

Scale-up of assisted partner services in Kenya: assessing linkage to care, integration and costs

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A dissertation submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

University of Washington

2021

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Program Authorized to Offer Degree:

Global Health

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Abstract

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Despite marked progress in achieving universal 95-95-95 targets, gaps still exist, especially in improving individual awareness of HIV status. According to the 2018 Kenya Population-based HIV Impact Assessment (KenPHIA) report, approximately 79.5% of individuals were aware of their status, 96.0% were on antiretroviral therapy, and 90.6% were virally suppressed. Men were less likely to be aware of their HIV status compared to women (72.6% vs 82.7%) necessitating HTS strategies to effectively target this 'hard-to-reach' group.

HIV assisted partner services (aPS), or healthcare provider supported notification of sex partners to newly diagnosed HIV-positive individuals, have been used to bridge this gap in HIV testing, and have been shown to be safe, effective, and cost-effective. aPS was scaled up within the national HIV testing services (HTS) program in Kenya in 2016 after World Health Organization (WHO) recommended the intervention. Our objective was to assess linkage to care, integration, and costs of scaling up aPS within the national HTS program in Kenya.

In the first study, we used data from nine facilities randomized to receive immediate aPS in a cluster-randomized trial conducted in Kenya. We estimated linkage to care - defined as HIV clinic registration - and ART initiation separately for index clients and their sex partners. We found that only two-thirds of newly diagnosed HIV-positive sex partners, and known HIV-positive sex partners not enrolled in care at study enrolment, linked to care after receiving aPS. However,

once linked to care, ART initiation was high (>85%) regardless of whether the participant was an index client, newly-diagnosed or known HIV-positive sex partner not previously linked to care. We recommend that HIV aPS programs optimize HIV care for these individuals, especially those who are younger and single.

In the second study, we used an integrated conceptual framework to assess the extent of aPS integration, institutionalization, and sustainability in routine HTS programs. This study was conducted within the aPS scale-up project – an implementation science study to implement and evaluate the effectiveness of aPS when integrated within routine HTS, and assess implementation outcomes including implementation fidelity, acceptability, demand, and costs. We conducted semi-structured key informant in-depth interviews with aPS stakeholders at national, county, facility and community levels, and found that aPS was well integrated into the national HTS program within two years of scale-up. Funding limitations, human resource constraints, and low community awareness were noted as major barriers to service provision and long-term sustainability. To overcome these barriers, we recommend increased resource allocation for aPS (funding, human resources) and community health volunteer-facilitated community-level awareness.

In the third study, using a payer perspective, we estimated the cost of integrating aPS into routine HTS within the aPS scale-up project in Kisumu and Homa Bay counties. We conducted microcosting, analyzing costs by start-up (August 2018), and recurrent costs one-year after aPS implementation (Kisumu: August 2019, Homa Bay: January 2020), and conducted time-and-motion observations. The average weighted incremental cost of integrating aPS into the existing HTS program was \$7,485.97 per facility per year, with recurrent costs accounting for approximately 90% of costs. Average unit costs per male sex partner (MSP) traced, tested, testing HIV-positive, and on antiretroviral therapy were \$34.54, \$42.50, \$108.71 and \$152.28, respectively, and varied by county and facility type, with larger volume facilities, especially county and sub-county hospitals, having higher total incremental costs and lower average unit costs.

The largest cost drivers were personnel (49%) and transport (13%). We found significant cost variations across facilities offering aPS with high volume facilities having low average unit costs per MSP. We recommend facility prioritization to improve efficiency in resource allocation, especially healthcare personnel, potentially reducing the time and cost spent on delivering aPS.

This dissertation contributes to the growing implementation science literature on aPS and highlights the need to prioritize resources as funding support towards HIV programs declines. As aPS is scaled-up, especially in resource-limited settings, policymakers and implementers will need to regularly review program data to identify sub-groups of PLWH requiring additional support before linking to HIV care and treatment services, and address communication gaps on aPS. Future research on cost-efficient strategies optimizing healthcare worker allocation during aPS is also critically important.

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## **Acknowledgements**

My sincerest gratitude to my dissertation committee chair, Carey Farquhar, and the members, Bryan Weiner, Carol Levin and James Hughes, for your instruction, mentorship and unwavering support during my doctoral studies.

I would like to thank the Kenyan Ministry of Health, the PATH-Kenya site team, and the study participants without whom this research would have been impossible. Special thanks go to our collaborators, including Mary Mugambi, Dr. Edward Kariithi, Harison Lagat, and George Otieno. Special thanks also go to the faculty and staff at the University of Washington's School of Public Health, in particular the Department of Global Health, as well as my peers and friends in Kenya and Seattle for your encouragement throughout this journey.

**Dedication**

I dedicate this dissertation to my husband Denis Cheruiyot, words cannot express what you have meant to me throughout this process.

To my daughter Zawadi, you are my inspiration every day. May your dreams become reality.

To my siblings Jane, Sammy, Caroline, and Susan, thank you for your unwavering support throughout my academic journey.

To my parents, Josephine and the late Phillip Wamuti. Mum, thank you for always supporting my dreams even when they did not make sense to you! Dad, while it is painful not having you at my PhD graduation ceremony, thank you for always believing in me. Till we meet again.

## **Chapter 1. Introduction**

Globally, HIV is a major cause of morbidity and mortality affecting a disproportionately large number of individuals, especially in sub-Saharan Africa (SSA) (1). UNAIDS 95-95-95 fast track targets to end the HIV epidemic by 2030 aim to have 95% of HIV-positive individuals aware of their status, 95% on antiretroviral therapy among those diagnosed, and 95% virally suppressed among those on therapy (2). Though Kenya has marked progress in achieving these targets, only 79.5% of individuals are aware of their status, 96.0% are on antiretroviral therapy, and 90.6% are virally suppressed, indicating major gaps, especially with the first 95 target. Assisted partner services (aPS) can bridge this gap in HIV case-finding, through tracing, testing and linking to care sex partners of individuals diagnosed with HIV especially men who are less likely to be aware of their HIV status compared to women (72.6% vs 82.7%) (3). Such gaps in awareness of HIV status by gender also indicate a need for HIV testing strategies that will effectively target men who are considered a 'hard-to-reach' group (4).

aPS was first recommended in 2016 by the World Health Organization (WHO) as part of the HIV testing services (HTS) package after successful aPS trials and implementation programs in SSA, US and Europe that showed it to be effective, safe and cost-effective. Data also came from a cluster randomized controlled trial (RCT) on aPS conducted in Kenya (5–19). The intervention was subsequently scaled-up in Kenya as a national HTS policy. While interventions may be highly efficacious in controlled settings, there is a possibility of reduced effectiveness within routine settings due to contextual factors that affect implementation (20).

Results from prior aPS studies and programs indicate that many sex partners to persons living with HIV (PLWH) notified through aPS were either unaware of their status, had not previously tested, or had not effectively linked to care if they had a prior HIV diagnosis (10,21). Studies in the United States and Europe indicate that clients receiving aPS were more likely to enroll in HIV care leading to earlier antiretroviral therapy initiation (22). Though SSA countries bear the highest burden of global HIV infections, few aPS implementing programs reported on

linkage to HIV care among sex partners with only one study on the Cameroon aPS program showing linkage to care among HIV-positive sex partners at 86% (10). Understanding factors affecting linkage to care outcomes among individuals receiving aPS will highlight population groups requiring support in establishing HIV care and treatment.

Most literature on aPS in both low and high-income settings present data from controlled trials, pilot programs, or non-governmental organization (NGO) projects with limited data systematically evaluating national implementation. There is paucity of data on the impact of aPS integration on a national HTS program as a whole, or on its key operational units such as human resource and planning. In addition, studies evaluating the integration of other interventions like tuberculosis (TB) screening into HTS programs have generally focused on service delivery at the facility level, rather than systemically at the national level, while none evaluated the extent of integration over time (56). Findings on the extent of aPS integration over time will highlight critical success factors and barriers that policymakers need to focus on to ensure effectiveness of the intervention during scale-up.

As aPS is scaled-up, it is important to evaluate its cost when integrated into routine HTS programs since prior studies have estimated costs within controlled settings. In an aPS RCT in Kenya, estimated costs per partner tested were \$48–55 using a program scenario with highly trained HTS providers referred to as health advisors, and \$27–32 in a task-shifting scenario using community healthcare workers (CHWs) – who are not yet approved to offer HTS and aPS in Kenya (8). Little is understood on how these costs will change during implementation and scale-up using regular HTS providers at the facility level. There is also a dearth of evidence on how these costs vary by facility, given differences in location and patient load, or their impact on personnel time. Results from this cost analysis will facilitate appropriate resource budgeting and planning especially with dwindling funding allocated towards HIV testing services (HTS).

The objectives of this dissertation are three-fold. First, we evaluated factors associated with poor linkage to HIV care among newly diagnosed HIV positive individuals (index clients) and

their sex partners after receiving aPS in Kenya. Second, we evaluated the extent of, barriers to, and facilitators of aPS integration into HTS in Kenya. Third, we estimated the costs of integrating aPS into routine HTS within the aPS scale-up project in Kisumu and Homa Bay counties, western Kenya. Findings will be used to advise policy makers within the Kenyan Ministry of Health as well as in countries implementing aPS programs particularly in SSA, on the individual, healthcare system and cost factors that affect scale-up of the intervention. We expect to generate evidence-based strategies on linkage to care, integration, and costs of scaling up aPS in a low and middle income country, and inform policy makers on the scale-up of similar interventions in their national HTS programs.

## **Chapter 2. Factors associated with poor linkage to HIV care among index clients and sex partners receiving HIV assisted partner services (aPS) in Kenya**

### **Abstract**

**Introduction:** HIV assisted partner services (aPS) has been recommended as a strategy to increase HIV case-finding. We evaluated factors associated with poor linkage to HIV care among newly diagnosed HIV positive individuals (index clients) and their partners after receiving aPS in Kenya.

**Methods:** In a cluster randomized trial conducted between 2013 and 2015, 9 facilities were randomized to immediate aPS (intervention). Linkage to care - defined as HIV clinic registration, and ART initiation were self-reported. ART was only offered to those with CD4<500 during this period. We estimated linkage to care and ART initiation separately for index clients and their partners using log-binomial generalized estimating equation (GEE) models with exchangeable correlation structure and robust standard errors.

**Results:** Overall, 550 index clients and 621 sex partners enrolled, of whom 46% (284/621) were HIV positive. Of the 284, 264 (93%) sex partners returned at 6-weeks: 120 newly diagnosed and 144 whom had known HIV-positive status. Among the 120 newly diagnosed, only 69% (83) linked to care at 6-weeks, while among the 18 known HIV-positive sex partners not already in care at baseline, 61% (11) linked. Newly diagnosed HIV-positive sex partners who were younger and single were less likely to link to care ( $p<0.05$  for all).

**Conclusion:** Two-thirds of newly diagnosed HIV-positive sex partners linked to care after receiving aPS. HIV aPS programs should optimize HIV care for newly diagnosed HIV-positive sex partners, especially those who are younger and single.

## **Introduction**

Globally, significant advances have been made to control the spread of HIV. However, gaps still exist in HIV diagnosis, care and treatment. In sub-Saharan Africa (SSA) an estimated 79% of those living with HIV are diagnosed, 78% of those diagnosed are on antiretroviral therapy (ART), and 86% of these individuals are virally suppressed (23). Assisted partner services (aPS) is a public health strategy to increase the proportion of persons living with HIV (PLHIV) who know their status and are engaged in care. HIV aPS involves eliciting contact information for sex partners from newly diagnosed HIV-positive individuals (index clients), then actively tracing and offering HIV testing to these individuals. A critical and understudied component of aPS is ensuring that PLHIV are linked to care and treatment services (5).

Linking PLHIV to care is essential to the access of HIV care services, including ART initiation and prophylaxis against opportunistic infection, which result in reduced HIV-associated morbidity and mortality and prevention of new HIV infections. Several studies have shown that early ART initiation can reduce incidence of AIDS-defining events including tuberculosis (24) and prolongs life expectancy among PLHIV (4). In addition, the risk of HIV transmission to sex partners of PLHIV who are on ART is reduced by up to 96% (24,27–29).

aPS has been shown to be effective in HIV linkage to care in the United States and Europe, forming a key strategy in HIV prevention by increasing HIV testing and ART initiation for both index clients and their sex partners (14,30–32). In studies conducted in the US, index clients who received partner services were more likely to enroll in HIV care (33,34). Studies conducted in Europe have shown that partner services improve linkage to HIV care, lead to earlier ART initiation, reduce vertical HIV transmission from mothers to infants, and increase life expectancy (22,35–37). Though SSA countries bear the highest burden of global HIV infection, experience in implementing aPS is limited. Among aPS implementing programs in SSA, few have reported on

linkage to HIV care among sex partners. To our knowledge, only one study on the Cameroon aPS program showed linkage to care among HIV-positive sex partners at 86% (10–12).

In a multicenter cluster-randomized controlled trial of aPS in Kenya, we conducted a sub-set analysis limited to the aPS intervention arm (i.e., those who received provider referral) to investigate prevalence and correlates of two key aPS outcomes among newly diagnosed HIV-positive individuals (index clients) and their sex partners: 1) linkage to HIV care, and 2) ART initiation.

## **Methods**

### **Study design**

The study design and methods are reported in the study protocol paper (6). Briefly, a multi-site cluster-randomized controlled trial was conducted between August 2013 and August 2015 in 18 healthcare facilities offering HIV testing services (HTS) that were randomized in a 1:1 ratio to receive either immediate aPS (intervention) or aPS delayed for 6 weeks (control). In the intervention arm, aPS was implemented immediately after index enrollment whereby sex partners were immediately notified of HIV exposure. This analysis focuses only on index clients and their sex partners within this aPS intervention arm.

The facilities were urban, peri-urban and rural, and were located in five counties in Kenya: Nairobi, Kiambu, Murangá, Kisumu and Siaya (6). We conducted restricted randomization of the sites to ensure balance in facility characteristics between the intervention and delayed arms in terms of in terms of county [Nairobi, Kiambu, Murang'a, Kisumu, and Siaya] and proximity to a city [urban, peri-urban, and rural]. The study was unblinded since the protocols and follow-up timelines for the immediate and delayed arms were distinctly different.

### **Study participants**

We enrolled index clients who tested and were newly diagnosed HIV-positive at the study facilities. They were considered eligible if they were  $\geq 18$  years, willing to provide informed consent, and willing to provide information on at least one sex partner from the past 3 years. Clients who were pregnant or had experienced intimate partner violence within the last month were excluded from study participation. Index clients' sex partners from the prior 3 years were traced and invited to enroll in the study. Partners were considered eligible if they were  $\geq 18$  years and willing to provide informed consent for the study.

All study participants provided written, informed consent. Ethical approval for this study was obtained from the Kenyatta National Hospital Ethics and Scientific Review Committee and the University of Washington Institutional Review Board. The trial is registered with ClinicalTrials.gov (NCT01616420).

### **Study procedures**

#### *Index client enrollment, follow-up and linkage to care*

At index client enrollment, health advisors (HTS counselors specially trained on partner notification) collected information on demographic characteristics, sex risk behavior, HIV testing history and contact details of sex partners in a standardized interview. The aPS process was explained to the index clients and they were assured of confidentiality when their partners were being notified. The informed consent form also outlined in detail privacy and confidentiality measures that would be taken to protect the index client. All index clients were encouraged to enroll for HIV care at a healthcare facility of their convenience. Whenever possible, the health advisors would escort them to the HIV comprehensive care center (CCC) within the same healthcare facility.

At the 6-week and 3-month follow-up visits for the index clients, health advisors collected information on the primary outcome of linkage to care. Linkage to care was defined as participant-reported enrollment in an HIV Comprehensive Care Centre (CCC). For all clients, we confirmed linkage to care by requesting for their CCC card which is used to record information on clients

enrolled at the CCC. Participants also reported information about their initiation of cotrimoxazole prophylaxis, CD4 T-cell blood draws, ART eligibility and ART use. At the time of this study, Kenya national guidelines recommended ART for all adults with CD4 cell count below 500.

#### *Sex partner enrollment, follow-up and linkage to care*

After index enrollment, health advisors in the aPS intervention arm sites contacted the sex partners immediately. HIV testing and linkage to care services were offered to these sex partners where they were encouraged to receive HTS either at the healthcare facility, home or work place. Sex partners were defined as known positive if they knew their HIV-positive status before study enrollment; those who learnt of their HIV-positive status during the course of the study were defined as newly diagnosed. Newly diagnosed HIV-positive partners were referred and linked to care at a facility of their choice. Partners who had a known HIV-positive diagnosis were encouraged to continue with HIV care and to disclose their status to their sex partners. HIV-negative sex partners were offered HIV prevention messages including information on condom use.

At sex partner enrollment, health advisors collected information on demographic characteristics, risky sexual behavior and HIV testing history. Partners were encouraged to enroll at the nearest study site; for those who could not come to the study site, the health advisors would arrange to meet at a convenient place and time including the participant's home, workplace or other available venue. Sex partners were tested for HIV at enrollment (usually within two weeks of index client enrollment), and data on linkage to HIV care was collected at the 6-week follow-up visit from their CCC card, similar to the index clients.

Data were collected on pre-designed questionnaires programmed into smartphones using Open Data Kit (ODK) (7). Questionnaires had pre-set validation checks to ensure accuracy and consistency of data at the point of data entry. Once completed, they were uploaded to the Ministry of Health National AIDS and STI Control Program (NAS COP) server (7).

#### **Statistical analysis**

Sociodemographic characteristics at baseline, and linkage to care outcomes at 6-weeks for both index clients and sex partners in the intervention arm were described using medians and interquartile ranges (IQR) for continuous variables, and proportions for categorical variables. Linkage to care outcomes were binary and included enrollment in HIV care, CD4 T-cell blood draw, eligibility for ART, and ART initiation. We used the 6-week follow-up visit for consistency in presentation of data for both the index participants and sex partners.

Analyses of linkage to care correlates among the index clients and their sex partners were performed separately. Correlates of linkage to care among index clients and their sex partners were assessed using bivariable, log-binomial generalized estimating equation (GEE) models with exchangeable correlation structure, and robust standard errors to account for facility and participant correlation. Relative risks (RRs) and 95% confidence intervals (CIs) were calculated. Variables associated with linkage to care in these bivariable analyses ( $p < 0.1$ ) were included simultaneously in two separate multivariable models for index clients and their sex partners. All analyses were conducted using Stata 13.0 (StataCorp, College Station, TX).

## **Results**

### *Baseline sociodemographic and sex behavior characteristics*

In the aPS intervention arm, 550 index clients were enrolled into the study (median age: 30 years; male: 41.5%; currently married: 61.1%) (**Table 1**). Approximately 30% (164/550) of index clients had at least one new sex partner in the prior 3 months; 42.0% (230/550) had at least five lifetime sex partners; and about one quarter (137/550, 24.9%) had used a condom at their last sex contact.

Overall, 621 sex partners were enrolled into the intervention arm (median age: 30 years; male: 50.7%; currently married: 64.6%) (**Table 1**). Of these sex partners, 35.6% (221/625) had at least one sex partner in the prior 3 months, 46.8% (290/625) had at least five lifetime sex partners, and 38.9% (241/625) had used a condom at the last sex encounter.

**Table 2-1 Baseline characteristics of immediate arm index participants and sex partners<sup>1</sup>**

	<b>Index participants N=550</b>	<b>Sex partners<sup>1</sup> N=621</b>
	n (%) or Median (IQR)	n (%) or Median (IQR)
<b>Demographic factors</b>		
Age	30 (25, 37)	30 (26, 37)
Gender: Male	228 (41.5)	315 (50.7)
Marital Status		
Single	104 (18.9)	135 (21.7)
Currently Married	336 (61.1)	401 (64.6)
Divorced/Widowed	89 (16.2)	58 (9.3)
Live-In Partner	21 (3.8)	27 (4.4)
Has electricity	311 (56.6)	320 (51.5)
Has running water	225 (40.9)	227 (36.6)
<b>Sex Risk Behavior</b>		
New sex partners in last 3 months		
0	386 (70.2)	400 (64.4)
1+	164 (29.8)	221 (35.6)
Lifetime sex partners <sup>2</sup>		
<5	317 (58.0)	330 (53.2)
5+	230 (42.0)	290 (46.8)
Used condom at last sex <sup>3</sup>	137 (24.9)	241 (38.9)
Ever given money for sex	102 (18.6)	156 (25.1)
Ever received money for sex	94 (17.1)	140 (22.5)
<b>Economic factors</b>		
Way to support self	381 (69.3)	-
Stable place to live	496 (90.2)	-
Have children	455 (82.7)	-
<b>HIV Status</b>		
HIV Status		
Negative	-	337 (54.3)
New Positive	550 (100)	128 (20.6)
Known Positive	-	156 (25.1)

IQR – Interquartile Range

<sup>1</sup> Excluded 22 in the immediate arm that had been included in the initial study paper due to missing and discrepant data.

<sup>2</sup> Analyzed only among 547 immediate arm index participants and 620 immediate arm partners.

<sup>3</sup> Analyzed only among 550 immediate arm index participants and 620 immediate arm partners.

*Linkage to care outcomes: Index clients, sex partners*

Of the 550 index clients in the intervention arm, 472 (85.8%) returned for the 6-week visit, and 439 (93.0%) of these 472 had linked to care prior to this visit (**Figure 1, Table 2**). Only 76.3% (360/472) had a CD4 blood draw, and 301 (83.6%) of the 360 clients discussed ART eligibility with their healthcare provider. Of the 63.1% (190/301) meeting criteria for treatment initiation, 91.6% (174/190) of the index clients initiated ART. Index clients who returned for 6-week follow-

up were more likely to be older than those who did not return for follow-up ( $p=0.041$ ), but they were similar on all other baseline characteristics.

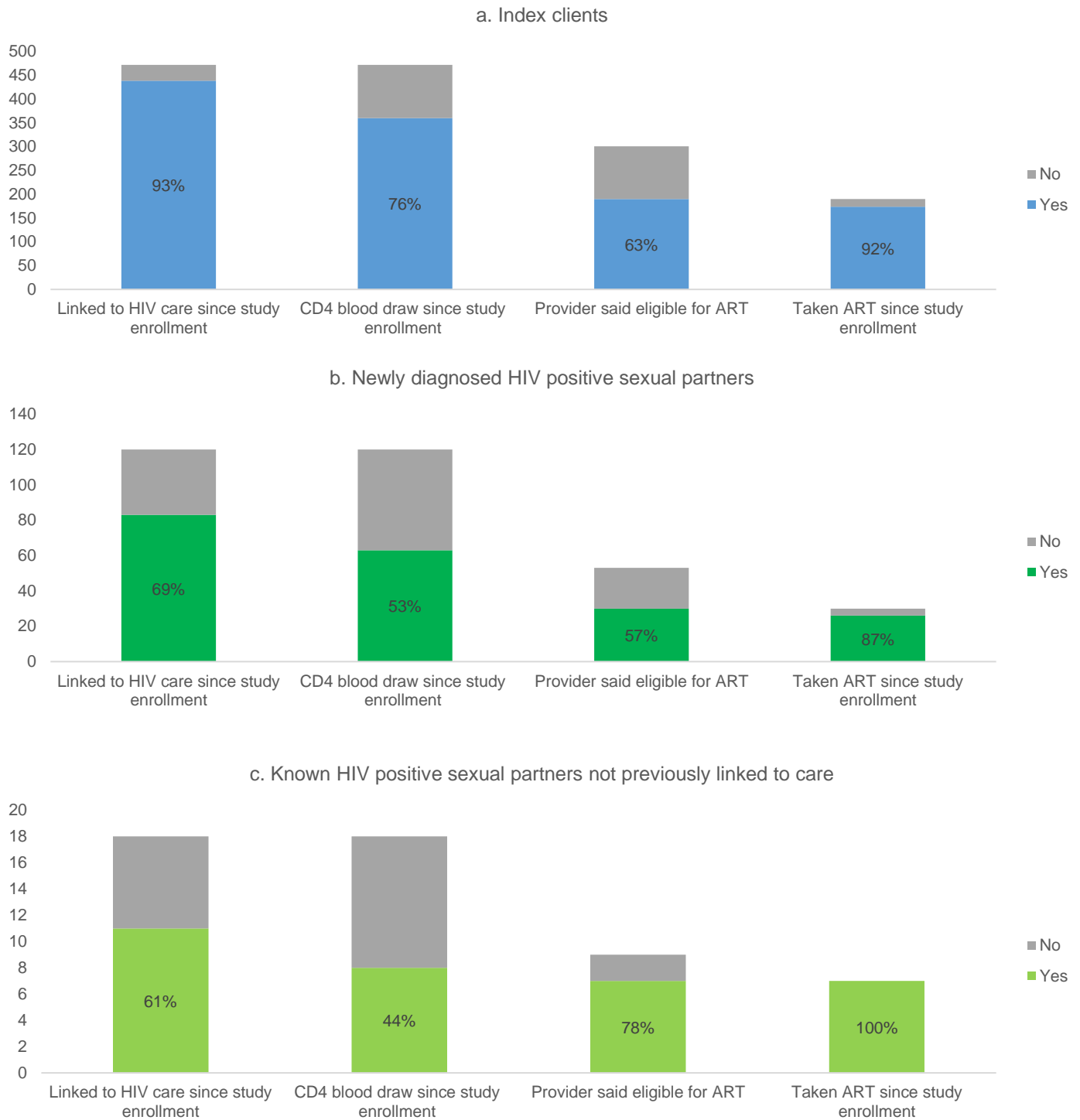


Figure 2-1 Linkage to care cascade for index participants and HIV positive sex partners at the 6-week follow-up visit

Among the 621 enrolled sex partners, 284 (45.7%) were HIV-positive. Of the 284, 93.0% (264) returned for their 6-week visit i.e. 120 newly diagnosed and 144 known HIV-positive sex partners (**Figure 1, Table 2**). Partners who did not return for 6-week follow-up were more likely to have electricity ( $p=0.001$ ) and less likely to have used a condom the last time they had sex ( $p=0.031$ ), but they were similar on all other baseline characteristics.

**Table 2-2 Linkage to care outcomes for index participants and HIV positive sex partners at the 6-week follow-up visit**

<b>Immediate arm outcomes</b>	<b>n/total</b>	<b>%</b>
<b>Outcomes for index participants</b>		
Enrolled in HIV care since study enrollment	439/472	93.0
CD4 blood draw since study enrollment	360/472	76.3
Provider said eligible for ART <sup>1,2</sup>	190/301	63.1
Taken ART since study enrollment <sup>3</sup>	174/190	91.6
<b>Outcomes for newly diagnosed partners</b>		
Enrolled in HIV care since study enrollment	83/120	69.2
CD4 blood draw since study enrollment	63/120	52.5
Provider said eligible for ART <sup>4</sup>	30/53	56.6
Taken ART since study enrollment <sup>5</sup>	26/30	86.7
<b>Outcomes for known positive partners not previously linked to care</b>		
Enrolled in HIV care since study enrollment	11/18	61.1
CD4 blood draw since study enrollment	8/18	44.4
Provider said eligible for ART <sup>6</sup>	7/9	77.8
Taken ART since study enrollment <sup>6</sup>	7/7	100.0

ART – Anti-Retroviral Therapy

<sup>1</sup> Excluded 138 immediate index cases who did not discuss ART with a provider

<sup>2</sup> By World Health Organization (WHO) staging

<sup>3</sup> Among those who were eligible for ART

<sup>4</sup> Excluded 30 immediate group partners who did not discuss ART with a provider; among those enrolled in care

<sup>5</sup> Among those who were eligible for ART and enrolled in care

<sup>6</sup> Excluded 2 immediate group partners who did not discuss ART with a provider; among those enrolled in care

Among the 120 newly diagnosed HIV-positive sex partners, only 83 (69.2%) had linked to care at 6-weeks, and 63 (52.5%) had a CD4 blood draw, with 53 (63.8%) of the 83 clients discussing their ART eligibility with their healthcare provider. Of the 53, 30 (56.6%) clients meet the criteria for ART initiation, and 86.7% (26/30) initiated ART by the 6-week visit. Among 144 known HIV-positive sex partners, 126 (87.5%) were already enrolled in HIV care at enrollment and were excluded from the analysis. Among 18 known HIV-positive sex partners who were not previously

enrolled in HIV care at enrollment, 11 (61.1%) had linked to care at 6-week follow-up and 8 (44.4%) had a CD4 blood draw. Among those enrolled in HIV care, 77.8% were eligible for ART, and among those eligible for ART, 100.0% initiated treatment.

*Correlates of linkage to care: Index clients and sex partners*

Among index clients, those who linked to care in the first 6 weeks had similar demographic characteristics to those who did not link to care (**Table 3**). There was a trend for those who enrolled in care to be more likely to have had at least one sex partner in the last 3 months after adjusting for number of lifetime sex partners (adjusted RR, aRR: 1.04, 95% confidence interval [CI]: 1.00, 1.08) and to have had at least five lifetime sex partners after adjusting for number of new sex partners in the last 3 months (aRR 1.04, 95% CI: 1.01, 1.07).

Among the newly diagnosed HIV-positive sex partners, increased age was significantly associated with increased linkage to care (**Table 4**). We observed a 6% increase in linkage to care for every 5-year age increase (aRR: 1.06, 95% CI: 1.01, 1.11), after adjusting for marital status. Those who had a live-in partner were more likely to link to care than those who were single (aRR: 1.42, 95% CI: 1.07, 1.89) after adjusting for age. There were no statistically significant differences in other demographic and sex risk behavior characteristics between sex partners enrolled in care compared to those who did not enroll. Among the known HIV-positive sex partners who had not linked to care before study enrollment, there were no statistically significant differences in demographic and sex risk behavior characteristics between sex partners enrolled in care compared to those who did not enroll after adjusting for gender and ever given money for sex (**Table 5**).

**Table 2-3 Correlates of linking to care in the first 6 weeks among index participants**

	Linked to Care N=439 n (%) or Median (IQR)	Not linked to Care N=33 n (%) or Median (IQR)	RR (95% CI)	p value	aRR <sup>1</sup> (95% CI)	p value
<b>Demographic factors</b>						
Age	30 (25, 36)	27 (24, 38)	1.01 (0.99, 1.02) <sup>2</sup>	0.315	--	
Gender: Male	184 (41.9)	13 (39.4)	1.01 (0.96, 1.06)	0.803	--	
Marital Status						
Single (ref)	78 (17.8)	7 (21.2)	1.0		--	
Currently Married	267 (60.8)	24 (72.7)	1.00 (0.94, 1.07)	0.998	--	
Divorced/Widowed	78 (17.8)	0 (0.0)	--	--	--	
Live-In Partner	16 (3.6)	2 (6.1)	0.98 (0.85, 1.12)	0.738	--	
Has electricity	242 (55.1)	18 (54.6)	1.00 (0.94, 1.07)	0.939	--	
Has running water	176 (40.1)	10 (30.3)	1.03 (0.96, 1.10)	0.375	--	
<b>Sex Risk Behavior</b>						
New sex partners in last 3 months						
0 (ref)	300 (68.3)	27 (81.8)	1.0		--	
1+	139 (31.7)	6 (18.2)	1.05 (1.01, 1.09)	0.027	1.04 (1.00, 1.08)	0.034
Lifetime sex partners <sup>3</sup>						
<5 (ref)	245 (56.1)	23 (69.7)	1.0			
5+	192 (43.9)	10 (30.3)	1.04 (1.01, 1.07)	0.011	1.04 (1.01, 1.07)	0.017
Condom use at last sex	113 (25.7)	5 (15.2)	1.04 (0.98, 1.11)	0.234	--	
Ever given money for sex	87 (19.8)	5 (15.2)	1.02 (0.97, 1.07)	0.436	--	
Ever received money for sex	79 (18.0)	5 (15.2)	1.01 (0.94, 1.09)	0.714	--	
<b>Economic factors</b>						
Way to support self	304 (69.3)	21 (63.6)	1.02 (0.96, 1.08)	0.568	--	
Stable place to live	397 (90.4)	31 (93.9)	0.97 (0.90, 1.04)	0.377	--	
Have children	359 (81.8)	29 (87.9)	0.97 (0.91, 0.99)	0.410	--	

RR – Relative Risk; aRR – Adjusted Relative Risk; CI – Confidence Interval

<sup>1</sup> aRR is adjusted for number of new sex partners in the last 3 months and number of lifetime sex partners

<sup>2</sup> RR is comparing for a 5 year increase in age

<sup>3</sup> Missing data for 2 participants who enrolled in care

**Table 2-4 Correlates of linkage to care for 120 newly diagnosed sex partners**

	<b>Linked to Care N=83</b> n (%) or Median (IQR)	<b>Not linked to Care N=37</b> n (%) or Median (IQR)	<b>RR (95% CI)</b>	<b>p value</b>	<b>aRR<sup>1</sup> (95% CI)</b>	<b>p value</b>
<b>Demographic factors</b>						
Age	31 (26, 36)	28 (25, 32)	1.07 (1.01, 1.13) <sup>2</sup>	0.024	1.06 (1.01, 1.11) <sup>2</sup>	0.019
Gender: Male	37 (44.5)	18 (48.7)	0.95 (0.84, 1.09)	0.481		
Marital Status						
Single (ref)	11 (13.3)	7 (18.9)	1.0		1.0	
Currently Married	64 (77.1)	27 (73.0)	1.17 (0.81, 1.68)	0.405	1.09 (0.76, 1.56)	0.636
Divorced/Widowed	2 (2.4)	3 (8.1)	0.72 (0.27, 1.91)	0.512	0.67 (0.28, 1.59)	0.365
Live-In Partner	6 (7.2)	0 (0.0)	1.58 (1.13, 2.21)	0.007	1.42 (1.07, 1.89)	0.015
Has electricity	43 (51.8)	13 (35.1)	1.14 (0.95, 1.36)	0.164	--	
Has running water	29 (34.9)	10 (27.0)	1.03 (0.85, 1.24)	0.756	--	
<b>Sex Risk Behavior</b>						
New sex partners in last 3 months						
0 (ref)	54 (65.1)	22 (59.5)	1.0			
1+	29 (34.9)	15 (40.5)	0.93 (0.83, 1.04)	0.216	--	
Lifetime sex partners						
<5 (ref)	45 (54.2)	17 (46.0)	1.0		--	
5+	38 (45.8)	20 (54.0)	0.94 (0.75, 1.17)	0.583	--	
Used condom at last sex	19 (22.9)	9 (24.3)	1.03 (0.82, 1.29)	0.817	--	
Ever given money for sex	18 (21.7)	11 (29.7)	0.92 (0.71, 1.20)	0.550	--	
Ever received money for sex	18 (21.7)	13 (35.1)	0.84 (0.66, 1.06)	0.148	--	

RR – Relative Risk; aRR –Adjusted Relative Risk; CI – Confidence Interval

<sup>1</sup> Adjusted for age and marital status

<sup>2</sup> RR is comparing those 5 years older to those 5 years younger

**Table 2-5 Correlates of linkage to care for 18 known HIV-positive sex partners who had not enrolled in HIV care prior to study enrollment**

	<b>Linked to Care N=11</b> n (%) or Median (IQR)	<b>Not linked to Care N=7</b> n (%) or Median (IQR)	<b>RR (95% CI)</b>	<b>p value</b>	<b>aRR<sup>1</sup> (95% CI)</b>	<b>p value</b>
<b>Demographic factors</b>						
Age	34 (27, 46)	30 (28, 33)	1.07 (0.98, 1.18) <sup>2</sup>	0.141	--	
Gender: Male	4 (36.4)	5 (71.4)	0.48 (0.22, 1.06)	0.070	0.51 (0.20, 1.31)	0.163
Marital Status <sup>3</sup>						
Single	0 (0.0)	2 (28.6)				
Currently Married	10 (90.9)	5 (71.4)	1.75 (0.51, 6.01)	0.371	--	
Divorced/Widowed	1 (9.1)	0 (0.0)				
Live-In Partner	0 (0.0)	0 (0.0)				
Has electricity	5 (45.5)	4 (57.1)	1.05 (0.44, 2.55)	0.908	--	
Has running water	4 (36.4)	2 (28.6)	1.23 (0.70, 2.17)	0.476	--	
<b>Sex Risk Behavior</b>						
New sex partners in last 3 months						
0 (ref)	9 (81.8)	4 (57.1)	1.0		--	
1+	2 (18.2)	3 (42.9)	0.61 (0.29, 1.25)	0.176	--	
Lifetime sex partners						
<5 (ref)	9 (81.8)	3 (42.9)	1.0		--	
5+	2 (18.2)	4 (57.1)	0.53 (0.12, 2.33)	0.403	--	
Used condom at last sex	4 (36.4)	2 (28.6)	1.11 (0.57, 2.14)	0.765	--	
Ever given money for sex	2 (18.2)	2 (28.6)	0.56 (0.34, 0.90)	0.018	0.76 (0.38, 1.51)	0.433
Ever received money for sex	1 (9.1)	0 (0.0)	--	--	--	

RR – Relative Risk; aRR –Adjusted Relative Risk; CI – Confidence Interval

<sup>1</sup> Adjusted for gender and ever given money for sex

<sup>2</sup> RR is comparing those 5 years older to those 5 years younger

<sup>3</sup> This model only includes the currently married variable

## Discussion

Within the aPS intervention arm, 6-week linkage to care was high (>93%) for index clients and known HIV-positive sex partners, however, only 65% of newly-diagnosed HIV-positive and 61% of known HIV-positive sex partners not previously linked, enrolled in care. Index clients who linked to care were similar to those who did not link with regard to demographic, sex risk behavior and economic factors. Among newly diagnosed HIV positive sex partners, those who were younger and single were less likely to link to care. Once linked to care, ART initiation was high (>85%) regardless of whether the participant was an index client, newly-diagnosed or known HIV-positive sex partner not previously linked to care.

Notably, only two-thirds of newly diagnosed HIV-positive partners and known HIV-positive partners not previously enrolled in care in the aPS intervention arm linked to care within 6-weeks of index client HIV testing compared to more than 90% linkage among index clients. One explanation may be that at the time of our study, Kenya had not yet implemented the World Health Organization's (WHO) 2016 *Test and Treat All* recommendation. It is possible that these HIV-positive sex partners did not feel unwell and thus did not consider themselves likely to be eligible for ART initiation and were therefore less likely to seek HIV care. Healthcare providers were also less inclined to insist on immediate ART initiation among these clients since they did not meet eligibility criteria for treatment. Within universal test and treat (UTT) trials in SSA, linkage to care results were similar to our study. In the Sustainable East Africa Research in Community Health (SEARCH) trial, linkage to care among HIV-positive clients not already in HIV care was 56.6% and 61.3% within one and three months of testing, respectively (38). Age was associated with linkage to care with higher likelihood of linkage with each additional year increase in age, similar to our study. Probability of retention to care at one year was lower among newly diagnosed compared to previously in care individuals (39). Though we did not evaluate retention to care at one-year as an outcome variable due to our limited study timeline, these results reinforce the

need for more proactive engagement of both newly and previously diagnosed HIV-positive individuals. We did not observe any gender disparity in linkage to care similar to the SEARCH trial (38,39) but unlike other SSA studies that show lower linkage and retention to care among men (40,41). This is possibly due to proactive tracing and notification for both male and female sex partners in our study, and more streamlined patient-centered care at the health facilities.

Few studies in SSA countries show results on linkage to care among PLHIV who have specifically received aPS. In Cameroon, where aPS has been implemented since 2007, there was high linkage with about 86% of HIV positive sex partners linking to HIV care. However, they did not disaggregate their results by new versus known HIV-positive sex partners (10). They also did not indicate the time point at which they evaluated linkage to care and we considered linkage at the 6-week visit only. It is possible that linkage would be higher at later time points, assuming additional follow-up of the sex partners. To our knowledge, there are no aPS studies that have evaluated the effect of time on linkage to care; however, we anticipate that aPS models with proactive sex partner engagement and follow-up, especially for newly diagnosed HIV-positive sex partners, might be necessary if programs are to successfully link and retain these individuals in care.

Index clients who linked into care were similar to those who did not link into care with regard to demographic, sex risk, and economic factors. Among sex partners, those who were younger and single were less likely to be linked. These results differ from those of a study on linkage to care in South Africa, which found that age was not predictive of linkage to HIV care in HTS clients (42). This finding suggests that it may be useful to tailor messages about linkage to care and condom use to younger, single HIV-positive partners. Achieving high rates of linkage to care is critically important if partner notification services programs are to be effective at reaching UNAIDS 95:95:95 targets across SSA (23).

In our analysis, once index clients and sex partners in the aPS intervention arm linked to care, ART initiation was high with approximately 90% of all index clients and more than 85% of sex partners who were eligible for ART initiating treatment by the 6-week follow-up visit. These results are very encouraging given the UNAIDS targets. Also, by the close of our study, WHO's 2016 *Test and Treat All* recommendation had not been incorporated into the Kenya HIV Testing Services Guidelines, and therefore did not affect the proportion of individuals initiating ART (5,43). Our findings are consistent with the Kenya AIDS Indicator Survey 2012 where 85% of individuals who knew their HIV status and were ART-eligible, were taking ART (44), therefore showing the potential for aPS to achieve even higher levels of ART initiation among clients. As global policy shifts towards 100% treatment, aPS is an important strategy to address challenges identifying those living with HIV, linking them to care and initiating therapy.

Strengths of this study include conducting the study in urban, peri-urban and rural HTS facilities, thus our study results are generalizable to a wide range of settings. Second, we collected data that enabled us to disaggregate results by new and known HIV-positive sex partners. This enabled us to show differences in linkage to care and ART initiation for these sub-groups. Third, we followed up clients to ascertain linkage to care status which provided an opportunity for additional support for clients with difficulties in establishing care. Limitations include that our linkage to care outcomes were self-reported and could be subject to social desirability bias with potential over-reporting of linkage to care and ART initiation. Second, the time for index client and sex partner follow-up for this analysis was conditional on follow-up at 6 weeks, with both index clients and sex partners who did not return for follow-up having similar characteristics to those who did except for older age (index clients), and lower likelihood of having electricity or using condoms among the sex partners. A longer study would be helpful to evaluate the effect of aPS on linkage and retention in care for both index and sex partners over time. In addition, this study focused on heterosexual relationships in the general population; therefore, results might differ

among key populations. Further studies to investigate aPS in key populations in Kenya, including female sex workers, men who have sex with men, and people who inject drugs would be useful.

### **Conclusion**

Overall, aPS is a critical strategy for ensuring linkage to care and ART initiation among HIV-positive sex partners and it is being incorporated as part of routine HIV services. Providing immediate aPS was associated with high linkage to HIV care among index clients. However, this was not observed among newly diagnosed or known HIV-positive sex partners who had not linked to care, or among sex partners who were single or younger, highlighting areas for attention. As aPS programs scale up in Kenya and other parts of SSA, optimization of HIV care for newly diagnosed HIV-positive sex partners will be critical to the achievement of UNAIDS 95-95-95 goals.

### **Chapter 3. Integration of assisted partner services within Kenya's national HIV testing services program: A qualitative study**

#### **Abstract**

**Background:** Assisted partner service (aPS) augments HIV case-finding among sexual partners of people newly diagnosed with HIV. In 2016, aPS was incorporated into the national HIV testing services (HTS) program in Kenya. We evaluated the extent of, barriers to, and facilitators of aPS integration into HTS in Kenya.

**Methods:** We conducted 40 semi-structured in-depth interviews (IDIs) with stakeholders selected using stratified purposive sampling at national, county, facility and community levels. IDIs were conducted at two timepoints: baseline during study initiation from August-September 2018 in Kisumu and January-June 2019 in Homa Bay, and follow-up approximately two years later from May-August 2020 in both counties. We defined integration as the creation of linkages between the new intervention (aPS) and the existing HTS program across five healthcare subsystems, defined as operational divisions within the healthcare system responsible for HTS, namely procurement/logistics, recruitment/training, planning/sensitization, monitoring/evaluation and service delivery. Data were analyzed inductively and deductively using thematic content analysis based on an integrated conceptual framework on integration, institutionalization and sustainability of aPS within HTS.

**Results:** We found varying degrees of aPS integration across subsystems, highest in procurement/logistics and lowest in HTS provider recruitment/training. At baseline, aPS integration was low overall and in a planning phase including guideline development and stakeholder coordination. At follow-up, aPS was integrated in almost all subsystems including aPS provision, joint supervision, and data review meetings. At baseline, most aPS activities were at introductory phase; over time, there was increasing routinization with establishment of clear aPS cycles, e.g. budget cycles, quarterly data review meetings, and annual work-plans. The

majority of interviewees reported low community awareness at both baseline and follow-up. Major barriers included limited government funding, staff recruitment constraints, and inadequate community-level sensitization; however, implementing partner organizations played a crucial role in filling these gaps. Facilitators included increased resource allocation for aPS (funding, human resources) and community health volunteer-facilitated community-level awareness and adoption of aPS.

**Conclusion:** aPS had been well integrated into HTS within two years of study initiation. Funding limitations, human resource constraints and low community awareness were noted as major barriers that should be addressed to ensure seamless service provision and long-term sustainability.

## **Introduction**

HIV still affects a disproportionately large number of individuals globally (45). HIV case-finding is the first step in offering preventive messaging, referral and linkage to HIV care and treatment services for people with HIV (5). Assisted partner services (aPS) have been used to augment HIV case-finding and involves tracing, testing and linking to care sexual and drug-injecting partners of individuals diagnosed with HIV, and was first recommended in 2016 by the World Health Organization (WHO) as part of the HIV testing services (HTS) package (5). Increasingly, aPS is being promoted through ministries of health (MOHs) as a strategy for partner tracing, exposure notification, HIV testing and linkage to care, as part of the universal 95-95-95 targets that by 2030, 95% of people living with HIV know their HIV status, 95% of people who know their status are receiving treatment and 95% of people on HIV treatment achieve viral suppression (2,10,14,30,31,46).

Kenya incorporated aPS into its national HIV testing services (HTS) program in 2016 soon after release of the WHO recommendations, and after a successful cluster-randomized controlled trial that found aPS to be effective, safe and cost-effective in Kenya (6,8,21,47). Though interventions might be efficacious during controlled trials, translation to real-life settings may reduce effectiveness (20). Most literature on aPS in both low and high-income settings present data from controlled trials or pilot programs with few systematically evaluating national implementation (10–12,48–52). Integration, defined as the creation of linkages between new interventions and existing programs to improve healthcare delivery (53), occurs at different degrees across subsystems, defined as operational divisions within the healthcare system responsible for HTS, including procurement/logistics, recruitment/training, planning/sensitization, monitoring/evaluation and service delivery. As new interventions become institutionalized over time (54), they may eventually have long-term viability or be unsustainable (55) depending on factors such as resource availability.

To promote seamless and sustainable integration of aPS into national HTS programs, it is important to identify key barriers and enablers to integration and manage them appropriately. However, little is understood about the impact of aPS integration on a national HTS program as a whole, or on its subsystems. In addition, studies evaluating the integration of other interventions into HTS programs, like tuberculosis (TB) screening, have generally focused on service delivery at the facility level, rather than within subsystems at the national level, while none have evaluated the extent of integration over time (56).

We explored the extent of, barriers to, and facilitators of aPS integration into the national HTS program in Kenya. This was conducted as part of a larger project on evaluating the effectiveness of aPS implementation in western Kenya. We qualitatively described the extent of aPS integration across key MOH subsystems at two time points: at baseline - the start of the larger effectiveness study, and at follow-up - approximately two years after study initiation, and compared the levels of aPS integration at these two phases.

## **Methods**

### *Study design and participants*

Qualitative in-depth interviews (IDIs) were nested within a collaborative study between the MOH, PATH-Kenya, and the University of Washington to evaluate the scale-up of aPS in Kenya described in detail elsewhere (57). The collaborative study took place in 31 healthcare facilities in Kisumu and Homa Bay, two counties in western Kenya with the highest HIV prevalence in the country (4).

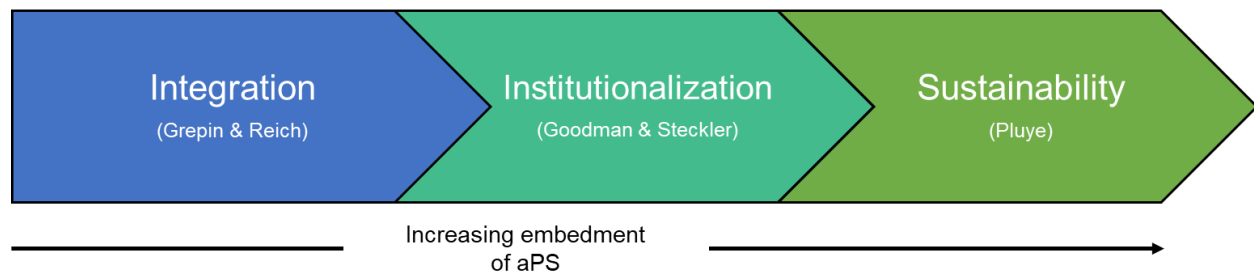
Using stratified purposive sampling, we selected 40 key aPS stakeholders (twenty each at baseline and follow-up) from national, county, facility and community levels. These included MOH policy makers, HIV implementing partner organization representatives, county and sub-county AIDS coordinators (CASCOs, SCASCOs), facility-in-charges, and community representatives

from Kisumu and Homa Bay. Facility-in-charges, typically government workers supervising individual healthcare facilities, support policy implementation and service delivery including those related to HTS. Community representatives, not included at baseline, were included in the follow-up IDIs to gain community perspectives on aPS integration. This sample was selected to include perspectives from all healthcare system levels in Kenya and provide a holistic perspective of aPS integration within the national HTS program. If an interviewee is not able to participate in the follow-up interview, an alternative stakeholder from the same or similar organization was purposively sampled to participate.

IDIs were conducted at two time points, baseline and follow-up. Baseline interviews were conducted at the start of the collaborative study in two phases: from August-September 2018 in Kisumu, and from January-June 2019 in Homa Bay. Baseline interviews were conducted at different times because Homa Bay facilities entered the study six months after the Kisumu sites. Follow-up interviews occurred approximately two years later in both counties, from May-August 2020.

### *Conceptual framework*

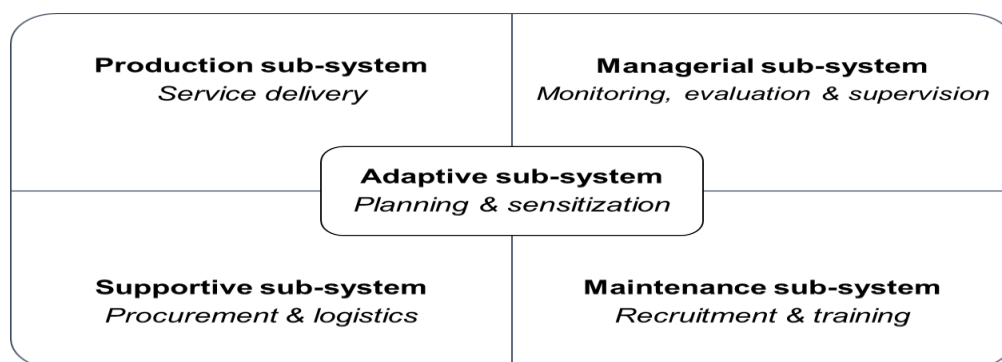
We assessed the extent of aPS integration, institutionalization and sustainability by combining three theoretical frameworks: program integration by Grepin & Reich (53), program institutionalization by Goodman & Steckler (54), and program sustainability by Pluye (55) (*Figures 1, 2*). Integration was operationalized at national, county and community levels (53). Varying degrees of integration were used including full, partial or minimal integration, which referred to complete, incomplete or limited aPS incorporation to a subsystem, respectively.



*Figure 3-1 Conceptual framework of aPS integration in Kenya’s HTS program*

Institutionalization, defined as the attainment of long-term viability of innovations in an organization, was operationalized using a two-dimensional matrix: i) *organizational subsystems* - adaptive, supportive, maintenance, production, and managerial, and ii) *levels of institutionalization* – passages (introduction), cycles (routinization) and niche saturation of aPS within the national HTS program (54). Passages describe the start point of any intervention, in this case the introduction of aPS into HTS. Routinization describes its recurrent adoption within HTS, e.g. budget or training cycles that include aPS. Niche saturation refers to the ubiquitous adoption of aPS throughout Kenya, i.e. sustained aPS provision within HTS across all settings.

The adaptive subsystem (planning, sensitization) monitors relevant modifications to MOH’s organizational structure and processes and engages in strategic planning, e.g. incorporation of aPS into national HTS guidelines. The supportive subsystem (procurement, logistics) evaluates procurement of resources for aPS provision, e.g. purchasing and distribution of HIV test kits. The maintenance subsystem (recruitment, training) reinforces the roles of staff, e.g. hiring and training of HTS providers on aPS. The production subsystem (aPS provision) focuses on partner elicitation, tracing and notification by HTS providers. The managerial subsystem (monitoring, evaluation, supervision) coordinates all subsystems and harmonizes program requirements with MOH resources, e.g. reviewing progress towards key aPS indicators against targets.



**Figure 2. 1 Organizational sub-systems in Kenya’s HTS program based on conceptual framework**

Sustainability, defined as the persistent continuation of programs with a defined set of activities and resources focused on program-related objectives, was categorized into three degrees: *weak sustainability* – absence of cycles, *medium sustainability* –presence of non-standard cycles, and *strong sustainability* - presence of cycles that are supported at state level e.g. government supported guidelines(55).

*Study procedures and data collection*

Key aPS stakeholders were approached for participation in IDIs, each lasting one to two hours. IDIs were conducted in person or on phone in either English, Swahili, or Luo by two qualified qualitative interviewers (baseline: CO, follow-up: MO). Semi-structured interview guides based on the conceptual framework were administered by the qualitative interviewers. IDIs were audio-recorded, transcribed and coded independently by MO and BMW. Transcriptions were done by a transcriber familiar with the three languages. The qualitative interviewers verified all transcripts and corrected any inconsistencies.

*Data analysis*

Personal identifiers were removed from recorded interviews and corresponding transcripts, and these were assigned identification numbers. CO, MO and BMW used deductive and inductive coding to develop the codebook based on structured codes from the conceptual framework and emerging codes from the interviews. The codebook was pilot tested on two transcripts, revised, and the researchers coded the remaining transcripts and reached consensus through discussion. Interview transcripts were analyzed using thematic content analysis. Demographic characteristics of the interviewees, selected excerpts of interview quotes, and the degree of integration have been presented using tables and quotes. Analyses were conducted using ATLAS.Ti version 8.4.4 and Microsoft Excel.

## Results

Sociodemographic characteristics for the forty aPS stakeholders are described in **Table 1** while illustrative quotes are presented in **Tables 2-4**. Overall, six MOH policy makers, ten HIV implementing partner organization representatives, nine CASCO/SCASCOS, 11 facility-in-charges and four community representatives were interviewed.

**Table 3-1 Stakeholder characteristics**

Participant group	Baseline (20)	Follow-up (20)	Total (40)
MOH policy maker	4 (20%)	2 (10%)	6 (15%)
HIV implementing partner	5 (25%)	5 (25%)	10 (25%)
CASCO <sup>1</sup> /SCASCO <sup>2</sup>	4 (20%)	5 (25%)	9 (22%)
Facility-in-charge	7 (35%)	4 (20%)	11 (28%)
Community representative	-	4 (20%)	4 (10%)

<sup>1</sup>CASCO – County AIDS and STI (STI – Sexually transmitted infection) coordinator

<sup>2</sup>SCASCO - Sub-county AIDS and STI coordinator

## Extent of aPS integration, institutionalization and sustainability in Kenya

We found varying degrees of aPS integration across the subsystems, highest being in procurement/logistics and lowest in recruitment/training (**Table 2, Figure 3**). Overall, the extent of aPS integration at baseline was at initial planning stages i.e. aPS guideline and policy

development, and stakeholder coordination. During follow-up interviews, stakeholders reported that aPS was increasingly integrated into almost all subsystems, including aPS provision, joint supervision and data review meetings. A majority of the interviewees reported low community awareness at baseline that seemed to persist one year into the program.

Organizational sub-system		Baseline	Follow-up
<b>Supportive</b>	Procurement, logistics	Full integration	Full integration
<b>Production</b>	aPS provision	Full integration	Full integration
<b>Adaptive</b>	Planning	Partial integration	Full integration
	Sensitization	Minimal integration	Partial integration
<b>Managerial</b>	Monitoring, evaluation	Minimal integration	Partial integration
	Supervision	Partial integration	Full integration
<b>Maintenance</b>	Recruitment	Minimal integration	Partial integration
	Training	Minimal integration	Partial integration
<b>Funding</b>	Budgets	Minimal integration	Minimal integration

**Legend**

Full integration

Partial integration

Minimal integration

*Figure 3-2 Extent of aPS integration across organizational subsystems*

At baseline, most aPS activities were in an introductory phase; over time, there was increasing routinization with establishment of clear aPS cycles, e.g. budget cycles, quarterly data review meetings, and annual work-plans (**Table 3**). None of the activities had reached niche saturation i.e. none were ubiquitously adopted due to limited government funding.

The presence of government-supported aPS guidelines that detailed aPS inputs, processes and procedures across all subsystems implied that aPS was highly sustainable (i.e. due to the presence of cycles that are supported at state level). However, stakeholders mentioned that resource limitations were key barriers to its full realization by affecting activities such as staff hiring, training, phone and physical tracing.

### **Integration and institutionalization of aPS across organizational subsystems**

#### ***Procurement/logistics (supportive subsystem)***

At baseline, aPS had been fully integrated into the existing national procurement and logistics systems and cycles, and included the provision of medical supplies and commodities, e.g. HIV test kits and gloves, to support HIV testing for traced sexual partners. aPS was considered a critical part of the HTS program which facilitated integration to the supply chain system. This level of integration persisted two years into program roll-out.

*I: ....in terms of supplies, do you feel that aPS is fully integrated within the KEMSA (Kenya Medical Supplies Agency) supply system P: Yes, because we do it and...we report it in the (MOH) 643, we report in (MOH) 731 (medical commodity consumption reports), and these are able to reflect the number of clients that have been tested. (KII 005 SCASCO, follow-up)*

#### **APS provision (production subsystem)**

At both baseline and follow-up, all stakeholders reported that aPS had been fully integrated into HTS delivery. aPS was being offered as standard-of-care, and was considered part of HTS providers' key performance indicators. Some of the enabling factors included rigorous teamwork, coordination, and supervision at the facility level. Further, aPS had been routinized as a daily task for all HTS providers though challenges with funding and lack of adequate staff was seen to hinder optimum aPS performance at the facility level.

*I: Would you say aPS is integrated within HTS at the facility level? P: It is fully integrated because all counsellors are aware of aPS and they practice it. All HTS counselors know at the back of their minds that there is something called aPS and if they get any eligible client who can benefit or if they get a positive from their clients, they take it up. (KII 004 Nursing officer-in-charge, follow-up)*

#### **Planning/sensitization (adaptive subsystem)**

Although there was a marked aPS integration in planning at baseline, community level sensitization on aPS seemed to be lagging and this persisted into the follow-up period. At baseline, the MOH had planned for and developed aPS guidelines and training materials. Since a phased county-level aPS sensitization had been preferred over a national launch, there was initial confusion by some interviewees on whether these aPS tools were available for use. At follow-up, this confusion had been resolved and planning was now also part of county level activities. Clear cycles e.g. quarterly training cycles, quarterly and annual work plans, and contract-based staff hiring cycles had also been set up. However, the inadequate community level sensitization on aPS noted during baseline interviews still came up in the follow-up interviews, which some attributed to lack of a clear communication strategy on aPS.

*P: Sensitization has been happening for healthcare workers majorly in the facilities but at the community level... I don't think sensitization for aPS has happened. I: OK, so the community is not aware about the services? P: No, unless when we deal with our clients individually when they come to the facilities. (KII 003 SCASCO, follow-up)*

### **Monitoring, evaluation and supervision (managerial subsystem)**

There was moderate integration of aPS in monitoring, evaluation, and supervision; it was minimal at baseline and had become increasingly integrated at follow-up, though sub-optimally. County governments ensured aPS was conducted according to MOH protocols, though there was a major failure in integrating aPS indicators into the national data reporting tools noted at both baseline and follow-up. The national HTS register had been updated prior to incorporation of aPS into the HTS program; therefore, aPS indicators had to be collected on separate data collection tools at the facility level and relayed through the county to the national level, which made it difficult to proactively track the status of aPS in the country. Most of these separate data collection tools were provided by the implementing partner organizations. To overcome this challenge, county

level teams had to proactively supervise aPS provision and coordinate monthly review meetings to assess aPS performance.

*P: As for me, the biggest gap is integrating the aPS indicators, all the way to the national level. I: OK. P: We are collecting aPS indicator data at the facility level, but our summary tools which is MOH 362 and 711, the DHIS (Demographic Health Information System) don't capture that. So that is what we are working on. But that is a big gap for me. (KII 001 Implementing Partner, follow-up)*

### ***Recruitment and training (maintenance subsystem)***

The lowest degree of integration was observed in the recruitment and training of HTS providers. At baseline, integration in this subsystem was low as the MOH had put on hold the hiring of HTS providers due to funding limitations. During follow-up interviews, it emerged that this cadre was being hired on contract basis through implementing partner organizations with approval from the county governments. The Public Service Commission, a government agency in charge of hiring government staff, was yet to formally incorporate aPS and HTS provider job descriptions, further complicating adoption of aPS. Despite efforts to institutionalize this cadre, not much progress had been made over a year into roll-out. Similarly, though aPS training materials were available from the government, there was limited government funding to train facility level HTS providers; this funding was provided by implementing partner organizations. Therefore, hiring and training cycles for staff were not well established and seemed particularly dependent on external funding sources.

*I: ....The MoH asks (implementing) partners to support the HTS providers. The reason I'm saying that is because government is not able to quickly respond to paying healthcare workers because they expect an annual budget. So basically, (implementing) partners usually take up the immediate responsibility of recruitment of providers to provide aPS.*

*The long-term vision is of them being taken up by governments being absorbed by government in terms of the planning cycle. So, (implementing) partners, take up the responsibility of filling the gaps for HTS providers and paying for them through the Public Service Commission in the county. (KII 001 Implementing Partner, follow-up)*

## **Funding**

Funding emerged as a key standalone theme that had not been distinctly outlined in our conceptual framework. At both baseline and follow-up, funding budgets had not been integrated, with implementing partner organizations operating their own aPS budgets separate from the government. Due to limited county government funding, financing for aPS at the county level was predominantly supported by implementing partner organizations. To facilitate the coordination of county-wide aPS activities, CASCO/SCASCOS held annual work plan meetings with implementing partner organizations to align on budgetary support for aPS related activities.

*P: Well, when we do the annual work plan, we plan for everything, we budget for everything. But it's usually very hard to get the finances to carry out those activities. I: The budgeting process, is there any point where that is done jointly between (implementing) partners and the MoH? P: No. I: So, you run on separate budgets? P: Yes. (KII 005 SCASCO, follow-up)*

## **Facilitators of and barriers to aPS integration**

Major barriers to aPS integration included human resource constraints, funding gaps, incomplete HTS registers and client issues (**Table 4**). Stakeholders reported that hiring restrictions on HTS providers constrained service delivery, leading to demotivation and poor performance in some facilities. They also felt that limited government funding resulted in inadequate mentorship, training and supervision of aPS. Lack of aPS indicators on HTS registers complicated national

aPS coordination; possible harmonization with existing indicators would improve program supervision. Some noted that client concerns regarding privacy, confidentiality and safety were due to inadequate sensitization on aPS which contributed to low client awareness, and necessitated additional HTS provider support when handling complicated partner notification scenarios.

*I: What are some of the gaps that still exist? P: .....Human resource constraints. Even as we are implementing aPS, we have not been able to put human resource because for us to have aPS in a facility, we need like 15 or 20 counselors and nobody is hiring and it is just the same few people who are doing the work. Training, we have tried the best we could so it is not really a challenge, but right now PEPFAR (U.S. President's Emergency Plan for AIDS Relief) has pulled out all the money for training and we are not doing any more training. So we have to do online trainings or struggle with the other small (implementing) partners to fund the training. (KII 033 MOH Policy Maker, follow-up)*

Stakeholders proposed increased resource allocation towards aPS and incorporation of community health volunteers (CHVs) to support community sensitization as crucial facilitators to aPS integration (**Table 4**). They reported that aPS was resource intensive and that there was need for additional funding and human resources to effectively support partner tracing and notification. Due to the seemingly low level of community awareness of aPS, stakeholders thought that CHVs, who better understand their communities, could play a pivotal role in increasing community awareness of aPS and supporting HTS providers during partner tracing and notification. In addition, there was need for a comprehensive communication strategy as well as community-level advocacy for aPS. Interviewees also thought that joint stakeholder coordination and planning, incorporation of aPS indicators to HTS registers, and increased government funding for HTS-related activities would facilitate the integration of aPS.

*P: One thing that I would like to say is that through our peer educators and our community health volunteers (CHVs), we have been able to create awareness. We have been able to promote entry into the community, in that, sometimes it demands that one of the HTS provider would request the CHV to go with her to the community. (KII 085 Facility-in-charge, baseline)*

## **Discussion**

Kenya had made significant progress in integrating aPS into its national HTS program over the course of two years, though we found varying levels of integration by organizational subsystem, highest in procurement/logistics to lowest in recruitment/training. In our study, we found that aPS had become routine practice within Kenya's HTS program and was supported by national guidelines and policies. Though key barriers to integration included funding limitations, staff hiring constraints, and low community sensitization on aPS, implementing partner organizations played a crucial role in addressing them. Facilitators to integration included increased resource allocation (funding, human resources) towards aPS-related activities, and incorporation of CHVs to facilitate community awareness and adoption of the intervention.

Several interventions have been integrated to HTS programs including tuberculosis (TB) screening, provision of pre-exposure prophylaxis (PrEP), family planning, HIV self-testing (HIVST) among others (58–61). Though such integration efforts foster better patient care, challenges were noted during implementation. For example, in a systematic review of integrated HIV/TB services, expanded HTS programs intensified TB case finding by offering TB screening to clients testing for HIV (58). Though HIV/TB integration was feasible, numerous programmatic, staffing, infrastructural challenges were encountered due to paucity of financial and human resources, akin to what we found in our study (62).

Similar to TB screening integration, PrEP/HTS integration was affected by infrastructural limitations during patient referral for additional care (59). Staff referred clients from rooms with limited space to other parts of the facility for additional review. Unfortunately, clients initiating PrEP were noted to spend an additional 18 minutes on PrEP-specific activities, which could indicate potential service bottlenecks. HTS/aPS integration could potentially lead to such bottlenecks once sexual partners traced and notified through the intervention are referred for further care and treatment at the health facilities. Healthcare systems managers need to anticipate such resource constraints and avail the necessary resources for them.

In a qualitative study similar to ours evaluating perspectives on HIV partner notification, partner HIVST and partner home-based HIV testing in Malawi and Zambia, pregnant/postpartum HIV-positive and negative women, their male partners, healthcare workers, and policymakers assessed partner notification (using invitation letters), home-based testing and HIV self-testing (HIVST) to understand whether offering different options for partner HIV testing would increase acceptability (61). A choice-based approach - where clients were free to select any intervention they felt fit - was seen as acceptable and feasible, though policy makers noted that implementation challenges in personnel, resources or space for such an approach would affect outcomes. Though this study largely focused on individual level perspectives, its insights highlight some of the challenges likely to be encountered during national implementation of aPS.

In our study, we found that recruitment and training (maintenance subsystem) had the lowest degree of integration. Overall, we found major human resource constraints with limited government funding emerging as a key theme. It was also clear that implementing partner organizations played a major role supporting aPS budgets, which seemed to affect perceived long-term sustainability. Similar challenges were noted in family planning integration where human resource challenges, inadequate planning and limited budgets were noted as key impediments (60). In a study based in Zimbabwe, competing clinical responsibilities and lack of

sufficient budget to offer more trainings were seen as major limitations to FP integration; however, adequate resource planning and allocation could potentially avert them (63).

We found low community awareness of aPS. During family planning integration to HIV programs (60), authors also noted participants had poor access to family planning information and recommended incorporation of female peer educators living with HIV to deliver family planning information to potential clients, and training of clinic staff and peer educators (involving both didactic learning and practical applications), with on-site support supervision. In our study, stakeholders advocated for a comprehensive community engagement strategy to improve access to information on both aPS and HIV testing. Thorough training, mentorship and supervision of both HTS providers as well as CHVs could form a crucial part of this approach.

Our study illustrates the prospects and challenges of integrating aPS into Kenya's national HTS program using a conceptual framework that combines concepts from program integration, institutionalization and program sustainability literature. This integrated conceptual framework provides a more holistic assessment of integration not only across subsystems, but also over time. Our stratified purposive sampling approach that included national, county and community level stakeholders enabled a more inclusive view of aPS integration through the different healthcare levels in Kenya. Using qualitative data collected at two time-points, we were able to demonstrate aPS integration over time, highlight areas with persistent challenges and recommend improvements. We were also able to gain a more granular view of aPS integration at an organizational subsystem level which will enable stakeholders to refine and adapt their integration approach to specific departments.

We encountered several limitations in our study. Due to challenges in interviewer availability, we engaged two different qualitative researchers at baseline and follow-up which might have affected the consistency of the interviews. However, both interviewers thoroughly reviewed the conceptual

framework, interview guides and codebook before conducting the interviews to ensure uniformity. Second, baseline interviews were conducted at different times in the two study counties because Homa Bay facilities entered the study six months after the Kisumu sites. These temporal differences might have affected the baseline context of aPS integration in the country. Fortunately, we did not see marked differences in the baseline interviews in these two counties.

## **Conclusion**

The opportunity to increase HIV testing yield through aPS makes it an attractive program to integrate in national HTS programs. However, limited government resources available for aPS and heavy reliance on implementing partner support were noted as major challenges in aPS integration. Ministries of health interested in incorporating aPS into their national HTS programs need to ensure adequate resource availability, widespread sensitization, and leverage CHVs to improve community-level awareness.

**Table 3-2 Quotes comparing integration at baseline and follow-up**

<b>Organizational Subsystem</b>	<b>Summary comparison</b>	<b>Baseline interview quotes</b>	<b>Follow-up interview quotes</b>
<b>Supportive</b>			
Medical supplies and commodities	aPS was fully integrated into the national HIV supply system at both baseline and follow-up	<i>P: ....The county will (support) allocation of the commodities (like) HIV testing kits. There we have been actively involved, like now during every quarter, we review our used commodities, the balance remaining, and what we should procure for the next three months. So in terms of county, what we can say we have been active on, is in terms of procuring the commodities; though in consultation with the county commodity committee, with the team under the test kits supply chain in (National AIDS and STI Control Program) NASCOP, and also with (Kenya Medical Supplies Agency) KEMSA. (KII 081 SCASCO, Baseline)</i>	<i>I: ....in terms of supplies, do you feel that aPS is fully integrated within the KEMSA (Kenya Medical Supplies Agency) supply system P: Yes, because we do it and... we report it in the (MOH) 643, we report in (MOH) 731 (medical commodity consumption reports), and these are able to reflect the number of clients that have been tested. (KII 005 SCASCO, follow-up)</i>
<b>Production</b>			
Integration of aPS into HTS	At both baseline and follow-up, aPS was considered part of routine service delivery	<i>I: Would you say that aPS is provided by HTS providers on routine basis, in other words part of routine delivery? P: Yeah, it is part of their routine delivery. (KII 078 Facility-in-charge, baseline)</i>	<i>I: Would say aPS is integrated within HTS at the facility level. P: It is fully integrated because all counsellors are aware of aPS and they practice it. All HTS counselors know at the back of their minds that there is something called aPS and if they get any eligible client who can benefit or if they get a positive from their clients, they take it up. (KII 004 Nursing Officer-in-charge, follow-up)</i>
<b>Adaptive</b>			
Sensitization/awareness raising	Though there was greater awareness of assisted partner services (aPS) at follow-up compared to baseline, there were gaps with community level sensitization	<i>P: So far I have little literature or advocacy messages which have been put in place. However, we have involved the CHWs (Community Health Workers) and try to explain to them. But you know aPS covers a wider area, so there are still a lot of challenges in advocacy. People are not aware. (KII 087 Facility-in-charge, baseline)</i>	<i>P: Sensitization has been happening for healthcare workers majorly in the facilities but at the community level... I don't think sensitization for aPS has happened. I: OK, so the community is not aware about the services? P: No, unless when we deal with our clients individually when they come to the facilities. (KII 003 SCASCO, follow-up)</i>
<b>Managerial</b>			

Data reporting tools	At both baseline and follow-up, aPS indicators had only been integrated to data reporting tools at the facility level, but not at the national level.	<i>I: Yeah, right now as we speak, how is data on personal notification captured from the facility to the national level? P: It is only captured at the facility. I do not have data at the national level. I am so keen....that we start collecting it at national level. (KII 068 - MOH Policy maker, baseline)</i>	<i>P: As for me, the biggest gap is integrating the aPS indicators, all the way to the national level. I: OK. P: We are collecting aPS indicator data at the facility level, but our summary tools which is MoH 362 and MOH 711 in the DHIS (Demographic Health Information System) don't capture that. So that is what we are working on. But that is a big gap for me. KII 001 Implementing Partner, follow-up)</i>
<b>Maintenance</b>			
Recruitment	At both baseline and follow-up, the government encountered challenges in hiring HTS providers who would offer aPS. Implementing partner organizations helped to fill in this gap.	<i>P: ...In terms of Human Resource, mostly it is with the (implementing) partners who have really financed.....So it is the (implementing) partners who have done very much. So I think also they are waiting for enlightenment in terms of Human Resource for HTS; so that in terms of transition now we can see how the county talks together with the stakeholders how we can transition this (aPS) into our system of human resource. (KII 081 SCASCO, baseline)</i>	<i>I: ....The MoH asks (implementing) partners to support the HTS providers. The reason I'm saying that is because government is not able to quickly respond to paying healthcare workers because they expect an annual budget. So basically, (implementing) partners usually take up the immediate responsibility of recruitment of providers to provide aPS. The long-term vision is of them being taken up by governments being absorbed by government in terms of the planning cycle. So, (implementing) partners, take up the responsibility of filling the gaps for HTS providers and paying for them through the public service commission in the county. (KII 001 Implementing Partner, follow-up)</i>
<b>Funding*</b>			
Budgets	At baseline, aPS budgets were restricted to the national level with no mention of it at the county level. At follow-up, budgets were part of county annual work plan process.	<i>I: Do you know if the government itself or the Ministry of Health or the county departments of health have allocated any monies or budget lines specifically for the aPNS? P: No. You know the Ministry of Health and the county for that matter, they basically and majorly depend on the implementing partner organizations..... So they do not have any funds allocated to any activity like the PNS. However, we involve them a lot in meeting, supervision, mentorship...but for funding no. (KII 080 Implementing partner, baseline)</i>	<i>P: Well, when we do the annual work plan, we plan for everything, we budget for everything. But it's usually very hard to get the finances to carry out those activities. I: The budgeting process, is there any point where that is done jointly between (implementing) partners and the MoH? P: No I: So, you run on separate budgets? P: Yes. (KII 005 SCASCO, follow-up)</i>

\*Funding was an emerging theme and was added to the conceptual framework.

**Table 3-3 Extent of aPS institutionalization in Kenya’s HTS program**

<b>Organizational sub-system</b>	<b>Extent of institutionalization</b>	<b>Quotes</b>
<b>Planning/sensitization (Adaptive)</b>	Cycles were well established e.g. annual work plans, quarterly technical working group (TWG) meetings, and monthly review meetings.	<i>P: There is definitely a work plan. There is an annual work plan that the MoH does every year and all meetings are scheduled and maybe a monthly meeting or quarterly meeting. So, they have supervision, quarterly TWG (technical working group) meetings which are all there. (KII 011 Implementing Partner, follow-up)</i>
<b>Procurement/logistics (Supportive)</b>	Budgets are developed annually together with the annual work plans. Supplies are ordered quarterly by the facilities.	<i>P: So currently whatever we do in terms of commodity supply system, we order commodities quarterly every facility has been given a drawing right to order commodities. So, commodity you order as per your work load and I know aPS is part of the facility workload. So, as they order for commodities, they factor in the workload of each and every department. (KII 010 SCASCO, follow-up)</i>
<b>Recruitment/training (Maintenance)</b>	Training cadence was set and the frequency depended on the stakeholder.	<i>I: Are there cycles for refresher training? P: Like I said, we usually have virtual trainings like every week. Those training are from MoH but if there is a new concept, new guideline or anything, then we have those sensitizations. (KII 011 Implementing Partner, follow-up)</i>
<b>Monitoring, evaluation, supervision (Managerial)</b>	Cycles had been established e.g. for supervision.	<i>P: That one (support supervision) is done quarterly and also depends on whether the money is there. That is as per our work plan it is quarterly and sometimes due to lack of resources, we are forced to postpone a quarter to another quarter. (KII 010 SCASCO, follow-up)</i>
<b>aPS service delivery (Production)</b>	aPS was part of the daily HTS routine.	<i>I: Would you say that aPS is provided by HTS providers on routine basis, in other words part of routine delivery? P: Yeah, it is part of their routine delivery. (KII 078 Facility-in-charge, baseline)</i>

**Table 3-4 Facilitators of and barriers to aPS integration**

	<b>Details</b>	<b>Quotes</b>
<b>Barriers to aPS integration</b>		
<b>Human resource challenges</b>	The main human resource challenges especially hiring gaps.	<i>I: What are some of the gaps that still exist? P: .....Human resource constraints. Even as we are implementing aPS, we have not been able to put human resource because for us to have aPS in a facility, we need like 15 or 20 counselors and nobody is hiring and it is just the same few people who are doing the work. Training, we have tried the best we could so it is not really a challenge, but right now PEPFAR (U.S. President's Emergency Plan for AIDS Relief) has pulled out all the money for training and we are not doing any more training. So we have to do online trainings or struggle with the other small partners to fund the training. (KII 033 MOH Policy Maker, follow-up)</i>
<b>Funding gaps</b>	The main funding gaps were in providing transport reimbursement to conduct physical partner tracing	<i>I: Have you heard of any challenges ...have you experienced any challenges or heard any challenges expressed by the providers with regards to aPS? P: Okay, they report that some of these clients are coming from very far..... It is difficult to trace them because the program cannot provide funds for that. (KII 078 Facility-in-charge, baseline)</i>
<b>Client issues</b>	These included client concerns with privacy, confidentiality, safety and risk of intimate partner violence (IPV)	<i>P: .....community acceptance still is low because of the stigma issues. I told you there are human rights issues on disclosure. The disclosure point, maybe you come to my house and am positive maybe the wife is positive. This is the common scenario and maybe the husband has not accepted. So, we really need to talk to the CHVs to help us gain entry in that village. Some people (even) turn violent. (KII 012 Facility-in-charge, follow-up)</i>
<b>Sensitization challenges (community awareness)</b>	There was need to create demand for aPS esp. at the community level	<i>I: What are some of the gaps that still exist? P: The only gaps we have is the way people perceive it (aPS). One, we have not been able to disseminate the guidelines fully. Two, perception because we have not been able to have a plan of demand creation. (KII 033 MOH Policy Maker, follow-up)</i>
<b>Facilitators of aPS integration</b>		
<b>Increased resources</b>	These resources include funding, human resources, training, and updated reporting tools	<i>P: Yes, if you ask me I think there should be additional allocation of the resources, especially on the follow up of the (sexual network) tree, especially on the sexual partner. Yes, because this follow up tree normally is very long. The residence in terms of the locator information sometimes stretches outside the boundaries of the hospital, and therefore it means sometimes you will have to involve the second or the 3rd person to reach the person you want to test, actually the sexual partner. (KII 084 Implementing partner, baseline)</i>
<b>Involve community health volunteers (CHVs)</b>	There was need to increase community awareness and participation in aPS.	<i>P: One thing that I would like to say is that through our peer educators and our community health volunteers (CHVs), we have been able to create awareness. We have been able to promote entry into the community, in that, sometimes it demands that one of the HTS provider would request the CHV to go with her to the community. (KII 085 Facility-in-charge, baseline)</i>

## **Chapter 4. Cost of integrating assisted partner services in HIV testing services in Kisumu and Homa Bay counties, Kenya: a microcosting study**

### **Abstract**

**Background:** HIV assisted partner services (aPS), or provider notification for sex partners of newly diagnosed HIV-positive individuals, has been shown to be safe, effective, and cost-effective and was scaled up within the national HIV testing services (HTS) program in Kenya in 2016. Evaluating aPS costs can inform government on budget allocation and cost drivers in different clinic settings. We estimated the costs of integrating aPS into routine HTS within the aPS scale-up project in Kisumu and Homa Bay counties, western Kenya.

**Methods:** We conducted microcosting using a payer perspective in 14 facilities. We designed an activity based costing method to identify key aPS activities, inputs, resource use, and associated prices and values of goods and services. We analyzed costs by start-up (August 2018), and recurrent costs one-year after aPS implementation (Kisumu: August 2019, Homa Bay: January 2020) and conducted time-and-motion observations. We estimated the incremental costs of implementing aPS, average cost per male sex partner (MSP) traced, tested, testing HIV-positive, and on antiretroviral therapy, cost shares, facility disaggregated incremental and average costs, and median time spent on aPS activities.

**Results:** The average weighted incremental cost of integrating aPS into the existing HTS program was \$7,485.97 per facility per year, with recurrent costs accounting for approximately 90% of costs. Average unit costs per MSP traced, tested, tested HIV-positive, and on antiretroviral therapy were \$34.54, \$42.50, \$108.71 and \$152.28, respectively, and varied by county and facility type, with larger volume facilities, especially county and sub-county hospitals, having higher total incremental costs and lower average unit costs. The largest costs drivers were personnel (49%) and transport (13%). Partner elicitation activities accounted for the largest share of incremental costs at approximately 25% of the HTS visit. The median time spent on phone and physical tracing was 6 min, and 2.5 hours, respectively.

**Conclusion:** Using data from an implementation program, average facility costs will increase when integrating aPS, with the incremental costs dependent on the facility type, location, and volume of clients served. Strategies on efficiently utilizing healthcare personnel will be critical for effective, affordable, and sustainable aPS.

**Key words:** Cost, integration, HIV, assisted partner services, Kenya, microcosting

## Introduction

In Kenya, approximately 1.5 million people are living with HIV (PLWH) of whom an estimated 79.5% of individuals aged 15-64 years are unaware of their status, 72.6% among men compared to 82.7% among women (64). The World Health Organization (WHO) recommends scaling up of assisted partner services to address this gap, particularly among men who have lower HIV testing rates and tend to start antiretroviral therapy later in the course of their illness compared to women, as part of a comprehensive package of testing and care for PLWH (3,64).

HIV partner services comprises trained health workers who elicit contact information on sex partners to newly diagnosed HIV-positive persons (index clients) and notify these partners of their potential exposure to HIV, linking them to testing and care services (3). In passive partner services, index clients are encouraged to disclose to their sex partners and bring them for testing. Assisted partner services (aPS) involve healthcare worker-facilitated notification, either after an agreed time if the index client fails to notify their sex partner (contract referral), or direct notification without the involvement of the index client (provider referral). Healthcare providers offering aPS enumerate sex partners of index clients and either make phone calls requesting them to receive HIV testing services (HTS) at a facility, or trace these partners at their homes or workplaces and offer HIV testing (3).

Previous research and implementation projects from sub-Saharan Africa (SSA) demonstrate that aPS is safe, acceptable, and more effective in increasing the number of newly testing partners and partners testing HIV-positive compared to passive referral (6,9–12,49,65,66). In addition, aPS has also been shown to be cost-effective and affordable. The incremental cost-effectiveness ratio (ICER) of aPS is estimated to be \$1,094 USD per disability-adjusted life year (DALY) averted, falling below the CE threshold of \$1,358 GDP per capita, making it very cost-effective (8). A budget impact analysis (BIA) of aPS in Kisumu County, Kenya demonstrated that it is affordable when funded by U.S. President's Emergency Plan for AIDS Relief (PEPFAR), but the impact was highly sensitive to the level of uptake of the service (67).

Kenya's Ministry of Health (MOH) is integrating aPS into the national HIV testing services (HTS) program. As aPS is scaled up, it is important to evaluate its cost when integrated into routine HTS programs. There is a dearth of evidence on how these costs vary by facility given the differences in location and client load, or their impact on personnel time. Information on the cost of implementing and delivering aPS will guide program planners and providers interested in introducing and scaling up aPS in their own health systems.

We evaluated the cost of integrating aPS in the HTS program in Kisumu and Homa Bay counties in Kenya within the aPS scale-up project. We estimated the incremental costs associated with integrating aPS into routine HTS programs, including a breakdown of start-up and recurrent costs. We estimated the average unit cost per male sex partner traced, tested, testing HIV-positive, and on antiretroviral therapy. We generated cost shares of key inputs to identify the key drivers of aPS program costs. We also disaggregated by facility the incremental and average unit costs per MSP of integrating aPS, and its impact on time allocation.

## **Methods**

### *Parent project and intervention description*

The microcosting was nested in the aPS scale-up project, a collaborative implementation science project between the Ministry of Health (MOH) National AIDS and STI Control Program (NASCO), PATH-Kenya and University of Washington, conducted in 31 health facilities in Kisumu and Homa Bay counties in western Kenya. Details of the aPS scale-up project and its implementation procedures have been published (57). The overall goal of the project was to implement and evaluate the effectiveness of aPS when integrated within routine HTS, and assess implementation outcomes including acceptability, demand, implementation fidelity, and costs.

The project's target population was men with a primary focus of improving HIV testing in this group. Though aPS is offered to both male and female index clients in Kenya, the project only collected program data on female index clients, their male sex partners (MSPs), and

female sex partners of MSPs. Briefly, female clients testing HIV-positive at participating facilities (female index clients) received information on the intervention and were screened for eligibility by healthcare workers. Those eligible for the project were  $\geq 15$  years of age, newly diagnosed HIV-positive, not at risk of intimate partner violence (IPV), not pregnant, and had at least one sexual partner within the last 3 years. Consenting female index clients were asked to provide names and contact information for all MSPs in the last 3 years. HTS providers contacted these MSPs *via* phone or physical tracing to notify them of their potential exposure and offer HIV testing. MSPs testing HIV-positive were asked to enroll and provide contact information of their female sex partners, who were also followed up, notified of their exposure, and offered HTS. Female index clients and sex partners testing HIV-positive were encouraged to link to care and were followed up at 6 weeks, 6 months, and 12 months to assess linkage to care, antiretroviral therapy initiation, and HIV viral load suppression.

#### *Cost data collection*

Start-up costs were collected in 2018 from MOH NASCOP and PATH offices; recurrent costs were collected from 14 facilities in Kisumu (n=8) and Homa Bay (n=6) counties in two phases. Kisumu recurrent cost data were collected in August 2019, while those from Homa bay were collected in January 2020. Facilities were purposefully sampled based on location and client volume after consultation with the site team.

Start-up cost data were collected from NASCOP administrative offices and from PATH-Kenya offices and reflected annual costs. Data were extracted from expense reports and budgets, and supplementary information on all key activities and resource use essential for the current aPS scale up were obtained as needed. Recurrent cost data were collected through semi-structured interviews with key health personnel and facility administrators. Information on resource use, including time-and-motion studies for aPS activities. Activity, time use and resource data were collected, including information on rents, salaries, and supply prices from MOH sources and project expense records. We disaggregated costs by facility to evaluate variations in incremental costs and average unit cost per MSP.

### *Cost analysis*

We estimated the incremental financial and economic costs associated with integrating aPS into the HTS program using a payer perspective (68) following principles outlined in the Global Health Cost Consortium Reference Case (69). Financial costs represent actual expenditure on goods and services, while economic costs reflect the value of resources used to produce output. We designed an activity-based ingredients approach to identify key aPS activities, inputs, resource use, and associated prices and values of goods and services. We identified key activity cost centers and used microcosting methods to quantify and value inputs from each activity across facilities.

We differentiated between new aPS costs, and shared program costs to support the integration of aPS services into the existing HTS program. New costs were those related to additional aPS inputs and activities not conducted prior to aPS scale-up. These included costs of aPS microplanning meetings, initial trainings, sensitization, transport costs for physical tracing, communication costs for phone tracing, personnel (service delivery) and aPS supervision. Shared program costs from the current HTS program were allocated based on the share of the activity or input used in aPS. These included the share of program costs for vehicles, equipment, overheads, HTS supplies, health facility administration, and refresher training.

We distinguished between fixed and variable costs. Fixed costs included overheads (e.g. building costs, water, and electricity), capital (vehicles, equipment), and non-service delivery personnel costs (i.e. health facility administration and aPS supervision). We allocated building space based on the proportion of the HTS visit taken up by aPS activities at each facility. The rental rate was estimated from MOH rates for government facilities or rental rates from nearby commercial properties. Capital costs were annualized over the expected useful life (assumed to be five years) using a discount rate of 3% (69). Similarly, start-up costs (microplanning, sensitization and training), which occurred once during the project, were

treated as a type of fixed costs and were annualized over five years using a discount rate of 3%.

We estimated variable costs by measuring resource use at the 14 facilities. Personnel time was captured as a proportion of full-time work allocated to aPS. Salaries were transformed into hourly wages based on the assumption of full-time employment equivalent to 2080 h/year. We estimated personnel time using time-and-motion observation for partner elicitation at the clinic, and MSP outreach by phone and in-person tracing. To estimate the cost of personnel time, we multiplied the cost per minute (including both salary and benefits) by the median time spent on: 1.) partner elicitation by the number of female index clients seen; 2.) phone tracing by the number of MSPs traced on phone accounting for approximately 40% repeat calls; and 3.) physical tracing multiplied by the number of MSPs traced physically accounting for 10% repeat physical tracing attempts. We assumed all MSPs elicited from the female index clients were traced, 70% on phone and 30% by physical tracing. Estimates for the phone calls and physical tracing attempts were based on facility reports and staff opinion.

Average phone call costs were estimated as a percentage of airtime assigned to the facility per year used to call MSPs elicited through aPS. Average transport costs were estimated by multiplying the number of expected commutes per year, mainly public transport, by the average cost of each commute. For supplies and commodity costs, we observed resource use during HIV testing and multiplied the relevant quantities by input costs obtained from program budgets or centralized price lists.

Cost data were collected and analyzed in templates designed using Microsoft Excel (Microsoft, Redmond, USA). We excluded the cost of research activities not part of routine aPS. We adjusted costs to 2019 currency and converted to US dollars (USD) using the 2019 average exchange rate (1 USD = KSh 101) (70).

#### *Program volume*

We used data collected from facility HTS registers by the implementation project staff to estimate the number of MSPs traced, tested, tested HIV-positive, and on antiretroviral

therapy over a one-year period. These data were compiled from April 1, 2019 to March 31, 2020.

#### *Cost metrics*

For each facility, we first estimated incremental costs by summing the start-up and recurrent costs. We then calculated the average unit cost per MSP traced, tested, testing HIV-positive, and on antiretroviral therapy by dividing the incremental costs by the number of MSPs traced, tested, testing HIV-positive, and on antiretroviral therapy, respectively. Lastly, we estimated the average weighted incremental costs across our sample of 14 facilities to derive an annual average weighted incremental facility cost. We also explored all cost metrics by facility to assess how client volume and geographic location affect total incremental and average unit costs per MSP. Lastly, we generated cost shares by activity and input to explore how critical resources and activities were utilized within aPS.

#### *Scenario analysis*

Since the national HTS program receives financial support from external funding sources, we estimated the costs of integrating aPS under an MOH-only scenario. Based on expert opinion from the MOH and site staff, we excluded costs associated with international non-governmental organization (NGO). We assumed that all HTS providers transitioned into the MOH human resource system, that only MOH staff would supervise aPS delivery, and that no international NGO overhead costs were incurred.

#### *Ethical approval*

This study received ethical approval from the Kenyatta National Hospital Ethical and Scientific Review Committee (P465/052017) and the University of Washington Institutional Review Board (STUDY00002420).

## **Results**

#### *Program volume*

The total number of MSPs traced, tested, testing HIV-positive, and on antiretroviral therapy across the 14 facilities as well as the number of clients reached through aPS over the

one-year study period are presented in **Table 1**. The number of participants did not differ significantly by county.

**Table 4-1 Program volume and reach overall and by county**

	Kisumu	%	Homa Bay	%	Overall
<b>Program volume</b>					
Male sex partners traced	1027	49%	1048	51%	2075
Male sex partners tested	869	53%	763	47%	1632
Male sex partners testing HIV-positive	370	55%	298	45%	668
Male sex partners on antiretroviral therapy	272	56%	215	44%	487
<b>Program reach</b>					
Partner elicitation: HIV positive female clients	4815	59%	3340	41%	8155
Partner elicitation: HIV negative female clients	389	53%	339	47%	728
Phone tracing	1027	49%	1048	51%	2075
Physical tracing	339	49%	346	51%	685

\*% - Percentage

*Incremental and average unit costs per MSP*

The average weighted incremental cost of aPS as implemented was \$7,485.97 per facility per year, with recurrent costs accounting for approximately 90% of costs (**Table 2**). Personnel (49%) accounted for the largest share of costs followed by transport costs (13%). The proportion of costs appropriated to different categories was similar in both counties apart from personnel costs, which accounted for over 50% of incremental costs in Kisumu, compared to a lower estimate of 35% in Homa Bay, mainly due to differences in personnel time spent on tracing.

**Table 4-2 Annual average weighted incremental facility cost—As implemented (2019 USD)**

	Kisumu	%	Homa Bay	%	Overall	%
<b>Start-up costs</b>						
Microplanning	\$483	5%	\$432	9%	\$459	6%
Initial Training	\$466	5%	\$416	9%	\$443	6%
Sensitization	\$90	1%	\$17	0%	\$56	1%
<b>Sub-total</b>	<b>\$1,040</b>	<b>10%</b>	<b>\$865</b>	<b>18%</b>	<b>\$958</b>	<b>13%</b>
<b>Recurrent costs</b>						
Personnel	\$5,407	54%	\$1,632	35%	\$3,642	49%
HTS supplies	\$573	6%	\$500	11%	\$539	7%
Equipment	\$28	0%	\$29	1%	\$28	0%
Vehicles	\$215	2%	\$0	0%	\$114	2%
Transport	\$1,260	13%	\$695	15%	\$996	13%
Communication	\$165	2%	\$40	1%	\$107	1%
Overhead	\$758	8%	\$580	12%	\$675	9%

Refresher training	\$489	5%	\$355	8%	\$426	6%
<b>Sub-total</b>	<b>\$8,896</b>	<b>90%</b>	<b>\$3,831</b>	<b>82%</b>	<b>\$6,528</b>	<b>87%</b>
<b>Summary</b>	<b>\$9,935</b>	<b>100%</b>	<b>\$4,696</b>	<b>100%</b>	<b>\$7,486</b>	<b>100%</b>

\* Percent of total costs

The average unit cost per MSP traced, tested, testing HIV-positive, and on antiretroviral therapy was \$34.54, \$42.50, \$108.71, and \$152.28, respectively (Table 3). These costs were much higher in Kisumu compared to Homa Bay County due to differences in personnel time spent on tracing.

**Table 4-3 Average unit cost per MSP – As implemented (2019 USD)**

	Kisumu	Homa Bay	Overall
Average unit cost per male sex partner traced	\$46.56	\$20.86	\$34.54
Average unit cost per male sex partner tested	\$54.96	\$28.30	\$42.50
Average unit cost per male sex partner testing HIV-positive	\$135.29	\$78.44	\$108.71
Average unit cost per male sex partner on antiretroviral therapy	\$183.02	\$117.26	\$152.28

*Direct aPS activity costs and shared program costs*

Overall, 74% of the incremental costs were program specific aPS delivery costs, while the remainder were shared program costs related to overhead, training, administration, and supply costs of the existing HTS program (Figure 1). For the aPS delivery activities, the largest cost drivers were personnel and transport in both counties. However, the direct aPS delivery costs were higher in Kisumu compared to Homa Bay County (77% versus 66%) mainly due to more personnel time spent on tracing activities.

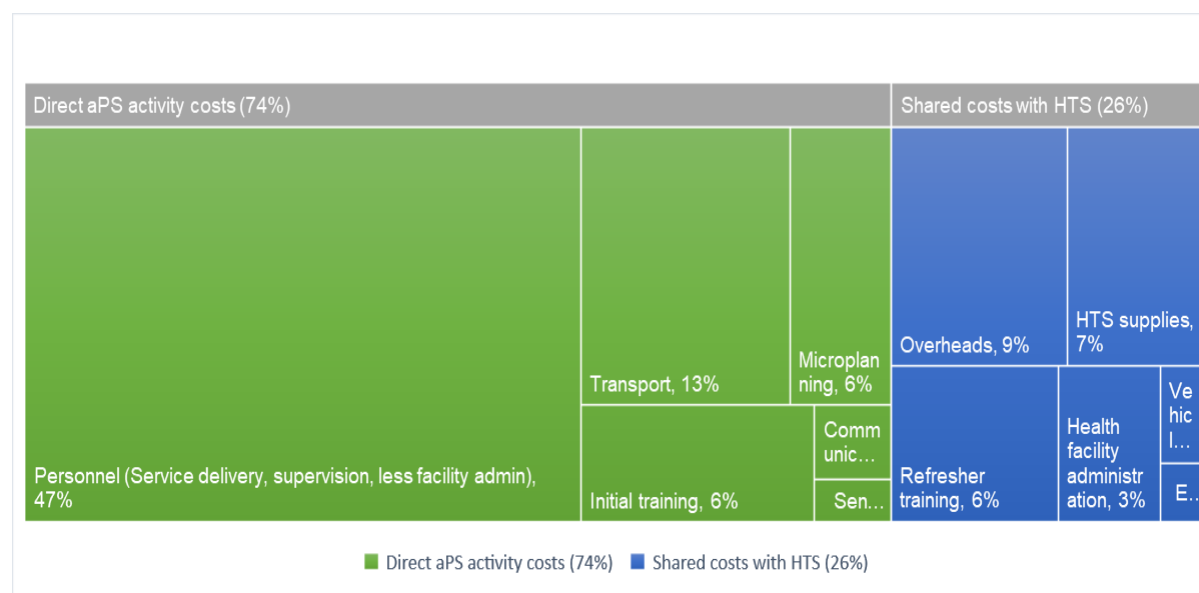


Figure 4-1 Direct aPS activity costs compared to shared program costs of integrating aPS into HTS. Only proportions >3% are presented.

Fixed and variable costs

Overall, costs were evenly split into fixed to variable costs, with no difference in shares of fixed or variable costs in Kisumu or Homa Bay County (Figure 2).



Figure 4-2 Proportion of incremental costs by input type for aPS integration. Only proportions >5% are presented.

Facility level costs

When exploring facility level costs and outputs, the total incremental costs varied substantially, ranging from \$630.06 to \$ \$15,572.24 per facility per year, while the average unit cost per MSP testing HIV-positive ranged from \$24.56 to \$157.52. In general, the highest incremental costs and lowest average unit costs per MSP were observed in larger volume

facilities, especially county and sub-county hospitals, which had higher client volumes (Figure 3, 4).

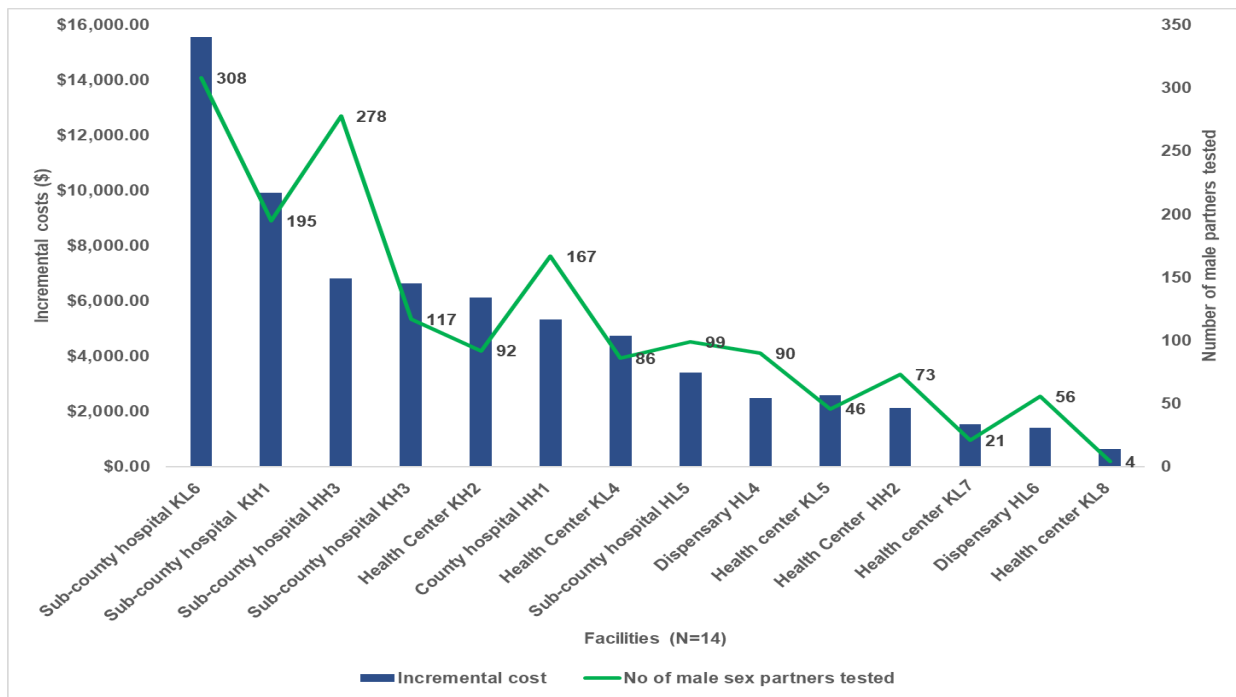


Figure 4-3 Annual incremental costs in 14 Kisumu and Homa Bay facilities

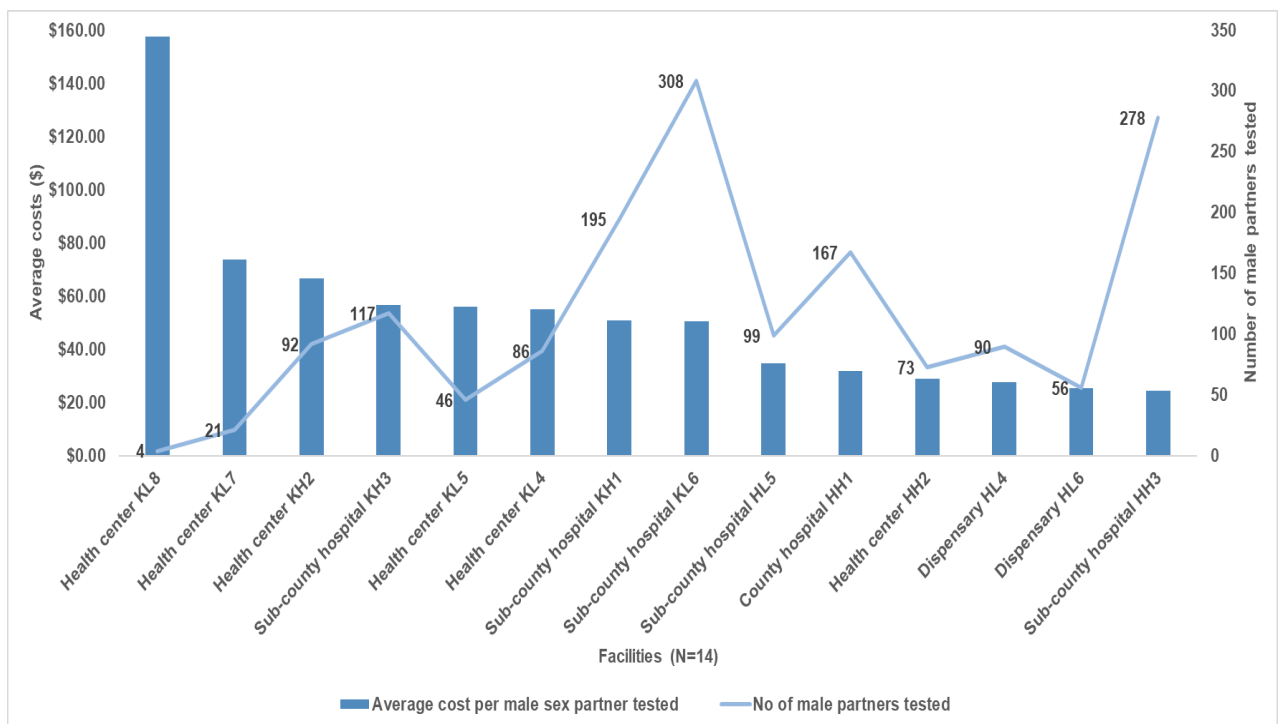


Figure 4-4 Average unit cost per male sex partner tested in 14 Kisumu and Homa Bay health facilities

### MOH-only scenario analysis

After excluding international NGO costs, the average weighted incremental cost of integrating aPS was \$5,494.06 per facility per year, while the average unit costs per MSP traced, tested, testing HIV-positive, and on antiretroviral therapy were \$25.55 \$31.59, \$81.42, and \$114.17, respectively (Table 4, 5). The reduction in costs was due to a decrease in personnel costs (from 49% to 41%) and overheads (from 9% to 1%) when excluding international NGO resources.

**Table 4-4 Annual average weighted incremental facility cost – MOH only scenario (2019 USD)**

	Kisumu	%	Homa Bay	%	Overall	%
<b>Start-up costs</b>						
Microplanning	\$483	7%	\$432	12%	\$459	8%
Initial Training	\$466	7%	\$416	11%	\$443	8%
Sensitization	\$90	1%	\$17	0%	\$56	1%
<b>Sub-total</b>	<b>\$1,040</b>	<b>15%</b>	<b>\$865</b>	<b>23%</b>	<b>\$958</b>	<b>17%</b>
<b>Recurrent costs</b>						
Personnel	\$3,213	46%	\$1,215	33%	\$2,279	41%
HTS supplies	\$573	8%	\$500	13%	\$539	10%
Equipment	\$28	0%	\$29	1%	\$28	1%
Vehicles	\$215	3%	\$0	0%	\$114	2%
Transport	\$1,260	18%	\$695	19%	\$996	18%
Communication	\$165	2%	\$40	1%	\$107	2%
Overhead	\$72	1%	\$18	0%	\$46	1%
Refresher training	\$489	7%	\$355	10%	\$426	8%
<b>Sub-total</b>	<b>\$6,015</b>	<b>85%</b>	<b>\$2,851</b>	<b>77%</b>	<b>\$4,536</b>	<b>83%</b>
<b>Summary</b>	<b>\$7,055</b>	<b>100%</b>	<b>\$3,717</b>	<b>100%</b>	<b>\$5,494</b>	<b>100%</b>

\* Percent of total costs

**Table 4-5 Average unit cost per MSP – MOH only scenario (2019 USD)**

	Kisumu	Homa Bay	Overall
Average unit cost per male sex partner traced	\$33.42	\$16.60	\$25.55
Average unit cost per male sex partner tested	\$39.51	\$22.57	\$31.59
Average unit cost per male sex partner testing HIV-positive	\$97.79	\$62.78	\$81.42
Average unit cost per male sex partner on antiretroviral therapy	\$131.82	\$94.07	\$114.17

*Time allocation associated with integrating aPS into HTS*

During HTS, providers spent nearly a quarter of their time on partner elicitation (HIV-negative clients: 13 out of 54 min; HIV-positive clients: 20 out of 96 min) (**Table 6**). For partner follow-up activities, the median time spent per MSP traced on phone and in-person was 6 min and 2.5 hours, respectively. More time was spent on physical tracing in Kisumu compared to Homa Bay (174 min vs 125 min) while minimal differences were noted in median time spent on partner elicitation and phone tracing in both counties. Total personnel time costs for aPS during HTS, phone and physical tracing, using median time across facilities, was \$11,814.11, approximately one third of observed personnel cost.

**Table 4-6 Median time spent per client on aPS-related activities**

Health facility	Median time spent on partner elicitation among HIV-negative clients receiving HIV testing services (per client)			Median time spent on partner elicitation among HIV-positive clients receiving HIV testing services (per client)			Median time spent phone tracing per client (min)	Median time spent physical tracing per client (min)
	Partner elicitation (min)	Partner elicitation + HIV testing services (min)	%*	Partner elicitation (min)	Partner elicitation + HIV testing services (min)	%*		
<b>Kisumu County</b>								
Sub-county hospital KH1	12	50	24%	27	107	25%	6	125
Sub-County hospital KL6	22	73	30%	27	110	27%	10	148
Health center KL5	3	16	19%	3	16	19%	5	163
Health Center KL4	13	50	26%	15	119	17%	4	185
Health Center KL7	8	36	22%	13	57	23%	6	153
Sub-county hospital KH3	12	84	14%	27	126	19%	13	202
Health center KL8	16	83	19%	34	120	25%	10	194
Health Center KH2	10	39	26%	10	39	26%	9	307
<b>Median</b>	<b>12</b>	<b>50</b>	<b>24%</b>	<b>21</b>	<b>109</b>	<b>19%</b>	<b>6</b>	<b>174</b>
<b>Homa Bay County</b>								
Health Center HH2	17	66	26%	37	106	31%	5	114
Sub-county hospital HH3	15	60	25%	20	92	23%	8	97
Dispensary HL6	9	53	17%	19	81	21%	3	155
County hospital HH1	17	56	31%	30	88	32%	9	137
Sub-county hospital HL5	15	59	25%	20	73	26%	8	114
Dispensary HL4	9	53	17%	14	75	18%	2	170
<b>Median</b>	<b>15</b>	<b>57</b>	<b>26%</b>	<b>20</b>	<b>84</b>	<b>23%</b>	<b>6</b>	<b>125</b>
<b>Overall median</b>	<b>13</b>	<b>54</b>	<b>25%</b>	<b>20</b>	<b>96</b>	<b>21%</b>	<b>6</b>	<b>150</b>

\*% - Percentage

## Discussion

In this microcosting analysis, aPS integration into HTS in Kisumu and Homa Bay county facilities is likely to increase overall HTS costs by an average of \$7,485.97 per facility per year, mostly driven by recurrent costs. In addition to the direct aPS costs, integration required approximately 25% of shared HTS program costs already in place in hospitals and clinics. Higher incremental and lower average unit costs per MSP were observed in larger volume facilities, suggesting that aPS implementation is more costly in low volume clinics, and may highlight the need to prioritize funding towards higher volume facilities to improve cost efficiency by reaching a larger number of individuals.

Across facilities, personnel costs were the largest cost driver at 49%, followed by transport costs at 13%. Kisumu county had higher personnel costs than Homa Bay due to differences in time spent on physical tracing as HTS providers spent more time on physical outreach. In Kisumu, MSPs were harder to trace since they constantly changed their places of work and residence compared to those from Homa Bay, a more rural county where clients rarely change residence. This finding is consistent with qualitative results on aPS from our study (71). The high personnel time and transport costs of sex partner tracing highlight the importance of identifying methods to increase efficiency, e.g. batching visits, reducing the distance traveled by HTS providers, utilizing community health workers or volunteers (CHWs, CHVs) to support physical tracing, incentivizing sex partners to come to the clinic for testing, and improving their mobile phone access.

Although prior studies have estimated aPS costs within randomized control trials (RCT), to our knowledge, this is the first study evaluating the cost of integrating aPS within a routine HTS program in SSA. In an aPS RCT involving both male and female sex partners in Kenya, estimated costs per partner tested were \$48–55 using a program scenario with highly trained HTS providers referred to as health advisors (8). In the same RCT, the cost of aPS ranged between \$44.75 and

\$53.07 per client for nurse-based testing, and between \$32.04 and \$33.72 per client for CHW-based testing (67). Our estimated average unit cost per MSP tested (as implemented: \$42.50, MOH-only scenario: \$31.59) using regular HTS providers was lower, and our cost estimates focused on male sex partners only instead of both male and female sex partners. Though CHWs – who earn much lower salaries - are not yet approved to offer HTS and aPS in Kenya - task-shifting scenarios using this cadre were shown to lower the costs per partner tested and could potentially be used to offer the aPS intervention once approved (67,72). Whether or not the cost of integrating aPS is considered sustainable will depend on funding priorities of the MOH and external funders, and willingness to scale-up and sustain aPS in the long-term. With declining funds and potential transition of HIV management from external funders to the government, key policy makers at national and county levels will need to plan and adjust their budgets accordingly to ensure sustainability of this intervention.

Similar to other aPS costing studies, personnel was a major cost driver accounting for 40-70% of total costs (8,67). Our study utilized HTS providers who routinely offer aPS at Kenyan healthcare facilities, and tend to be paid lower than health advisors or nurses used in prior aPS costing studies (8,67). In an attempt to reduce personnel costs, the aPS scale-up project in which our microcosting was nested utilized a hub-and-spoke model (73) in which HTS providers stationed at high volume facilities supported several lower volume facilities. While this occurred after our cost data collection had concluded, a hub-and-spoke strategy might improve cost efficiency given lower average unit costs per MSP in high-volume facilities (74). Other strategies to improve cost efficiency include community sensitization on aPS as a way to improve awareness and encourage sex partners to receive HTS at the nearest facility, thereby reducing time and costs spent on phone and physical tracing (74). Ministries of health might also consider transferring physical tracing to HTS providers stationed at health facilities closest to sex partners

as a way to improve cost efficiency. However, this approach needs to be carefully reviewed in conjunction with the index clients due to concerns on privacy and confidentiality of personal information, and risks of intimate partner violence (9,47).

Our study has several strengths. We evaluated the cost of integrating aPS into HTS programs within real-world settings, giving a realistic picture of the costs of implementation compared on other studies conducted in controlled trial settings. We focused on MSPs of female index clients, a WHO population group prioritized for HIV testing. We disaggregated costs to identify variations across facilities and proposed strategies to improve cost efficiency. Finally, through detailed time-and-motion studies, we estimated the median time cost of providing aPS during HTS, which will facilitate resource planning especially human resource allocation and transport reimbursements.

There were several limitations in our study. By focusing on MSPs only, we were not able to estimate the cost of aPS for female sex partners. However, we anticipate most costs would be similar, apart from physical tracing costs, which will likely vary by target group. Secondly, our study focused on Kisumu and Homa Bay counties, which have the highest HIV prevalence in Kenya (>15%) and might not be representative of other counties (64). Finally, we utilized a payer perspective and do not account for costs incurred or saved by participants receiving aPS in clinics or HTS in the community.

## **Conclusion**

This study fills the knowledge gap on the cost of integrating aPS in routine HTS programs. As aPS is scaled-up and integrated into HTS programs globally, strategies to efficiently utilize healthcare personnel will be critical for effective, affordable, and sustainable aPS. As funding allocated to HTS shifts, additional research on strategies to improve cost efficiency is required.

## **Chapter 5. Conclusion**

This dissertation highlights the need to consider contextual factors when implementing and scaling up the aPS intervention. We found that newly diagnosed HIV-positive sex partners, especially those who were young and single, were less likely to link to care. Though aPS was well integrated into the routine HTS program, the degree of integration varied across the program especially in funding, staff recruitment, and community-level awareness of aPS. We also found significant variations in the cost of implementing aPS across facilities with lower average costs per male sex partner observed in higher volume facilities.

These findings provide evidence, especially to stakeholders implementing aPS, on the need to identify and fill resource gaps, target population sub-groups for HIV testing and linkage to care services, and implement strategies to improve cost efficiency. This is relevant due to dwindling funding allocations towards HIV especially from external funding sources, such as donor organizations, and the need for ministries of health to maximize positive HIV testing outcomes despite these changes.

Following this dissertation, I would like to explore different scenarios for scaling up and sustaining aPS; this will provide insight on the affordability of aPS if HTS funding declines. I will also review implementation fidelity to the aPS intervention to provide additional context to facility level variations in its scale-up. These results will provide timely guidance to countries on the scale-up of aPS.

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