# Variation in Effectiveness of HIV Assisted Partner Services by Region, Rural Location and Gender in Kenya: A Cluster Randomized Trial

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A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master in Public Health

University of Washington

2016

Committee:

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Program Authorized to offer degree:

Global Health

University of Washington

## Abstract

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**Introduction**

Assisted partner services (aPS), a strategy to test and link to care the sexual partners of HIV infected persons, is effective in finding new HIV cases. This study assessed whether the effectiveness of aPS differs by region, rural location and gender in a cluster-randomized controlled trial in Kenya.

**Methods**

Eighteen HIV testing sites were randomized to either provide immediate or delayed aPS. We investigated whether there were interactions between receiving immediate aPS and region (Nairobi/Central vs Nyanza). Generalized estimating equations with a Poisson link, robust standard errors and exchangeable correlation structure were used to assess whether the effectiveness of receiving immediate aPS in getting a sexual

partner tested, newly diagnosed with HIV, and linked to care was modified by region (Nairobi/Central vs. Nyanza), testing location (urban vs. rural/peri-urban), and gender.

**Results**

We enrolled 1119 index clients and 1286 partners between August 2013 and June 2015. The effectiveness of aPS in getting a sexual partner tested for HIV was modified by region (p=0.001), location (p=0.018), and gender (p=0.061). Comparing the immediate and the delayed arm, partner testing increased 7 fold in Nyanza compared to a 3 fold increase in Nairobi (Incidence Rate Ratio (IRR) 7.2; 95% Confidence Interval (CI) 5.4, 9.6 vs IRR 3.4 95%CI 2.3, 4.8), a 7 fold increase in rural/peri-urban sites compared to a 4 fold increase in urban sites (IRR 6.6; 95%CI 4.5, 9.6 vs. IRR 3.54 95%CI 2.5, 5.0), and a 6 fold increase in female index clients compared to a 4 fold increase in male index clients (IRR 5.8 95%CI 4.2, 7.9 vs IRR 3.7; 95% CI 2.4, 5.8)). In addition, there was a 9 fold increase in newly diagnosing a partner with HIV among female index clients compared to a 3 fold increase among male index clients (IRR 9.1; 95% CI 4.0, 20.9 vs IRR 3.2 95% CI 1.7, 6.0).

**Conclusions**

While immediate aPS was effective among the overall study population in Kenya, the size of the effect differed by region, location, and gender. These differences can help to guide the target populations and geographies for aPS as it is rolled out in Kenya.

## Introduction

Knowledge of ones HIV status is the gateway to accessing HIV care and treatment[1]. As the world strives to reach the end of AIDS, the global goal is to have 90% of those who are HIV infected know their HIV status, 90% of those infected on ART, and 90% of those on ART virally suppressed[2] . In 2012, 53% of Kenyans infected with HIV were unaware of their status[3]. In contrast, among those who knew their status, 89% were enrolled in HIV care and taking cotrimoxazole with high retention and linkage to care [3,4]. With the HIV epidemic varying greatly among populations, age, gender, marital status, residence and sexual risk behavior have been identified as factors associated with undiagnosed HIV infection in Kenya and South Africa [3,5-7]. Among women, undiagnosed infection was associated with being aged 35-39 years, divorced or separated, urban residence, Nyanza region, self-perceiving a moderate risk of HIV infection, condom use with the last partner in the previous 12 months, and reporting 4 or more lifetime number of partners were associated with undiagnosed infection. Among men, widowhood, condom use with the last partner in the previous 12 months, and lack of circumcision were positively associated with undiagnosed HIV infection. In South Africa, men, individuals younger than 20, and older than 35 were less likely to have had a previous HIV test.

Routine community and facility testing has been limited in reaching newly infected persons. Assisted partner services (aPS) is a public health strategy to provide notification, test and link to care the sexual partners of HIV infected persons [8]. aPS has

been shown to be feasible and effective in newly diagnosing HIV infected individuals by identifying partners of those who are HIV infected, testing them and linking them to care if HIV infected or providing HIV prevention advice if not [9-13]. aPS also has the potential to reduce HIV transmission, aid disclosure, and may reduce unsafe sexual behaviors of those infected following notification.[14] Notification of sexual partners is not routinely carried out in Kenya.

Many of the studies of APS have been conducted in high resource settings with very few studies conducted in sub-Saharan Africa. These studies in sub-Saharan Africa have not investigated geographic or gender variations in the effectiveness of APS. Previous studies have confirmed feasibility, acceptability, cost effectiveness, and methods of recruitment and tested various testing and partner notification strategies. Very limited data exists on the success of aPS with varied HIV prevalence, gender, or geographic area. A study in Malawi showed that partner notification may be more effective in HIV case finding than routine HIV testing in low prevalence areas [15]. A study in Cameroon reported a low number needed to interview (NNTI) indicating that aPS may be more effective in populations with low HIV testing rates [9]. In New York City, the NNTI to find a new HIV positive case varied by sex and age with females having more than double that of males and a higher NNTI among individuals 40 years and older. Factors including age, gender and residence need to be considered in program design to maximize opportunities to diagnose new infections. This will also help in targeting and prioritization of populations and geographies to receive aPS provision if resource

limitations arise at the point of implementation in line with the Kenya HIV Prevention Revolution Roadmap[16,17].

A cluster-randomized controlled trial of APS in Kenya demonstrated the program's effectiveness in testing, newly diagnosing, and linking to care the sexual partners of HIV-infected index clients in the general population.[8] Using data from this study, we aimed to analyze whether the APS effectiveness varies by region, urban versus rural location, and gender.

## Methods

The study procedures are detailed in the study protocol [8] with this section briefly describing ds used.

### Study design

Data for this study were drawn from a randomized clinical trial (RCT) conducted at 18 HIV testing sites from rural and urban areas in Kenya during the period August 2013-June 2015(NCT01616420) [8]. As previously described, nine clinics were randomized to receive **immediate** assisted partner notification where the partners of an index HIV infected person were immediately notified of HIV exposure by the health provider and offered HIV counseling and testing. The other nine clinics were randomized to receive **delayed** assisted partner notification the index clients were encouraged to notify their sexual partners. They did not received additional support from the health providers for partner notification or testing until 6 weeks after the index client enrollment. The 6 week delay provided a control group for those who received immediate notification. This

control group provided the passive referral standard of care in Kenya. Further details are provided in the protocol and study paper [8].

The primary outcomes were the HIV case finding rate and the NNTI to get a partner tested, newly diagnosed, and linked to care. HIV case finding rate was defined by the number of new HIV positive partners identified per index client. NNTI was defined as the number of index clients interviewed to yield one partner tested for HIV, one new partner tested for HIV, one new HIV positive partner and one linked to HIV care.

**Study population**

**Site selection:** The study sites included 18 HIV testing sites in Kenya selected from a pool of over 30 sites based on the mode of testing, volume of HIV testing, location, and HIV prevalence, to aid generalizability of results. These sites were either from Nyanza or Nairobi/Central region and represented both rural and urban settings.

The study population were HIV infected index clients and their partners. HIV index clients refer to those participants that presented at the testing site for HIV testing and counseling and were found to be HIV infected. Partners refer to those whom the index partner had sexual contact with in the previous 3 years. The study included participants who were newly or recently diagnosed HIV (index patient), willing to provide consent, at least 18 years of age, not pregnant and reported no intimate partner violence in the preceding month. Those who lived outside a 50 km radius from the study site were excluded from the study.

**Study procedures**

**Index participants:** All index participants irrespective of the arm were seen at baseline (enrollment), at 6 weeks and 3 months to assess linkage to care, intimate partner violence and risky behaviors.

**Partner participants:**

a) Immediate arm: All partners in the immediate arm were seen at baseline (enrollment) and after 6 weeks to assess linkage to care. The enrollment into care was confirmed through a CCC number, CD4 count, WHO stage or use of cotrimoxazole or ART.
b) Delayed arm: All partners in the delayed arm were seen at baseline (enrollment) only for enrollment, assess prior notification, HIV status and linkage to care if they were HIV infected.

Index clients provided information on demographics, sexual behavior and testing history at enrollment, 6 week and 3 months follow up. Partners received HIV testing at enrollment and data on sexual history and demographics was collected. Data was analyzed at enrollment and at six weeks.

Human Subjects approval was obtained both at the University of Washington Institutional Review Board and locally from the Kenyatta National Hospital (KNH) Ethical and Scientific Review Committee.

## Statistical Analysis

Continuous variables were summarized using median and inter-quartile range (IQR) and categorical variables were summarized with percentages in each category. Generalized estimating equations (GEE) with a Poisson link, robust standard errors and exchangeable correlation structure were used to account for within clinic correlation. Interaction terms were included to see if there were differences in intervention effect by region, location or gender. Incremental NNTI was calculated as 1/ (rate in immediate arm-rate in delayed arm). This was compared at the cluster level (i.e. facilities in control vs facilities in intervention arm).

IRR and 95% CI were calculated. Interaction terms were tested with a significance (α) level of 0.05. Additional exploratory analysis were performed to investigate individual level predictors of partner testing and identifying new HIV cases including age, marital status, employment status and sexual partners among others. All analysis was conducted using Stata version 14.0 (StataCorp, College Station, TX)

## Results.

### Baseline Characteristics

We enrolled 1119 index clients who presented at the 18 testing facilities in Kenya from Nairobi/Central and Nyanza regions. The study enrolled 550 participants from the 9 clinics randomized to the immediate arm and 569 participants from the 9 clinics randomized to the delayed arm. There were 1286 sexual partners (621 in the immediate

arm and 665 in the delayed arm) who enrolled in the study. A more detailed description of the study is published [8].

Among index clients, the median age was 30 years (IQR 25, 38), 437 (37%) were from Nyanza region, 495 (42%) from rural or peri-urban areas and 690 (58%) were female. The majority of the index clients were married, employed and had tested for HIV in the past (Tables 1, 1a, 1b, and 1c). The median age of sexual partners was 31 years (IQR 26, 38) with 560 (44%) being females.

**HIV case finding rate and NNTI by region**

Index clients were older in Nairobi/Central region with a higher median age of 33 years (IQR 26, 39) as compared to 31 (IQR 25, 35) in Nyanza region. Index clients in Nyanza region had more polygamous relationships, were more likely to be unemployed, with more than 1 sexual partner in the past 3 months and more likely to have paid or received money for sex than in Nairobi /Central (Table 1a).

The effectiveness of aPS in getting a sexual partner tested for HIV was modified by region (p=0.001) Table 2. Comparing the immediate and the delayed arm, there was a 7 fold increase in getting a partner tested for HIV in Nyanza as compared to a 3 fold increase in Nairobi.

(Incidence rate ratio (IRR) 7.2; 95% CI 5.4, 9.6 vs IRR 3.4 95%CI 2.3, 4.8) (Table 3).The incremental number of index participants who needed to be interviewed (NNTI) in order to identify and test one sex partner was higher in Nairobi as compared to Nyanza. To get

one sex partner to tested for HIV, 3 index clients needed to be interviewed in Nairobi as compared to interviewing 1 in Nyanza region(Table 3). Despite a higher rate of getting a sexual partner newly HIV diagnosed and linked to care in Nairobi than in Nyanza, these differences were not significant (Table 3).

**HIV case finding rate and NNTI by location**

The index clients in the rural and peri-urban areas were more likely to be in polygamous relationships, paid or received money for sex and had less condom use than in the urban areas (Table 1b).

Location modified the effectiveness of aPS in getting a sexual partner tested for HIV (p=0.018) Table 2. Comparing the immediate and the delayed arm, there was a 7 fold increase in partner testing for HIV in rural/peri-urban sites compared to a 4 fold increase in urban (IRR 6.6; 95%CI 4.5, 9.6 vs. IRR 3.5 95%CI 2.5, 5.0). One would need to interview 1 index client to get one partner tested for HIV in rural sites as opposed to interviewing 2 partners in urban sites. There were no significant differences between arms to get a newly diagnosed HIV positive partner and link them to care.

**HIV case finding rate and NNTI by gender**

The males were older with a higher median number of lifetime sexual partners, a higher condom use at last sexual contact and are less likely to have ever tested for HIV. Males are more likely to have paid money for sex while the females were more likely to have received money for sex (Table 1c).

The effect of aPS on getting newly diagnosed HIV positive sexual partner was modified by gender (p=0.039). The effect on getting a partner tested for HIV showed a trend towards being modified by gender (p=0.061) Table 2. Comparing the 2 arms, there was a 6 fold increase in partner testing among sexual partners of female index clients compared to a 4 fold increase among partners of male index clients (IRR 5.8 95%CI 4.2, 7.9 vs IRR 3.7; 95% CI 2.4, 5.8). In addition, there was a 9 fold increase in newly diagnosing HIV in a sexual partner of a female index client as compared to a 3 fold increase among sexual partners of male index clients (IRR 9.1; 95% CI 4.0, 20.9 vs IRR 3.2 95% CI 1.7, 6.0). One would need to interview 2 female index clients as compared to 1 male index client to get one sexual partner tested for HIV. To get one HIV positive partner identified, one would need to interview 6 female index clients as compared to 5 male index clients.

**Discussion**

This cluster randomized trial showed that region, rural location and gender significantly modified the success of immediate assisted partner notification services to get sexual partners tested for HIV while gender significantly modified the effect of immediate APS to find new HIV positive partners. The case finding rates in those offered immediate aPS were higher in Nyanza than in Nairobi/central region, in rural areas than urban areas and in females than in males. However, it is more efficient to interview index clients from Nyanza, in rural areas and males index clients to get a partner tested for HIV. Interviewing males seems to get the highest yield of newly diagnosing a HIV positive partner. While there were differences in the case finding rates to get any HIV

positive case and linking them to care, these differences were no significant. This can be interpreted that the immediate aPS has more utility in getting a partner tested and newly diagnosed as HIV positive.

There are very few studies that conducted analysis by region, gender or location due to the small sample sizes and scope. Our study findings are consistent with the few studies that showed a higher number needed to interview in low prevalence areas, low testing areas, among female index clients [9,18,19].

Low HIV testing rates could explain the lower number needed to interview to find a new HIV positive partner in rural/per urban areas and in males. This could be supported by lower access to testing sites in rural areas and lower testing rates among males as seen in the Kenya Demographic and Health survey 2014[20]. One possible explanation is that a higher percentage of females know their HIV status through the Prevention of Mother to Child Transmission program (PMTCT) than males, making it relatively more difficult to find partners who have not been tested and with undiagnosed HIV infection. On the contrary, a smaller percentage of males know their HIV status and hence when they are interviewed, it is more likely to diagnose a new HIV infection in their partners. We believe a higher case finding rate in Nyanza could be due to the higher prevalence of HIV in Nyanza resulting in more access to HIV services. The higher number of polygamous relationships would also lead to a higher case finding rate.

Few studies have evaluated the effect of region, gender and rural location on HIV testing and partner services mainly due to limitation in scope. We believe that this is the first study to do an in-depth analysis of these factors and this will be useful in targeting and prioritization of the assisted partner services in line with the Kenya Prevention Revolution roadmap[16]. These findings are important because they point towards balancing both HIV case finding rates and reaching unreached populations to yield more diagnosis of new HIV cases when resources are constrained.

Our study strengths include that it was a large pragmatic cluster randomized clinical trial with implementation units being testing sites. These testing sites were randomized to ensure a balance and representativeness of counties, testing volumes and rural vs urban settings. This makes our study generalizable to the Kenyan population and was large enough to show effectiveness by region, location and gender.

Our study should be considered in light of several limitations. This was an unblinded trial and hence delayed arm representing standard of care may have been more aggressive than in normal settings. However this would have only in an attenuation of the effect size. In addition, we could not perform a separate peri-urban analysis which could lead to a mixing of effects.

**Conclusion**

While aPS was effective among the overall study population in Kenya, the size of the effect differed by region, location, and gender. These differences can help to guide the

target populations and geographies for assisted partner services as it is rolled out in Kenya to support the goal towards the UNAIDS 90-90-90 target.

**Acknowledgments**

I wish to acknowledge Carey Farquhar, Barbra Richardson and Peter Cherutich for their continued guidance and mentorship. I also wish to acknowledge the study team, study participants and advisors at the University of Washington.

**Author Disclosure Statement**

No conflicts of interest or competing financial interests are declared.

**Attribution of support**

This study was made possible through grants from the US National Institutes of Health (NIH), R01 A1099974-04 and the Fogarty International Center (FIC) D43 TW009580.

**Table 1a: Baseline characteristics of HIV infected index clients in the immediate APS and delayed APS arm**

| | Immediate (n=550) | | Delayed (n569) | | Overall (n=1119) | |
|---|---|---|---|---|---|---|
| **1. Socio-Demographic characteristics** | | | | | | |
| Age (years) (Median, IQR) | 30 | (25,37) | 31 | (26,38) | 30 | (25,38) |
| Age (years) (N, %) | | | | | | |
| 18-24 | 122 | (22.2) | 100 | (17.6) | 222 | (19.8) |
| 25-34 | 252 | (45.8) | 256 | (45.0) | 508 | (45.4) |
| 35-44 | 126 | (23.0) | 151 | (26.5) | 277 | (24.8) |
| 45-54 | 40 | (7.3) | 51 | (9.0) | 91 | (8.1) |
| >55 | 10 | (1.8) | 11 | (1.9) | 21 | (1.9) |
| Sex (Female) | 322 | (58.6) | 368 | (64.7) | 690 | (61.7) |
| Marital status | | | | | | |
| Single | 104 | (18.9) | 100 | (17.6) | 204 | (18.2) |
| Married-monogamous | 326 | (59.3) | 322 | (56.6) | 648 | (57.9) |
| Married-polygamous | 31 | (5.6) | 43 | (7.6) | 74 | (6.6) |
| Separated/Widowed/Divorced. | 89 | (16.2) | 104 | (18.3) | 193 | (17.3) |
| Employment[1] | | | | | | |
| Unemployed | 129 | (23.9) | 111 | (20.3) | 240 | (22.1) |
| Employed | 402 | ( 74.6) | 430 | (78.5) | 832 | (76.5) |
| Student | 8 | (1.5) | 7 | (1.3) | 15 | (1.4) |
| **2. HIV Behavioral characteristics** | | | | | | |
| No of sexual partners in past 3 months | | | | | | |
| 0 | 386 | (70.2) | 439 | (77.2) | 825 | (73.7) |
| 1 | 135 | (24.6) | 105 | (18.5) | 240 | (21.5) |
| >1 | 29 | (5.3) | 25 | (4.4) | 54 | (4.8) |
| Number of lifetime sexual partners (median, IQR) | 4 | (2,6) | 4 | (3,8) | 4 | (3,7) |
| Type of sexual partner | | | | | | |
| Paid money to have sex | 102 | (18.6) | 87 | (15.3) | 189 | (16.9) |
| Received money to have sex | 94 | (17.1) | 122 | (21.4) | 216 | (19.3) |
| Condom use in last sexual contact | 137 | (24.9) | 111 | (19.5) | 248 | (22.2) |
| **3. Testing characteristics** | | | | | | |
| Ever Tested for HIV | 379 | (68.9) | 366 | (64.3) | 745 | (66.6) |
| Self-reported last HIV test result | | | | | | |
| Does not know | 10 | (2.6) | 9 | (2.5) | 19 | (2.6) |
| HIV negative | 257 | (67.8) | 264 | (72.1) | 521 | (69.9) |
| HIV positive | 112 | (29.6) | 93 | (25.4) | 205 | (27.5) |

[1] Missing occupation data for 9 in Nyanza immediate, 5 in Nyanza delayed, 2 in Nairobi immediate 16 in Nairobi delayed

**Table 1b: Baseline characteristics of HIV infected index clients in the immediate APS and delayed APS arm by region**

| | Nyanza(n= 437) Median (IQR) or n (%) | | | | Nairobi/Central (n=682) Median (IQR) or n (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | Immediate (n=256) | | Delayed (n=181) | | Immediate (n=294) | | Delayed (n=388) | |
| **1. Socio-Demographic characteristics** | | | | | | | | |
| Age (years) (Median, IQR) | 29 | (25,35) | 28 | (24,36) | 30 | (25,39) | 32 | (27,39) |
| Age (years) (N, %) | 257 | | 181 | | 294 | | 388 | |
| 18-24 | 59 | (23.0) | 49 | (27.1) | 63 | (21.4) | 51 | (13.1) |
| 25-34 | 129 | (50.4) | 80 | (44.2) | 123 | (41.8) | 176 | (45.4) |
| 35-44 | 50 | (19.5) | 38 | (21.0) | 76 | (25.9) | 113 | (29.1) |
| 45-54 | 13 | (5.1) | 10 | (5.5) | 27 | (9.2) | 41 | (10.6) |
| >55 | 5 | (1.9) | 4 | (2.2) | 5 | (1.7) | 7 | (1.8) |
| Sex (Female) | 150 | (58.6) | 108 | (59.7) | 172 | (58.5) | 260 | (67.0) |
| Marital status | | | | | | | | |
| Single | 45 | (17.6) | 40 | (22.1) | 59 | (20.1) | 60 | (15.5) |
| Married-monogamous | 154 | (60.2) | 94 | (51.9) | 172 | (58.5) | 228 | (58.9) |
| Married-polygamous | 20 | (7.8) | 21 | (11.6) | 11 | (3.7) | 22 | (5.7) |
| Separated/Widowed/Divorced. | 37 | (14.5) | 26 | (14.4) | 52 | (17.7) | 78 | (20.1) |
| Employment[1] | | | | | | | | |
| Unemployed | 67 | (27.1) | 44 | (25.0) | 62 | (21.2) | 67 | (18.1) |
| Employed | 174 | ( 70.5) | 130 | (73.9) | 228 | (78.1) | 300 | (80.7) |
| Student | 6 | (2.4) | 2 | (1.1) | 2 | (0.7) | 5 | (1.3) |
| **2. HIV Behavioral characteristics** | | | | | | | | |
| No of sexual partners in past 3 months | | | | | | | | |
| 0 | 193 | (75.0) | 106 | (58.6) | 194 | (66.0) | 333 | (85.8) |
| 1 | 46 | (18.0) | 61 | (33.7) | 89 | (30.3) | 44 | (11.3) |
| >1 | 18 | (7.0) | 14 | (7.7) | 11 | (3.7) | 11 | (2.8) |
| Number of lifetime sexual partners (median, IQR) | 3 | (2,6) | 4 | (3,6) | 4 | (3,6) | 5 | (3,9) |
| Type of sexual partner | | | | | | | | |
| Paid money to have sex | 64 | (25.0) | 40 | (22.1) | 38 | (12.9) | 47 | (12.1) |
| Received money to have sex | 63 | (24.6) | 44 | (24.3) | 31 | (10.5) | 78 | (20.1) |
| Condom use in last sexual contact | 65 | (25.4) | 37 | (20.4) | 72 | (24.5) | 74 | (19.1) |
| **3. Testing characteristics** | | | | | | | | |
| Ever Tested for HIV | 172 | (67.2) | 126 | (69.6) | 207 | (70.4) | 240 | (61.9) |
| Self-reported last HIV test result | | | | | | | | |
| Does not know | 4 | (2.3) | 5 | (4.0) | 6 | (2.9) | 4 | (1.7) |
| HIV negative | 128 | (74.4) | 99 | (78.6) | 129 | (62.3) | 165 | (68.7) |
| HIV positive | 40 | (23.3) | 22 | (17.5) | 72 | (34.8) | 71 | (29.6) |

[1] Missing occupation data for 9 in Nyanza immediate, 5 in Nyanza delayed, 2 in Nairobi immediate 16 in Nairobi delayed

**Table 1c: Baseline characteristics of HIV infected index clients in the immediate APS and delayed APS arm by location (rural vs urban).**

| | Urban(N=624) Median (IQR) or N (%) | | | | Rural (N=495) Median (IQR) or N (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | Immediate (n=302) | | Delayed (n=322) | | Immediate (n=248) | | Delayed (n=247) | |
| **1. Socio-Demographic characteristics** | | | | | | | | |
| Age (years) (Median, IQR) | 30 | (25,38) | 31 | (25,38) | 30 | (26,37) | 32 | (27,38) |
| Age (years) (N, %) | | | | | | | | |
| 18-24 | 75 | (24.8) | 63 | (19.6) | 47 | (18.9) | 37 | (15.0) |
| 25-34 | 130 | (43.1) | 147 | (45.7) | 122 | (49.2) | 109 | (44.1) |
| 35-44 | 69 | (22.9) | 74 | (23.0) | 57 | (23.0) | 77 | (31.2) |
| 45-54 | 22 | (7.3) | 32 | (9.9) | 18 | (7.3) | 19 | (7.7) |
| >55 | 6 | (2.0) | 6 | (1.9) | 4 | (1.6) | 5 | (2.0) |
| Sex (Female) | 187 | (62.0) | 208 | (64.6) | 135 | (54.4) | 160 | (64.8) |
| Marital status | | | | | | | | |
| Single | 68 | (22.5) | 59 | (18.3) | 36 | (14.5) | 41 | (16.6) |
| Married-monogamous | 174 | (57.6) | 175 | (54.4) | 152 | (61.3) | 147 | (59.5) |
| Married-polygamous | 9 | (3.0) | 21 | (6.5) | 22 | (8.9) | 22 | (8.9) |
| Separated/Widowed/Divorced | 51 | (16.9) | 67 | (20.8) | 38 | (15.3) | 37 | (15.0) |
| Employment | | | | | | | | |
| Unemployed | 59 | (19.7) | 59 | (19.3) | 70 | (29.2) | 52 | (21.5) |
| Employed | 236 | (78.7) | 242 | (79.1) | 166 | (69.6) | 188 | (77.7) |
| Student | 5 | (1.7) | 5 | (1.6) | 3 | (1.3) | 2 | (0.8) |
| **2. HIV Behavioral characteristics** | | | | | | | | |
| No of sexual partners in past 3 months | | | | | | | | |
| 0 | 226 | (74.8) | 264 | (82.0) | 160 | (64.5) | 175 | (70.9) |
| 1 | 66 | (21.9) | 46 | (14.3) | 69 | (27.8) | 59 | (23.9) |
| >1 | 10 | (3.3) | 12 | (3.7) | 19 | (7.7) | 13 | (5.3) |
| Number of lifetime sexual partners (median, IQR) | 4 | (2,6) | 4 | (3,6) | 4 | (3.6) | 5 | (3,9) |
| Type of sexual partner | | | | | | | | |
| Paid money to have sex | 44 | (14.6) | 42 | (13.0) | 58 | (23.4) | 45 | (18.2) |
| Received money to have sex | 39 | (12.9) | 56 | (17.4) | 55 | (22.2) | 66 | (26.7) |
| Condom use in last sexual contact | 78 | (25.8) | 67 | (20.8) | 59 | (23.8) | 44 | (17.8) |
| **3. Testing characteristics** | | | | | | | | |
| Ever Tested for HIV | 213 | (70.5) | 229 | (71.1) | 166 | (67.0) | 229 | (71.1) |
| Self-reported last HIV test result | | | | | | | | |
| Does not know | 4 | (1.9) | 5 | (2.2) | 6 | (3.6) | 4 | (2.9) |
| HIV negative | 133 | (62.4) | 157 | (68.6) | 124 | (74.3) | 107 | (78.1) |
| HIV positive | 76 | (35.7) | 67 | (29.3) | 37 | (22.2) | 26 | (19.) |

[1] Missing occupation data 2 for Urban immediate, 16 for Urban delayed, 9 for Rural immediate and 5 for Rural delayed.

**Table 1d: Baseline characteristics of HIV infected index clients in the immediate APS and delayed APS arm by gender.**

| | Females(N=690) Median (IQR) or N (%) | | | | Males (N=430) Median (IQR) or N (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | Immediate (n=322) | | Delayed (n=368) | | Immediate (n=228) | | Delayed (n=201) | |
| **1. Socio-Demographic characteristics** | | | | | | | | |
| Age (years) (Median, IQR) | 27 | (23,32) | 29 | (25,35) | 35 | (30,42) | 36 | (30,42) |
| Age (years) (N, %) | | | | | | | | |
| 18-24 | 108 | (33.5) | 89 | (24.2) | 14 | (6.1) | 11 | (5.5) |
| 25-34 | 158 | (49.1) | 179 | (48.6) | 94 | (41.3) | 77 | (38.3) |
| 35-44 | 42 | (13.0) | 78 | (21.2) | 84 | (36.8) | 73 | (36.3) |
| 45-54 | 13 | (4.0) | 20 | (5.4) | 27 | (11.8) | 31 | (15.4) |
| >55 | 1 | (0.3) | 2 | (0.5) | 9 | (4.0) | 9 | (4.5) |
| Marital status | | | | | | | | |
| Single | 81 | (25.2) | 79 | (21.5) | 23 | (10.1) | 21 | (10.5) |
| Married-monogamous | 154 | (47.8) | 185 | (50.3) | 172 | (75.4) | 137 | (68.2) |
| Married-polygamous | 18 | (5.6) | 28 | (7.6) | 13 | (5.7) | 15 | (7.5) |
| Separated/Widowed/Divorced. | 69 | (21.4) | 76 | (20.7) | 20 | (8.8) | 28 | (13.9) |
| Employment | | | | | | | | |
| Unemployed | 96 | (30.3) | 97 | (27.4) | 33 | (14.9) | 14 | (7.2) |
| Employed | 215 | (67.8) | 251 | (70.9) | 187 | (84.2) | 179 | (92.3) |
| Student | 6 | (1.9) | 6 | (1.7) | 2 | (0.9) | 1 | (0.5) |
| **2. HIV Behavioral characteristics** | | | | | | | | |
| No of sexual partners in past 3 months | | | | | | | | |
| 0 | 232 | (72.1) | 293 | (79.6) | 154 | (67.7) | 293 | (79.6) |
| 1 | 75 | (23.3) | 62 | (16.9) | 60 | (26.2) | 62 | (16.9) |
| >1 | 15 | (4.7) | 13 | (3.5) | 14 | (6.1) | 13 | (3.5) |
| Number of lifetime sexual partners (median, IQR) | 3 | (2,4) | 4 | (3,6) | 6 | (4,10) | 6 | (4,10) |
| Type of sexual partner | | | | | | | | |
| Paid money to have sex | 21 | (6.5) | 10 | (2.7) | 81 | (35.5) | 77 | (38.3) |
| Received money to have sex | 75 | (23.3) | 107 | (29.1) | 19 | (8.3) | 15 | (7.5) |
| Condom use in last sexual contact | 68 | (21.2) | 66 | (17.9) | 69 | (30.3) | 45 | (22.4) |
| **3. Testing characteristics** | | | | | | | | |
| **Ever Tested for HIV** | 244 | (75.8) | 262 | (71.2) | 135 | (59.2) | 104 | (51.7) |
| Self-reported last HIV test result | | | | | | | | |
| Does not know | 6 | (2.5) | 8 | (3.1) | 4 | (3.0) | 1 | (1,0) |
| HIV negative | 160 | (65.8) | 191 | (72.9) | 97 | (71.9) | 73 | (70.2) |
| HIV positive | 78 | (32.0) | 63 | (24.1) | 34 | (25.2) | 30 | (28.9) |

[1] Missing occupation data for 5 Females immediate, 14 Females delayed, 7 Males immediate, and 7 Males delayed.

**Table 2: Significance of the interaction term by region, location and gender**

| | P value Region | P value Location | P value Gender |
|---|---|---|---|
| Partner testing for HIV | 0.001 | 0.018 | 0.061 |
| Partner newly testing for HIV | 0.679 | 0.338 | Convergence not achieved |
| Finding a new HIV positive partner | 0.656 | 0.474 | 0.039 |
| Finding any HIV positive partner | 0.585 | 0.505 | 0.183 |
| Linking a HIV positive partner to care | 0.376 | 0.168 | 0.144 |

**Table 3: HIV case finding rate and Number needed to interview overall, and by region, location and gender**

| | Immediate arm n=550 | | Delayed arm n=569 | | | | |
|---|---|---|---|---|---|---|---|
| | N | Rate per index | N | Rate per index | IRR | 95% CI | NNTI[2] |
| **Overall** | | | | | | | |
| HIV testing | 303 | (0.713) | 84 | (0.149) | 4.8 | (3.5, 6.5) | 1.8 |
| New HIV testing | 78 | (0.147) | 4 | (0.007) | 21.0 | (9.7, 45.3) | 7.1 |
| New HIV positive | 132 | (0.247) | 27 | (0.049) | 5.0 | (3.1, 8.2) | 5.0 |
| Any HIV positive | 269 | (0.556) | 275 | (0.559) | 1.0 | (0.7, 1.3) | N/A |
| Linked to care | 70 | (0.127) | 18 | (0.028) | 4.0 | (2.5, 6.3) | 10.5 |
| **Nairobi/Central** | | | | | | | |
| HIV testing | 141 | (0.537) | 62 | (0.160) | 3.4 | (2.3, 4.8) | 2.7 |
| New HIV testing | 40 | (0.143) | 3 | (0.008) | 18.5 | (5.0,149.9) | 7.4 |
| New HIV positive | 63 | (0.214) | 16 | (0.041) | 5.2 | (2.4, 11.4) | 5.8 |
| Any HIV positive | 132 | (0.486) | 162 | (0.482) | 1.0 | (0.7,1.4) | 225.4 |
| Linked to care | 38 | (0.129) | 11 | (0.036) | 4.6 | (2.3, 9.2) | 9.9 |
| **Nyanza** | | | | | | | |
| HIV testing | 162 | (0.914) | 22 | (0.127) | 7.2 | (5.4, 9.6) | 1.3 |
| New HIV testing | 38 | (0.152) | 1 | (0.006) | 27.6 | (5.1,150.3) | 6.8 |
| New HIV positive | 69 | (0.285) | 11 | (0.066) | 4.3 | (3.3, 5.7) | 4.6 |
| Any HIV positive | 137 | (0.637) | 113 | (0.724) | 0.9 | (0.6,1.3) | N/A |
| Linked to care | 32 | (0.125) | 7 | (0.039) | 3.2 | (2.4, 4.3) | 11.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Rural** | | | | | | | |
| HIV testing | 153 | (0.883) | 33 | (0.134) | 6.6 | (4.5, 9.6) | 1.3 |
| New HIV testing | 38 | (0.157) | 1 | (0.004) | 38.8 | (6.4,235.7) | 6.5 |
| New HIV positive | 65 | (0.278) | 16 | (0.065) | 4.3 | (2.2,8.3) | 4.7 |
| Any HIV positive | 129 | (0.629) | 148 | (0.688) | 0.9 | (0.6, 1.3 | N/A |
| Linked to care | 30 | (0.121) | 10 | (0.040) | 3.0 | (1.8, 4.9) | 12.4 |
| **Urban** | | | | | | | |
| HIV testing | 150 | (0.573) | 51 | (0.161) | 3.5 | (2.5, 5.0) | 2.4 |
| New HIV testing | 40 | (0.139) | 3 | (0.009) | 14.9 | (7.0, 31.8) | 7.7 |
| New HIV positive | 67 | (0.222) | 11 | (0.037) | 6.0 | (3.2, 10.9) | 5.42 |
| Any HIV positive | 140 | (0.497) | 127 | (0.460) | 1.1 | (0.8, 1.5) | 27.0 |
| Linked to care | 40 | (0.132) | 8 | (0.025) | 5.3 | (2.8, 10.2) | 9.3 |
| **Females** | | | | | | | |
| HIV testing | 171 | (0.643) | 41 | (0.111) | 5.8 | (4.2, 7.9) | 1.9 |
| New HIV testing | 54 | (0.177) | 0 | (0) | -[1] | - | - |
| New HIV positive | 63 | (0.199) | 8 | (0.022) | 9.1 | (4.0, 20.9) | 5.7 |
| Any HIV positive | 125 | (0.422) | 160 | (0.484) | 0.9 | (0.6, 1.3) | N/A |
| Linked to care | 31 | (0.096) | 6 | (0.016) | 5.9 | (2.7, 13.1) | 12.5 |
| **Males** | | | | | | | |
| HIV testing | 132 | (0.811) | 43 | (0.219) | 3.7 | (2.4, 5.87) | 1.0 |
| New HIV testing | 24 | (0.105) | 4 | (0.020) | -[1] | - | - |
| New HIV positive | 69 | (0.316) | 19 | (0.100) | 3.2 | (1.7, 6.0) | 4.6 |
| Any HIV positive | 144 | (0.746) | 115 | (0.697) | 1.1 | (0.8, 1.4) | 20.4 |
| Linked to care | 39 | (0.171) | 12 | (0.060) | 2.9 | (1.6, 5.1) | 9.0 |

[1] Could not calculate IRR and NNTI by gender as there was no observations in delayed arm.
[2] NNTI-Number needed to interview

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