveys that have directly returned results to participants have done so either in the home at the time of the interview [10] or they have made results available in designated health facilities after centralized laboratory testing [11]. In rural southwestern Uganda, rapid home-based HIV testing and counseling (HBTC) of population-based cohort study participants in selected clusters in a population-based sero-survey resulted in a significant three-fold (37%) increase of HIV testing and counseling compared to an uptake of less than 10% in previous surveys [12]. The 2007 Kenya AIDS Indicator Survey (KAIS) used a facility-based approach to inform participants of their HIV test results [11]. To inform planning of future surveys, we report uptake and describe the characteristics of individuals and couples who collected HIV test results in the 2007 KAIS and examine factors associated with individual and couple collection of results.

METHODS

The 2007 KAIS was a cross-sectional, two stage cluster sampling survey of Kenyan adults aged 15-64 years designed to provide national and provincial estimates of socio-demographic, behavioral, and biologic correlates of HIV infection. In addition to a structured questionnaire, venous blood samples were drawn from consenting participants for HIV antibody testing (Vironostika HIV-1/2 antigen/antibody EIA for screening, Murex HIV.1.2.O EIA for confirmation, with discrepancies resolved by Roche Amplicor HIV DNA PCR v1.5). For participants who could not provide venous blood, dried blood spots were collected for HIV testing (Vironostika HIV UNIFORM II Plus O v 3.3 and Murex HIV 1.2.0). Samples were tested at the Kenya National HIV Reference Laboratory and underwent quality assurance testing at the Kenya Medical Research Institute laboratory. Final HIV test results were recorded by laboratory staff on a paper form using a participant's unique study identification number and delivered to selected health facilities in each survey cluster.

Collection of Test Results

Participants were encouraged by the survey teams to collect test results with their spouse or sexual partner and informed that results would be available approximately 6 weeks after the blood draw. Results were available at two facilities; a health facility within the study cluster and one outside the cluster to provide an option for those concerned about confidentiality at facilities in the study cluster. Survey teams issued a test results voucher to participants who consented to blood draw. The voucher had a unique study identification number and sex of the participant; the facility name, location and operating hours; and beginning and end dates when results would be available.

A team of 202 trained and experienced counselors provided results and counseling to participants. Counselors were trained on clinical aspects of HIV prevention and treatment of HIV and STIs, partner testing and disclosure, basic counseling techniques and the approved protocol for returning results to participants. Participants with valid vouchers received test results and counseling in a private room in the health facility. Couples were first counseled individually and upon informed consent from both parties, counseled as a couple. Participants received standard counseling messages and informational brochures on HIV prevention, care and treatment of HIV and STIs and condoms. Counselors used a facility directory to refer participants for follow-up services as needed. Participants with non-reactive results were counseled on prevention and reminded that test results represented their status at the time of sample collection. After each counseling session, counselors recorded the participant's sex, whether the participant received results individually or with a partner, and referrals on the counselor results form. Participants were given a period of one-month to collect test results, after which all results forms were returned to the National AIDS and STI Control Program for data entry.

Data Collection and Statistical Analysis

Data from results forms were double-entered into EPI Info Version 3.0 (U.S. Centers for Disease Control and Prevention) and analyzed using SAS version 9.2 (SAS Institute Inc, Cary North Carolina, USA). All analyses were weighted and adjusted for complex survey design. Bivariate and multivariate analyses were conducted to examine differences in results uptake by socio-demographic, behavioral and serological characteristics. The analyses included proportions, odds ratios (OR), adjusted odds ratios (AOR) and 95% confidence intervals (CI). We used a Rao-Scott chi-square test to evaluate the association between uptake of HIV results and categorical variables. Variables significantly associated with the outcomes of interest (individual collection of results and collection of results as a couple) with $p < 0.2$ in the bivariate analysis were included in logistic regression models. Variables that remained associated with the outcome in the final model at a significance level of $p < 0.05$ were considered independent predictor variables.

A secondary analysis was conducted among KAIS participants who identified as the spouse or co-habiting partner of another KAIS participant to assess rates of test collection among married and cohabiting couples. We excluded couples in which a KAIS participant collected results with a non-KAIS partner. Each respondent within the couple was evaluated separately to determine whether they had collected results with their partner or individually. We describe the socio-demographic, behavioral, knowledge and serological characteristics of couples that collected HIV test results and assess factors associated with receiving results as a couple.

Ethics

The survey protocol was approved by the Ethical Review Committee at the Kenya Medical Research Institute (KEMRI) and the Institutional Review Board at the U.S. Centers for Diseases Control and Prevention (CDC). Survey

participants provided separate verbal informed consent to participate in the interview, blood draw and for storage of their blood specimens for future testing.

RESULTS

Socio-Demographic Characteristics of Participants who Collected HIV Test Results

Overall the median number of days between blood sample collection and results collection was 67days (9.6 weeks). Unexpected delays in the laboratory, health facilities and displacement of participants and counselors due to the 2007-2008 post-election violence delayed delivery of results in a small number of study clusters.

Of 15,853 participants who consented to blood draw, 7,222 (46.7%) collected their test results (46.5% of men, 46.8% of women, p = 0.835) (Table **1**). Individual collection of results increased with age with uptake ranging from 41.3% (ages 25-29) to 59.6% (ages 60-64), p < 0.001. Adults who had never been married or cohabited had the lowest uptake of tests results (41.4%) compared with those currently married or cohabitating (48.9%) or widowed (53.5%), p < 0.001]. Rural residents were nearly two times more likely to collect results (52.7%) than urban residents (26.9%, p < 0.001); collection of test results was highest in the sparsely populated North Eastern province (77.7%) and lowest in Nairobi, the capital city (13.9%), p < 0.001.

HIV Testing, Knowledge of HIV Status, Serological and Behavioral Characteristics

Overall, HIV prevalence among those who collected their results was 6.1% (95% CI 5.3-7.0) compared with 7.9% (95% CI 7.1-8.8), (p = 0.002) among those who did not collect results (data not shown). Among HIV-infected adults, uptake was 40.3% compared to 47.2% among those with no HIV infection (p = 0.002), irrespective of whether they knew their HIV status or not. Adults who expressed willingness to be tested for HIV at home were more likely to collect results than those not willing to be tested at home (46.8% *vs* 43.1%, p = 0.041); however, 87.2% of adults who did not collect their HIV results expressed willingness to be tested for HIV at home (data not shown).

Participants who had never been tested for HIV or had ever been tested but did not receive their last HIV test results were more likely to collect results (48.2%) than those who had been tested previously and received their last HIV test result (42.8%), p < 0.001. More than a third (39.5%) of HIV-infected adults who had incorrect knowledge of their HIV status and close to half of HIV-uninfected adults (48.7%) who did not know their HIV status collected their results.

Overall, sexually-active adults who reported unprotected last sex with a partner of unknown or known discordant HIV status in the past year were more likely to collect their results than those who reported using a condom at last sex e (48.4% *vs* 38.0%, p < 0.001). Nevertheless, sexually-active women who reported unprotected last sex with a partner of unknown or known discordant HIV status in the past year were more likely to collect results (48.6%) compared to men who reported unprotected sex with a partner of unknown or known discordant HIV status in the past year (35.8%, p <0.001, data not shown). Participants with accepting attitudes towards people with HIV/AIDS were less likely to collect results compared to those with low acceptance of people with HIV/AIDS (43.6% *vs* 49.3%, p < 0.001).

In multivariate analysis (Table **2**), the odds of individual collection of results (Table **2**) increased significantly with age compared to the youngest age group (15-24 years), with the highest odds among adults aged 60-64 years (AOR 1.6, 95% CI 1.2-2.1). Collection of results was significantly higher among persons living in rural areas (AOR 1.8, 95% CI 1.2-2.6), residence in all provinces compared to Nairobi (see Table **2** for AORs, p < 0.001) and among persons who reported willingness to be tested for HIV at home (AOR 1.2, 95%CI 1.0-1.4). Moreover, HIV-infected adults who believed they were HIV-negative based on their last HIV test and those who had never been tested for HIV were significantly less likely to collect results (AOR 0.8, 95%CI 0.6-0.9) compared to those who correctly knew their HIV status.

Collection of Results Among Couples

Of the 9,691 households sampled, 2,752 married or cohabiting couples (head of household and his/her primary partner) completed interviews and consented to blood draw [11]. We excluded 67 couples either because one partner collected results with a non-KAIS partner (n=60) or because of missing information on how they collected results (n=7). Overall, 18.5% of 2,685 KAIS couples collected results as a couple (Table **3**); 44.4% had either one or both partners collect results individually; and for 37.1% of couples, both partners did not collect results (data not shown).

Couples living in rural areas were more likely to collect results together compared to those in urban areas (20.3% *vs* 9.0%, p < 0.001). Couples in Eastern province had the highest test result uptake (26.9%) while those in Nairobi had the lowest (5.1%). Couples in the second (22.3%), middle (23.2%) and fourth (20.2%) wealth quintiles were twice as likely to collect results compared to those in the highest wealth quintile (10.8%).

There was no significant difference in collection of results by prior HIV testing history, awareness of VCT, knowledge of HIV discordance and knowledge of couple HIV status (Table **3**). Of HIV discordant couples who did not know their HIV status, 22.3% collected test results. Similarly, only (15.7%) of the 74 HIV concordant positive couples who did not know their HIV status collected results.

In multivariate analysis, collection of results among couples was significantly associated with living in Eastern province (AOR 4.8, 95% CI 2.0-11.5) compared to residence in Nairobi province; and being in the second (AOR 1.5, 95% CI 1.1-2.1) and middle (AOR 1.5, 95% CI 1.1-2.1) wealth quintiles compared to the lowest wealth quintile (Table **4**).

DISCUSSION

Returning HIV test results through health facilities in the 2007 KAIS resulted in close to half of the survey participants learning their HIV status, higher than the national uptake of lifetime HIV testing of 33% found in KAIS [11]. Moreover, 42.8% of all participants who had never been tested for HIV

Table 1. Characteristics of Men and Women (Age 15-64 Years) who Collected HIV Test Results in the 2007 Kenya AIDS Indicator Survey

Characteristic	Total	No. Collected Results	Weighted %	95% CI	p-Value
Total	15,853	7222	46.7	(43.8-49.5)	--
Sex					
Male	6804	3058	46.5	(43.4-49.7)	0.835
Female	9049	4164	46.8	(43.8-49.7)	
Age group					
15-24	5135	2114	42.8	(39.5-46.1)	<.0001
25-29	2219	907	41.3	(37.9-44.8)	
30-39	3554	1603	45.7	(42.4-48.9)	
40-49	2599	1327	53.7	(49.7-57.8)	
50-59	1749	915	52.6	(48.4-56.8)	
60-64	597	356	59.6	(54.7-64.5)	
Marital Status					
Never married	4523	1786	41.4	(38.2-44.7)	<.0001
Separated/divorced	919	393	43.6	(38.7-48.4)	
Widowed	772	403	53.5	(48.3-58.6)	
Married/cohabiting	9639	4640	48.9	(45.8-52.0)	
Residence					
Urban	3922	962	26.9	(20.9-32.8)	<.0001
Rural	11,931	6260	52.7	(49.3-56.0)	
Province					
Nairobi	1811	275	13.9	(10.2-17.6)	<.0001
Central	2277	999	43.6	(35.8-51.3)	
Coast	1773	728	42.9	(34.3-51.5)	
Eastern	2553	1479	59.8	(52.7-67.0)	
North Eastern	753	557	77.7	(64.3-91.1)	
Nyanza	2380	1060	45.4	(37.5-53.3)	
Rift Valley	2268	1068	49.5	(42.9-56.2)	
Western	2038	1056	50.8	(42.9-58.6)	
Education					
No education	2214	1291	56.3	(50.3-62.3)	<.0001
Incomplete primary	4499	2220	50.6	(46.8-54.4)	
Complete primary	3802	1747	47.9	(44.4-51.5)	
Secondary +	5338	1964	39.2	(35.8-42.6)	
Wealth Index[1]					
Lowest	2758	1570	56.1	(50.0-62.3)	<.0001
Second	2913	1555	53.0	(48.6-57.3)	
Middle	3049	1563	52.2	(48.1-56.3)	
Fourth	3095	1364	46.2	(42.0-50.3)	
Highest	4038	1170	32.9	(27.8-37.9)	

(Table 1) contd…..

Characteristic	Total	No. Collected Results	Weighted %	95% CI	p-Value
Accepting attitudes towards people with HIV/AIDS[2]					
Yes	7870	3249	43.6	(40.4-46.7)	<.0001
No	7610	3685	49.3	(46.1-52.5)	
Heard of VCT[3]					
Yes	13,419	5765	45.1	(42.2-48.0)	0.0001
No/Don't Know/Unsure	2061	1169	55.0	(49.6-60.3)	
Willingness to be tested for HIV at home[3]					
Yes	13,550	6,102	46.8	(43.9-49.8)	0.0410
No/Don't know/Unsure	1930	832	43.1	(39.1-47.1)	
HIV testing history[3]					
Yes	5244	2137	42.8	(39.4-46.2)	<.0001
No/Never received results	10,236	4797	48.2	(45.2-51.1)	
HIV status[4]					
HIV-negative	14,723	6802	47.2	(44.3-50.1)	.0021
HIV-positive	1104	411	40.3	(35.4-45.2)	
Knowledge of HIV status[4]					
Correct knowledge of HIV status	4728	1942	43.0	(39.5-46.5)	<.0001
Incorrect knowledge, HIV infected	913	327	39.5	(34.5-44.5)	
Incorrect knowledge, HIV uninfected	9637	4577	48.7	(45.7-51.7)	
Not willing to disclose HIV status	549	367	56.6	(46.0-67.2)	
Unprotected last sex with partner of unknown or known HIV discordant status in past 12-months[5]					
Yes	9925	4720	48.4	(45.4-51.4)	<.0001
No[6]	1640	589	38.0	(33.4-42.6)	

[1]A composite measure of the living standards of a household, based on household ownership of selected assets, materials used for houshing construction, access to water and sanitation. Households in the sample are placed on a continuous scale of relative wealth using principal components analysis. Individuals are ranked according to the household score and the sample is divided into five groups with an equal number of indiviuals (quintiles).

[2]Based on a composite score derived from responses to four questions on attitudes towards people living with HIV/AIDS. Analysis excludes 373 respondents who had never heard of AIDS.

[3]Excludes 373 adults who reported they had never heard of AIDS.

[4]Excludes 26 adults with indeterminate HIV results.

[5]Includes participants who reported sexual activity in the past 12 months; excludes 5 adults with missing information on sexual behavior.

[6]Includes HIV-infected adults who had unprotected sex with a known concordant HIV positive partner.

Participants with no education and those in the lowest wealth quintile had the highest collection rates (56.3% and 56.1%, respectively) while those with secondary or higher education and in the highest wealth quintile had the lowest uptake (39.2% and 32.9%, respectively).

and over a third (39.4%) of those living with HIV but unaware due to never testing in the past collected their HIV test results. These findings demonstrate that in Kenya and other countries with similar HIV epidemics and social contexts, population-based surveys can contribute towards universal awareness of HIV status while still meeting a country's HIV surveillance needs.

Individual collection of HIV test results increased with age and was associated with rural residence, willingness to be tested for HIV at home and correct knowledge of HIV status. The high results collection rate among rural residents and those living outside Nairobi province could be attributed to the limited availability or accessibility of routine HIV testing services in rural areas compared to urban areas, including Nairobi. The KAIS survey may have presented a unique opportunity for participants living in underserved regions to learn their HIV status. Similarly, survey response rates were higher among households and residents in rural clusters than in urban clusters [11]. Additionally, our analysis identified segments of the surveyed population that are less likely to collect HIV test results through health facilities, highlighting the need to consider alternative approaches in future surveys that could increase uptake of results among the youth, urban residents and persons living with undiagnosed HIV infection.

The 2007 KAIS [11] found high acceptance of HIV HBTC nationally (83.5% among adults 15-64 years). This finding and the high acceptance of HBTC among participants who did not collect their HIV test results in our analysis suggest that offering HBTC within a survey could increase knowledge of HIV status among survey participants.

We encouraged all survey participants to collect results with their sexual/marital partners. However, only two out of

Table 2. **Factors Associated with Individual Collection of HIV Test Results Among Men and Women (15-64 Years) in the 2007 Kenya AIDS Indicator Survey**

Characteristic	Unadjusted Odds Ratio (95% CI)	p-Value	Adjusted Odds Ratio (95% CI)[1]	p-Value
Sex				
Male	1.0	--	1.0	--
Female	1.01 (0.93-1.10)	0.8351	1.01 (0.93-1.11)	0.7860
Age group				
15-24	1.0	--	1.0	--
25-29	0.94 (0.84-1.06)	0.2996	0.95 (0.83-1.10)	0.5104
30-39	1.12 (1.00-1.26)	0.0463	1.04 (0.89-1.22)	0.5887
40-49	1.55 (1.38-1.75)	<.0001	1.36 (1.14-1.63)	0.0005
50-59	1.48 (1.27-1.73)	<.0001	1.25 (1.02-1.53)	0.0293
60-64	1.97 (1.60-2.44)	<.0001	1.61 (1.23-2.11)	0.0005
Residence				
Urban	1.0	--	1.0	--
Rural	3.03 (2.17-4.21)	<.0001	1.80 (1.24-2.61)	0.0020
Province				
Nairobi	1.0	--	1.0	--
Central	4.78 (3.08-7.44)	<.0001	2.55 (1.48-4.40)	0.0008
Coast	4.65 (2.91-7.43)	<.0001	2.93 (1.70-5.04)	0.0001
Eastern	9.23 (6.02-14.15)	<.0001	4.66 (2.71-8.02)	<.0001
North Eastern	21.58 (9.40-49.53)	<.0001	7.98 (2.92-21.79)	<.0001
Nyanza	5.14 (3.30-8.01)	<.0001	2.59 (1.47-4.58)	0.0010
Rift Valley	6.08 (4.05-9.13)	<.0001	3.35 (1.94-5.79)	<.0001
Western	6.38 (4.11-9.91)	<.0001	3.22 (1.84-5.64)	<.0001
Willingness to be tested for HIV at home				
No/Don't know/Unsure	1.0	--	1.0	--
Yes	1.16 (1.01-1.34)	0.0421	1.20 (1.04-1.39)	0.0146
Knowledge of HIV status				
Correct knowledge of HIV status	1.0	--	1.0	--
Incorrect knowledge, HIV- infected	0.86 (0.71-1.06)	0.1549	0.75 (0.61-0.93)	0.0080
Incorrect knowledge, HIV uninfected	1.26 (1.12-1.41)	<.0001	0.94 (0.84-1.04)	0.2436
Not willing to disclose status	1.73 (1.11-2.69)	0.0152	1.16 (0.76-1.78)	0.4792

[1]Multivariate model controlled for all other variables in Table **2**. Marital status, education, wealth index, accepting attitudes towards persons living with HIV/AIDS and unprotected last sex with a partner of unknown or known HIV discordant status in the past 12 months were included in the model and were insignificant.

ten married/cohabiting adults collected results as a couple. Similar proportions of couples who had never been tested for HIV and of those living with HIV but unaware of their status learned their HIV status during KAIS. Given that most new HIV infections in Kenya occur among heterosexual couples [12, 13], the national HIV/AIDS program has prioritized couples testing, in part by scaling up HBTC. Of note, the next KAIS survey will offer HBTC to all survey participants, a shift that is expected to reach more couples and other segments of the population that were less likely to collect results through health facilities. The logistics of this approach, including participant and household burden needs careful consideration.

The test results uptake in KAIS could have been influenced by several factors. Owing to the 6-week delay in returning HIV test results to health facilities and referrals provided during the survey, some participants could have sought VCT and saw no need to collect survey results. Further, unexpected delays in the central laboratory and in health facilities following the 2007-2008 post-election violence in Kenya could have negatively affected collection of test results in affected study clusters.

Table 3. Socio-Demographic, Behavioral and Serological Characteristics of Married and Cohabiting Men and Women (15-64 Years) in the 2007 Kenya AIDS Indicator Survey who Collected HIV Test Results as a Couple

Couple Characteristic	Number of Couples[1]	No. Collected Results as a Couple	Weighted %	95% CI	p-Value
Total	2685	462	18.5	(15.8-21.2)	--
Residence					
Rural	2175	423	20.3%	(17.2-23.4)	0.0006
Urban	510	39	9.0%	(4.7-13.3)	
Province					
Nairobi	207	7	5.1	(1.2-9.0)	0.0042
Central	375	63	17.0	(10.7-23.2)	
Coast	282	33	11.5	(5.8-17.1)	
Eastern	411	108	26.9	(20.4-33.4)	
North Eastern	141	15	13.1	(5.1-21.0)	
Nyanza	413	68	16.9	(10.8-23.0)	
Rift Valley	439	89	21.2	(14.0-28.4)	
Western	417	79	17.9	(10.5-25.3)	
Couple education level					
Both partners had no education	251	36	15.9	(9.2-22.7)	0.0570
One or both partners had primary education	1291	254	20.5	(17.1-24.0)	
One or both partners had secondary or higher education	1143	172	16.4	(13.3-19.5)	
Wealth index					
Lowest	579	83	15.4	(11.0-19.8)	<.0001
Second	520	113	22.3	(17.5-27.0)	
Middle	535	118	23.2	(18.8-27.7)	
Fourth	523	99	20.2	(15.3-25.0)	
Highest	528	49	10.8	(7.4-14.2)	
Ever been tested for HIV[2]					
Both never been tested	1257	229	20.0	(16.7-23.3)	0.1912
One partner had tested	898	150	17.7	(14.0-21.4)	
Both partners had tested	465	67	15.5	(10.9-20.1)	
Ever heard of VCT[3]					
Both partners had not heard	216	31	16.8	(9.6-24.1)	0.8679
One partner had heard	439	75	18.1	(13.5-22.6)	
Both partners had heard	2030	356	18.7	(15.8-21.6)	
Knowledge of HIV discordance					
Both partners did not understand	1974	354	19.3	(16.2-22.4)	0.3213
One partner understood	596	92	16.2	(12.0-20.3)	
Both understood	115	16	16.5	(9.3-23.6)	
Couple HIV status[4]					
Concordant HIV-	2419	419	18.4	(15.6-21.1)	
Concordant HIV+	94	15	19.1	(10.8-27.4)	
Discordant	163	28	20.7	(13.9-27.5)	

(Table 3) contd…..

Couple Characteristic	Number of Couples[1]	No. Collected Results as a Couple	Weighted %	95% CI	p-Value
Knowledge of couple HIV status[4]					
Correctly knew status	391	55	14.7	(10.1-19.2)	0.2376
Don't know status, concordant negative	1937	343	19.0	(16.0-22.0)	
Don't know status, concordant positive	74	10	15.7	(8.1-23.2)	
Don't know status, discordant	152	28	22.3	(15.2-29.4)	
Not willing to disclose status	122	26	21.1	(12.0-30.2)	

[1]Excludes 67 couples; 60 collected results with a non-KAIS partner and 7 had missing information.
[2]Excludes 65 couples with missing information on HIV testing.
[3]Adults who reported they had not heard of AIDS were classified as not having heard of VCT.
[4]Excludes 9 couples with indeterminate HIV results.

Table 4. Factors Associated with Collection of HIV Test Results as a Couple Among Married and Cohabiting Men and Women (15-64 Years) in 2007 Kenya AIDS Indicator Survey

Couple Characteristic	Unadjusted OR (95% CI)	p-Value	Adjusted OR (95% CI)[1]	p-Value
Residence				
Urban	1.0	--	1.0	--
Rural	2.59 (1.48-4.52)	0.0008	1.62 (0.77-3.41)	0.2012
Province				
Nairobi	1.0	--	1.0	--
Central	3.80 (1.52-9.51)	0.0043	1.92 (0.61-5.99)	0.2625
Coast	2.41 (0.91-6.40)	0.0770	1.46 (0.46-4.58)	0.5197
Eastern	6.84 (2.87-16.29)	<.0001	3.22 (1.10-9.44)	0.0328
North Eastern	2.79 (0.96-8.09)	0.0583	1.74 (0.48-6.35)	0.3995
Nyanza	3.78 (1.52-9.43)	0.0043	1.80 (0.59-5.49)	0.3002
Rift Valley	5.00 (2.01-12.44)	0.0005	2.56 (0.88-7.45)	0.0845
Western	4.06 (1.58-10.48)	0.0037	2.00 (0.61-6.56)	0.2547
Wealth index				
Lowest	1.0	--	1.0	--
Second	1.58 (1.08-2.30)	0.0189	1.54 (1.05-2.27)	0.0275
Middle	1.67 (1.17-2.37)	0.0046	1.64 (1.16-2.32)	0.0049
Fourth	1.39 (0.92-2.10)	0.1171	1.44 (0.94-2.21)	0.0927
Highest	0.67 (0.42-1.06)	0.0877	1.08 (0.61-1.92)	0.7948

[1]Multivariate model controlled for all other variables in Table **4**. Couple education level and knowledge of couple HIV status were included in the model and were not significant.

While the 6-week period allowed for centralized laboratory testing and quality assurance, HIV infected participants unaware of their HIV status could have unknowingly infected sexual partners or unborn babies. Although we referred all participants for HIV testing, those in underserved areas had limited or no other options of learning their HIV status. Reducing the time between specimen collection and availability of results in health facilities is an important consideration when planning future surveys.

In Uganda, survey participants cited inconvenience, fear of stigmatization and emotional vulnerability of receiving HIV test results from public facilities as the most common reason for selecting to participate in HBTC [14]. We provided participants the option of collecting results in a health facility in a neighboring cluster and trained counselors to observe strict confidentiality. Similar concerns about confidentiality in KAIS [11] could have negatively impacted collection of results in our survey.

Our analysis has some limitations. In the couple analysis, we only included one primary partner who had taken part in KAIS since we did not collect information on non-KAIS partners. This and the fact that individuals may have accessed HIV testing services in the 6-week waiting period may explain the lower results collection rates in the survey. Despite these limitations, our analysis demonstrates the importance of availing results to survey participants and identifies key gaps in using a facility-based approach that

will inform planning of future surveys. Our findings also demonstrate the need for countries that conduct household HIV sero-surveys to systematically analyze uptake of test results.

The ultimate goal of returning HIV test results in surveys is to facilitate access to HIV prevention, care and treatment services. Though appropriate referrals were made, the KAIS did not track uptake of referral. In Uganda, lack of HIV care and treatment services for HIV-infected participants was cited as a major drawback of providing HIV test results to survey participants [10]. As HIV surveillance and HIV service delivery become intertwined, surveys that return HIV test results should systematically monitor and evaluate current referral systems. With recent findings supporting earlier treatment [15], HIV-infected persons could seek services earlier. Systematic evaluation of referrals in surveys could help monitor this shift, in contexts where this policy is adopted. Despite the challenges in monitoring survey referrals, data from multiple countries has demonstrated that knowledge of HIV status alone reduces HIV transmission risk by up to 60%; thus HIV testing in surveys provides important HIV prevention benefits [16-18]. The low uptake of HIV test results among young people in urban areas in our analysis coupled with the high prevalence of HIV and risky sexual behaviors among individuals living in urban areas[10] emphasizes the need to intensify HIV testing and prevention efforts targeting youth in urban areas.

As more countries plan population-based surveys with HIV testing, developing efficient and effective approaches to increase opportunities for participants to learn their HIV status and by extension access available HIV services is critical. With the existence of behavioral and bio-medical interventions proven to prevent HIV infection and life-saving HIV care and treatment, the benefits of returning HIV test results in surveys are considerable. Other countries may draw important lessons from KAIS 2007 which demonstrated some benefits and limitations of using a facility-based approach to returning HIV test results but also suggested that higher results uptake might occur with a home-based approach.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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DISCLAIMER

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