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Evaluation of differentiated service delivery models on HIV treatment retention among key populations in Nigeria: a prospective cohort analysis

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Abstract

Introduction Differentiated Service Delivery models (DSD) that cater to the needs of key populations (KP) have shown promise in providing KP-sensitive and KP-tailored care and treatment services. We evaluated the effect of two DSD models on linkage to and retention in treatment in Nigeria.

Methods Between December 2017 and June 2018, newly-diagnosed men who have sex with men (MSM) and female sex workers (FSWs) were enrolled into treatment through two DSD models and followed prospectively for one year. Model 1 was a fully integrated one-stop-shop (OSS) while model 2 was a hybrid HIV prevention and treatment site (DIC). Retention was estimated from drug pick-up records and was defined as being on treatment within 90 days one-year post ART initiation. Cox regression was used to identify the independent effect of the DSD models on retention while probability of being retained in treatment at 1-year was estimated with Kaplan-Meier product limit.

Results A total of 605 newly-diagnosed clients were enrolled into the study (340 in OSS and 265 in DIC; 342 were FSWs, while 263 were MSM). Median age was 26 years for MSM and 30 years for FSWs. Among those linked to treatment, retention was higher in the OSS than in DIC (63% vs. 48%; $p=0.002$). Among those not retained, mean days to be lost-to-follow up (LFTU) was 60 days. Controlling for educational level, population type and age, clients who received treatment in M2 were 6 times more likely not to be retained in treatment at the end of 1 year (Hazard ratio 5.89; 95% CI: 1.04–33.16). The Kaplan Meier estimates of the probability of being retained in 6 months, 9 months and 12 months was 0.97, 0.92, 0.80 for the DIC and 1.00, 0.96, 0.91 for the OSS.

Conclusion Linkage to treatment was suboptimal across both models with less than 90% of newly-diagnosed positives initiated on treatment and suggests that facilitated linkage is required to achieve at least 95%. Though retention was higher in the OSS model, both models had an alarmingly short time frame for LTFU and thus intensive monitoring during this phase of treatment is recommended irrespective of the type of DSD. Addressing these gaps will improve service delivery by one stop shops for HIV care and treatment.

Keywords Differentiated service delivery, HIV, MSM, FSWs, Prospective study, Nigeria

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Introduction

In 2014, the Joint United Nations Programme on HIV/AIDS launched the 90-90-90 strategy which laid ambitious global target of 90% of all people living with HIV (PLHV) knowing their status, 90% of these PLHV to receive sustained antiretroviral therapy (ART) and being retained in treatment and 90% of PLHV on treatment being virally suppressed [1]. Achieving these targets required innovative strategies to reach, identify, retain and virally suppress PLHV in treatment. One of such strategies that has been developed to achieve these targets is differentiated service delivery. Furthermore, in 2016, WHO launched the consolidated guidelines on the use of ART and endorsed the Test and Treat policy [2] which further required that countries and programs implement differentiated services of care to meet the scale up of treatment services.

Differentiated service delivery (DSD), also referred to as differentiated care, is an approach that simplifies and adapts HIV services to better serve the needs of people living with and at risk of acquiring HIV and reduce unnecessary burdens on the health system [3]. The increasing emphasis on differentiated care has deemphasized the focus on formal large hospital settings to decentralization of treatment services at an informal facility within the community that is closer to clients [4, 5]. Proponents of DSD also believe that alternative models utilize resources more efficiently, without compromising patient care and this has further driven interest and expansion of DSD models [6–8]. However, the need to ensure that differentiated services are sub-population-specific has resulted in various models being developed and variations within models. Some models of DSD include facility-based individual, out–of-facility individual, health care worker managed group and client-managed group models [9–12]. Other models include inclusion of peers within the health team and the use of community-based peer-led organizations to engage HIV infected persons [13].

In sub-Sahara Africa, country level examples of DSD include an out-of-facility DSD in Uganda where community drug distribution points (CDDP), i.e. picking up their drugs near their homes, for clients who have been on ART for more than 10 weeks and have a CD4 of more than 350 cells/mm3 with 95% adherence has been reported [9]. In Cape Town, South Africa, a healthcare managed group has been documented in which community-based Adherence Clubs were formed and managed by a health worker. Clients who have been adherent to their treatment regime for more than 12 months and show viral suppression are accepted in the club and can receive their ART at an agreed community location [10]. Client-managed group model has been reported in Mozambique; clients who participated in a community ART group (CAGs), felt more empowered and involved in their care [14]. However, these examples have been implemented among general population. Several studies have reviewed the effectiveness of DSD on treatment outcomes [15–21]. A systematic review of DSD for HIV clients in low- and middle-income countries showed that attrition appears to be lower in partially and fully decentralized models of treatment [22]. In Mozambique, participants in a community ART group showed increased retention rates compared to those not in the group [14].

Retention in treatment has been associated with improved ART adherence, slower disease progression, improved survival, reduced infectiousness and reduced HIV transmission which is required to achieve epidemic control [4]. Retention in treatment, thus remains one of the most important indicators of the quality of an HIV program and more so in a test and treat era, when patients are initiated on treatment before they begin to experience any symptoms [4]. However, there is no gold standard or fixed method in the measure of retention in treatment. Retention may be measured cross-sectionally by looking at the proportion of those who are currently on treatment, irrespective of when they started. It can also be evaluated among a cohort of patients who initiate treatment within a defined period and are followed-up over a fixed period. Furthermore, most studies on retention have been conducted among the general population with few studies conducted among key populations which include men who have sex with men (MSM), female sex workers (FSWs), people who inject drugs (PWID) and people in confined settings such as prisons.

Nigeria has a generalized HIV epidemic, with adult prevalence of 1.4% [23], and adopted the test and start policy (TnS) in 2016, however full implementation began in 2018. Key populations (KPs) such as MSM and FSWs continue to bear a disproportionately higher HIV prevalence (22.9% and 14% respectively) [24]. Men who sex with men and FSWs are particularly confronted with pervasive stigma and homophobia, and poor sensitivity of health care workers that negatively affect their health seeking behaviors [25, 26]. Key populations need respectful, accessible HIV services to address these unique needs and challenges. In particular, for those KPs who test positive, effective strategies are necessary to facilitate their timely enrollment in care and treatment initiation.

Currently in Nigeria, differentiated HIV services for KPs offer varying degrees of facility-based individual "one-stop-shop" (OSS) to meet these communities' comprehensive prevention, treatment, and care needs. These facility-based services aim to meet the basic health needs of KPs in their immediate communities, reduce time and travel cost to secondary and tertiary health institutions, minimize stigma, and promote quality care in a culturally sensitive manner. While the setup of the DSD

models may seem similar especially from the perspective of client, review of programmatic data had shown differences in treatment outcome. Furthermore, the availability of the requisite cadre and number of clinical staff is assumed to have an effect on the quality of care.

We evaluated the effect of DSD on treatment outcomes among MSM and FSWs in Nigeria. This is pertinent given the high burden of disease among these sub-populations in Nigeria and the expansion of DSD in Nigeria for key populations.

Methods

Study setting

This study was conducted in Lagos and Benue states. These states were chosen primarily because KP-friendly facilities exist in these states with funding from PEPFAR. Furthermore, HIV prevalence among MSM was 41% in Lagos. For FSWs, it was 37% and 14% among brothel and non-brothel based FSW in Benue and about 8% for both brothel and non-brothel based FSW in Lagos state [24]. Lagos state, located in southwest Nigeria, is a densely populated (9.1 million) and largely urban state with substantial commercial activities while Benue state located in north central Nigeria has a population of 3.9 million and majorly an agrarian state [27].

Description of differentiated service delivery models at study sites

Model 1: single partner ("One-stop shop") (Lagos state)

A friendly master safe space treatment center, also referred to as One-stop-shop (OSS) that is operated by a full-time clinical team of doctors, nurses and pharmacists. All services (peer education; condoms/lubricants; STI management; HIV testing services (HTS); laboratory services, prevention messaging; ART; care and psychosocial support) are offered within the cluster and complicated cases are referred to a specialized facility. New clients are identified through outreach or may be referred by peers.

Model 2 (DIC): Drop-in centre (Benue)

Drop-in centers (DIC), situated in Benue state were primarily prevention centers but supported by a treatment partner to provide ART services. In this model, demand creation (peer education; condoms/lubricants; STI management; HTS; and prevention messaging) for MSM and FSW were provided by one partner while ART services and care are provided within the facility by a treatment partner which specializes in ART clinical care. Referrals of complicated cases was to one of the treatment partner-supported facilities, depending on proximity to or degree of acceptability by key populations. For other required services such as OVC care, PMTCT, and TB Dots, clients are referred to the treatment partner's site or other service delivery points.

In Lagos, three OSS facilities served as study sites of which one was supported by the Population Council while two were supported by Heartland Alliance. The study sites in Lagos state provided full range of HIV services supported by one partner only. In Benue the study sites were primarily DIC facilities where KP prevention services were provided by Heartland Alliance, and ART services and care were provided at the same site by a PEPFAR-funded HIV treatment partner. These OSS facilities were established to provide culturally appropriate services to KPs in these states.

Study design

This was a prospective cohort study conducted between December 2017 and June 2018. FSWs and MSM who tested positive at outreach sites or walked-in for testing during the study period were enrolled and followed prospectively for 12 months to measure the primary outcomes in both models.

Study population

The study comprised of MSM and FSW. Men who have sex with men were eligible if they were at least 16 years of age, reported engaging in anal intercourse with another man in the past six months, newly diagnosed HIV positive or previously diagnosed but treatment naive, intended to reside in the study catchment area for the next 12 months and willing to provide consent. Similarly, FSWs were eligible if they were at least 16 years of age, sold sex for at least once in the past six months, newly diagnosed HIV positive or previously diagnosed but treatment naïve, intended to reside in the study catchment area for the next 12 months and willing to provide consent.

Sample size

Because of the national rollout of the TnS policy, it was assumed that the linkage level will be high (close to 100%) across the two models. For this reason, a retention outcome was used to estimate the sample size. Based on national program data from retention during the test and start period, the current retention rate for the two sub-groups was estimated to be about 60%. We anticipated that the OSS model would increase retention rate from 60 to 85%; while in the DIC model, retention would increase from 60 to 75%. The sample size required to detect these differences between OSS and DIC models, at endline was estimated to be 270, assuming alpha of 5% and power of 80%. We also anticipated 10% lost to follow up (LTFU) of the cohort from baseline to endline and therefore the sample size was adjusted to a minimum 300 MSM and FSWs in each model, or a minimum of 600 for

the entire study. To understand the effect of the models on KPs, an attempt was made to recruit equal numbers of MSM and FSWs for each model to ensure adequate representation of each group in the study for analysis.

Recruitment procedure

To foster community, buy-in and trust, we enlisted community mobilizers to support the recruitment of MSM and FSWs. Participants were recruited via both community outreaches in which HIV testing was offered and among participants who walked-in to the any of the study designated OSSs in Lagos and Benue states. The community mobilizers informed potential participants about the study and facilitated the research team's efforts to screen and invite MSM and FSWs to participate. Once a client was identified as positive, trained study staff screened him/her for eligibility, and consent was sought for their participation in the study. The study OSSs were at different locations and participants were given the option to enroll into any of the preferred sites to improve the likelihood of the participant adhering to treatment. Baseline data collection was conducted at the recruitment/enrollment sites. For those recruited at outreach sites, interviews were conducted in private settings recommended by the community mobilizers. For walk-in participants to the CHC or DIC, interviews were conducted at the facility.

Data collection and management

Baseline

Baseline data was collected from participants at the time of HIV diagnosis either at outreach or at the facilities for walk-in clients. The content of the questionnaire included sociodemographic information, sexual behaviors (such as condom use and anal sex), HIV status disclosure, health status, internal and external stigma, violence, and perceived service quality. In addition behavioral outcomes (condom use, use of lubricants, alcohol use, psychoactive drug use, treatment of sexually transmitted infections) of interest were measured quantitatively at baseline and 12 months.

Data were collected by trained interviewers using tablets. Each participant was compensated with N1,000 ($3).

Cohort follow-up: follow-up surveys and clinical data extraction

At 12 months, a second round of survey data was collected from the study participants irrespective of clinical status or retention in treatment. Information collected in the follow-up interview was similar to the baseline interview, with the addition of questions aiming to measure key treatment outcomes and experience with the services that participants had received. For clinical outcomes; retention on treatment at 12 months, viral load data, and viral suppression were abstracted from clinical records. The six-month viral load was collected to measure viral suppression. According to the national guidelines, for newly initiated clients on ART, viral load was to be done at 6 months post-initiation and 1 year subsequently if the client is virally suppressed.

Data analysis

Analysis included descriptive statistics of key socio-demographic variables as well as key HIV treatment outcomes with 95% confidence interval. Chi-square test was used to measure difference across models for categorical variables and T-tests for continuous variables. All treatment outcomes (retention on treatment at 1-year, viral load test and viral load test score) were from data abstracted from clinical records. Retention on treatment at 1-year was defined as all those who had initiated treatment at baseline and were still on treatment at 12 months.

Cox logistic regression was used to measure the effect of the treatment models on retention at 1-year. Retention on treatment at 1-year was determined by reviewing all drug pick up visits during the follow up period. All clients who had at least one drug pick up from initiation and whose last drug pick up was within 30 days from the one-year treatment date were classified as retained on treatment at 1-year. Retention on treatment at 1-year was a dichotomous variable with those retained assigned "1" and those not retained "0". The selection of independent variables was initially determined through literature, theoretical concepts, and their levels of significance during bivariate analysis. We included key socio-demographic characteristics (age, education, marital status, and mode of recruitment) as covariates. As stigma and HIV disclosure is a critical barrier to accessing care and adherence, we also explored how it affected treatment outcomes. For internal and external stigma, total scores of each item were estimated for each client and the median sample score was generated to determine the cutoff point. Those below the median were designated as having "no/low stigma" while those at or above the median were designated as having "high stigma". Variables significant at $p \leq 0.35$ in bivariate analysis were included in the final multivariate analysis. Unadjusted and adjusted hazard ratios and 95% confidence intervals are reported. Data analysis was performed using Stata 14.

Ethical considerations

The study protocol received ethical approvals from Population Council's Institutional Review Board, U.S.A and the National Health Research Ethics Committee (NHREC), Nigeria. The procedures involving human participants complied with Population Council's Institutional Review Board and the NHREC ethical standards

for the conduct of research. Written informed consent was obtained from all participants by trained interviewers prior to commencement of the interviews.

Results

Key findings

Baseline characteristics of participants

Between December 2017 and June 2018, 605 KPs were enrolled into the study, and this comprised of 263 MSM and 342 FSWs. Among MSM, majority were less than 25 years (Table 1) in the OSS (57%) while majority were ≥ 25years in the DIC (86%; $p < 0.0001$). For FSWs, majority of the participants were ≥ 25years in both models (77% vs. 81%; $p = 0.401$). An assessment of educational status among MSM, showed that about a third (57%) had at least secondary level education among those in the OSS while among those in the DIC, primary level education was the most common (46%; $p < 0.0001$). Among FSWs, primary level education was the most common for both OSS and DIC (49% vs. 43%; $p = 0.442$).

Sexual risk behaviour

Among MSM, anal sex with females was higher in the DIC (73%) compared to 20% in the OSS (Table 2). Use of lubricants during sex (86%) and consistent use of lubricants (54%) was higher among MSM in the OSS. For history of sexually transmitted infections (STI), it was higher among MSM in the OSS compared to the DIC (43% vs. 16%; $p < 0.0001$), however there was no significant difference in the treatment of last episode of STI in the OSS compared to the DIC (77% vs. 75%; $p = 0.902$). Among FSWs, history of STI was higher in the DIC compared to the OSS (70% vs. 42%; $p < 0.0001$) while treatment of last episode of STI was higher in the OSS (79% vs. 52%; $p < 0,0001$).

Exposure to HIV testing services

More MSM in the DIC had ever been tested for HIV (82% vs. 70%; $p = 0.042$) and had an HIV test within three months of the study (46% vs. 32%; $p = 0.003$) compared to MSM in the OSS. For FSW, those in the OSS had a higher proportion that had ever tested for HIV (78% vs. 64%; $p = 0.007$), however more FSW in the DIC had received an HIV test in the last 3 months (85% vs. 23%; $p < 0.0001$). HIV risk perception was low but higher among those in the OSS compared to the DIC for both MSM (17% vs. 7%; $p = 0.03$) and FSW (10% vs. 4%; $p = 0.009$).

Treatment outcomes

Linkage to treatment

Of the 605 clients recruited into the study, only 427 (71%) were successfully linked and initiated on treatment (Table 3). Linkage to treatment was higher in the DIC (73%) compared to the OSS (68%; $p = 0.213$) but this was not significantly different. By key population, linkage to treatment was higher among MSM (75%) compared to FSWs (66%; $p = 0.021$).

Retention in treatment at 1 year

Among those linked to treatment, retention at 1 year was 56%. Retention was higher among participants in the OSS compared to those in the DIC (63% vs. 48%; $p < 0.01$). By

Table 1 Baseline characteristics

Indicators	MSM (*N*-263)			FSW (*N* = 342)		
	OSS (*n* = 180)	DIC (*n* = 83)	*p* value	OSS (*n* = 160)	DIC (*n* = 182)	*p* value
	% (*n*)	% (*n*)		% (*n*)	% (*n*)	
Age group (years)						
< 25	56.4 (101)	15.5 (13)		23.1 (36)	19.3 (35)	
>= 25	43.6 (78)	84.5 (71)	< 0.0001	76.9 (120)	80.7 (146)	0.401
Median age (IQR)	24 (21–27)	30 (26–34)	< 0.0001	31 (25–38)	29 (25–33)	0.004
Education						
None	0.6 (1)	2.4 (2)		22.5 (36)	30.2 (55)	
Primary	4.4 (8)	45.2 (38)		49.4 (79)	43.4 (79)	
Secondary	56.9 (102)	32.1 (27)		24.4 (39)	22.5 (41)	
Tertiary	38.0 (68)	20.4 (17)	< 0.0001	3.8 (6)	3.9 (7)	0.023
Marital Status						
Single	95.0 (171)	68.7 (57)		46.3 (74)	31.9 (58)	
Married	3.3 (6)	18.1 (15)		12.5 (20)	17.0 (31)	
Divorced/widowed	1.7 (3)	13.2 (11)	< 0.0001	41.3 (66)	51.5 (93)	0.023
Alcohol use						
Daily	2.8 (5)	3.6 (3)		26.3 (42)	4.6 (8)	
Occasionally	53.1 (95)	69.1 (58)		38.1 (61)	43.9 (76)	
Never	44.1 (79)	27.4 (23)	0.034	35.6 (57)	51.5 (89)	< 0.0001
Median age at sexual debut	17 (14–19)	18 (16–20)	0.008	17 (15–19)	16 (15–18)	0.001

Table 2 Prevalence of sexual risk behavior and HIV testing

Indicators	MSM (*N*-263)			FSW (*N* = 342)		
	OSS (*n* = 180)	DIC (*n* = 83)	*p* value	OSS (*n* = 160)	DIC (*n* = 182)	*p* value
	% (*n*)	% (*n*)		% (*n*)	% (*n*)	
Had sex with boy/girlfriend in past 6 months	50.8 (91)	61.9 (52)	0.093	36.9 (59)	53.9 (98)	0.002
Consistent condom use with boy/girlfriend in past 6 months	28.6 (26)	46.2 (24)	0.034	18.6 (11)	20.4 (20)	0.788
Had sex with casual partner in past 6 months	54.2 (97)	27.4 (23)	< 0.0001	9.4 (15)	18.1 (33)	0.02
Consistent condom use with casual partner in past 6 months	41.2 (40)	60.9 (14)	0.089	13.3 (2)	36.4 (12)	0.104
Anal sex with women in past 6 months	20.4 (33)	72.7 (24)	< 0.0001	NA	NA	
Use of lubricants during anal sex	85.5 (130)	45.9 (28)	< 0.0001	NA	NA	
Frequency of lubricant use during anal sex						
Everytime	45.3 (81)	23.8 (20)		NA	NA	
Almost everytime	13.4 (24)	14.3 (12)		NA	NA	
Sometimes	29.6 (53)	48.8 (41)	0.011	NA	NA	
Sexual position						
Insertive only	38.0 (62)	64.3 (45)		NA	NA	
Receptive only	30.1 (49)	5.7 (4)		NA	NA	
Both insertive and receptive	31.9 (52)	30.0 (21)	< 0.0001	NA	NA	
History of STI in last 12 months	43.0 (77)	16.7 (14)	< 0.0001	41.9 (67)	69.8 (127)	< 0.0001
Treated last episode of STI	76.6 (59)	75.0 (9)	0.902	79.1 (53)	52.9 (64)	< 0.0001
Ever tested for HIV	70.4 (126)	82.1 (69)	0.042	77.5 (124)	64.1 (116)	0.007
Recency of last HIV test						
Last 3 months prior survey	31.8 (40)	47.1 (32)		22.9 (28)	85.3 (99)	
Last 6 month prior survey	18.3 (23)	1.5 (1)		32.0 (39)	2.6 (3)	
> 6 months prior survey	50.0 (63)	51.5 (35)	0.003	45.1 (55)	12.1 (14)	< 0.0001
Feels at risk to HIV	17.2 (31)	7.2 (6)	0.03	10 (16)	4.4 (8)	0.009

Table 3 Linkage, viral load and treatment outcomes disaggregated by select variables

	Linkage	*p* value	Retention	*p* value	Viral load coverage	*p* value	Viral suppression	*p* value
Overall	70.6 (427)		56.0 (239)		71.0 (303)		96.0 (291)	
Model								
One	68.7 (233)	0.213	62.8 (147)	0.002	73.4 (171)	0.212	96.5 (165)	0.637
Two	73.4 (193)		47.7 (92)		67.9 (131)		95.4 (125)	
Age (years)								
< 25 years	69.8 (125)		62.4 (78)		64.8 (81)		96.3 (78)	
>= 25 years	71.8 (301)	0.62	53.5 (161)	0.091	73.8 (222)	0.063	96.0 (213)	0.89
Educational level								
None	66.7 (70)		45.0 (27)		66.7 (40)		95.0 (38)	
Primary	66.7 (130)		43.1 (56)		70.0 (91)		96.7 (88)	
Secondary	71.6 (144)		63.2 (91)		70.1 (101)		94.1 (95)	
Tertiary	74.5 (70)	0.456	68.6 (48)	< 0.0001	77.1 (54)	0.587	98.2 (53)	0.626
KP group								
FSW	65.7 (213)		49.8 (106)		69.0 (147)		95.2 (140)	
MSM	74.6 (191)	0.021	60.7 (116)	0.027	72.8 (139)	0.407	96.4 (134)	0.623
Mode of recruitment								
Outreach	67.2 (254)		45.3 (115)		69.7 (177)		94.5 (172)	
Walk-in	74.3 (150)	0.078	71.3 (107)	< 0.0001	72.7 (109)	0.524	96.5 (110)	0.434

key population, retention at 1 year was higher among MSM compared to FSWs (61% vs. 50%; $p = 0.027$). By mode of recruitment, retention was higher among those who walked-in compared to those who were recruited at outreaches (71% vs. 45%; $p < 0.0001$). There was no difference in retention between those who reported experiencing external stigma (62% vs. 59%; $p = 0.713$) while for internal stigma it was similar for those who experienced and those who did not experienced it (60%). Among those not retained, mean days to be lost-to-follow up (LFTU) was 60 days.

Table 4 Cox Regression Analysis Showing Effect of Treatment Models on attrition

Variables	Unadjusted HR	95% CI	*p* value	Adjsuted HR	95% CI	*p* value
Treatment model						
OSS	1			1		
DIC	2.96	0.96–9.15	0.06	5.89	1.04–33.16	0.044
Age group						
< 25 years	1			1		
>= 25 years	0.81	0.58–1.14	0.223	0.39	0.05–3.26	0.387
Educational status						
None/primary	1			1		
Secondary	0.49	0.12–1.94	0.306	0.61	0.13–2.85	0.524
Tertiary	0.33	0.04–2.73	0.303	0.44	0.04–4.86	0.501
Key population						
MSM	1			1		
FSW	2.28	0.71–7.27	0.165	0.45	0.10–2.00	0.29
Marital status						
Single	1					
Married	0.79	0.22–2.80	0.713			
Experienced external stigma						
No	1					
Yes	0.9	0.57–1.43	0.66			
Experienced internal stigma						
No	1					
Yes	0.78	0.38–1.60	0.497			

Viral load coverage and viral suppression

Viral load coverage

Overall, 71% of those initiated on treatment, received at least one viral load test within the study period. Viral load coverage was higher among participants in OSS compared to DIC (73% vs. 68%; $p = 0.212$). By key population, viral load coverage was higher among MSM compared to FSWs (73% vs. 69%; $p = 0.407$). By mode of recruitment, viral load coverage was slightly higher among those who walked-in compared to those recruited via outreaches (73% vs. 70%).

Viral suppression

Among those with a viral load test, viral suppression was 96%. This finding was similar for both models 1 (97%) and 2 (96; $p = 0.637$). By key population, viral load suppression was 96% for MSM and 95% for FSWs. By mode of recruitment, it was 96% for those who walked-in and 95% for those recruited via outreaches.

Effect of treatment models on retention

Table 4 shows the independent effect of the treatment models on retention in treatment. When controlled for educational level, sub-population type and age, clients who received treatment in the DIC were 6 times more likely not to be retained in treatment at the end of 1 year (Hazard ratio 5.89; 95% CI: 1.04–33.16). The Kaplan Meier estimates of the probability of being retained in treatment at 6 months, 9 months and 12 months was 1.00, 0.96, 0.91 and 0.97, 0.92, 0.80 for the OSS and the DIC respectively.

Discussion

This is the first study to evaluate the effect of differentiated care via one-stop-shops among KPs in Nigeria and a number of important findings were observed. First, despite the roll out of test and start, linkage to treatment remains sub-optimal among KPs in Nigeria with less than 75% of them initiated on treatment. Secondly, less than 50% of KPs received treatment for their STIs. Thirdly, despite increased risk of HIV transmission, less than 50% had received an HIV test in the three months prior to the study. Fourthly, retention at 1-year was less than 90% indicating gaps in program quality in retaining KP on treatment and lastly, by type of treatment model, those in the DIC, were less likely to be retained in treatment at the end of 1-year. These findings have salient implications for the use of differentiated HIV care and treatment among KPs in Nigeria.

Linkage to treatment

The second "95" of the UNAIDS 95:95:95 aims to promote the retention of clients on treatment. However, clients must be linked to treatment prior to be retained in treatment. Linkage to treatment in our study was 71% despite each of the models implementing a test and start approach to HIV management. In addition, there was no difference in proportion of clients linked to treatment

across both models and suggests that challenges or barriers limiting linkage may be similar in both models. Community-based testing, especially mobile outreaches has the tendency of identifying clients with high CD4 count who are physically healthy and thus convincing them to commence life-long treatment remains a challenge. Nhassengo et al. (2018) assessed barriers to the uptake of test and start in Mozambique and reported that barriers to ART initiation included: feeling healthy, not prepared to start ART for life, concerns about ART side effects, fear of HIV disclosure and discrimination, poor interactions with HCWs and limited privacy at health facilities [28]. These barriers are more likely to be observed among clients identified during outreaches than among those who received their HIV test at a health facility. In this study, linkage to treatment was higher among those who were tested at the health facilities compared to those at outreaches. The implementation of facilitated linkage, i.e. linkage with the use of counsellor follow-up, escort services or incentives to complete the linkage process have been shown to be very effective in improving linkage rates. A systematic review of HIV testing strategies and linkage to treatment showed that home and campaign interventions achieved a high proportion of individuals linked (95%) when paired with facilitated linkage to care strategies while interventions without facilitated linkage achieved lower proportions (26%) of HIV-positive individuals visiting a clinic [29]. Similar to linkage to care, they observed that ART initiation was higher in home interventions with facilitated linkage (76%) compared with those without facilitated linkage (16%) and furthermore, ART initiation rates after home HTC with facilitated linkage were similar to those achieved through facility HTC [29]. Another study in South Africa reported highest rates of linkage to treatment in interventions that incentivized monetary recruitment and another which used a call center to encourage linkage after HIV testing [30, 31].

Our findings also show that linkage to treatment was higher among MSM compared to FSWs. While there are few studies that have compared linkage rates among MSM and FSWs, studies have shown that linkage to treatment is higher among women than men. A retrospective cohort study that reviewed 3,496 clinical records of clients on treatment reported that 66% of the clients retained were females [32]. Another study looked at 5,760 records of clients on treatment and reported that 59% of clients retained were female [33]. Further studies are required to understand plausible reasons for the higher linkage rate among MSM.

Retention in treatment

Retention in treatment remains a measure of program quality and furthermore very few studies have assessed treatment retention among key populations in Nigeria. Our study showed a one-year retention in treatment of 56% and retention was higher among clients in the OSS compared to the DIC. Our retention rate was lower than other studies in Nigeria that had accessed retention rates among clients on HIV, though these studies were among the general population. A study in 2010, reported that retention at 1-year was 74% and females were more likely than males to be retained in treatment [33]. A similar study among general population in Nigeria, in 2015 reported that only 62% of clients were retained at 1-year and females compared to males were more likely to be retained in treatment [32]. Onifade et al. [33] assessed 1-year retention for the Nigerian HIV program and used a retrospective cohort analysis for different cohorts (2013–2017). The study reported that the probability of being retained in treatment at 1-year was 0.78, 0.76, 0.75, 0.70, 0.50 for those who initiated treatment in the years 2013, 2014, 2015, 2016 and 2017 respectively [34]. They argue that the low probability of retention for the 2017 cohort was probably due to the test and start program, similar to that observed in our study.

A further assessment showed that the median time to attrition in our study was 60 days. This suggests that under the test and treat strategy, intensified case monitoring must be instituted within and beyond the first 60 days of initiation to improve retention rates. The higher retention rate in the OSS compared to the DIC may be attributable to better client case management in the early days following treatment initiation given that they are better funded to have a more robust structure to monitor and follow up clients. Thus, while the test and start strategy is promising in that potentially, physiologically healthy clients are initiated early on treatment and if adherent on treatment, can sustain viral suppression which reduces the risk of further transmission, the high rate of attrition must be considered, and evidence-based strategies must be deployed to improve retention.

Viral load and viral suppression

Viral load test remains the gold standard in monitoring client's response to treatment. However, coverage of viral load was 71% among those initiated on treatment and 50% among all those diagnosed HIV positive. Viral load coverage was higher among those receiving treatment in the OSS compared to the DIC and may again, reflect the better program quality given the availability of requisite personnel and better client tracking for sample collection. Using the total number of clients enrolled as the denominator, the viral load coverage of 50% is similar to national coverage for viral load test. Among those initiated on treatment in 2018 in the national HIV program, 46,126 clients were eligible for viral load test and only 55% (25,160) had received a viral load test [33]. Stafford

et al. [35] evaluated clinical outcomes among clients who had being initiated on treatment under the test and start strategy in Nigeria and they reported that only 13% and 8% of clients had viral load documented at 6 months and 12 months respectively [36]. The national HIV program continues to lag behind in viral load coverage, and these are mainly due to logistics issues of sample collection and sample transfer especially for facilities that have over 4 h travel time between them and the reference facility. This also means, that providers are sub-optimally managing their clients as they do not know which clients are responding appropriately to treatment and those who are not. Dried blood spot samples (DBS) have been evaluated as a viable sample collection device with results comparable to plasma. Efforts must be made to include DBS as an option of sample collection in Nigeria as this will support the community ART program given that DBS requires less laboratory support in storage and transportation. In addition, strategies that will increase the demand of viral load test by the clients (client-led) may be an approach to increase the coverage of viral load test in Nigeria. Similarly, performance indicators/reward systems can be instituted to support the demand of viral load tests by providers (provider-led) of their clients. This two-prong approach can synergistically increase the viral load coverage among clients on treatment in Nigeria.

Viral suppression, the third "95" of the UNAIDS 95:95:95 goal is the desired outcome for all clients on antiretroviral therapy. Among those who had a viral load test, viral suppression was 96% and there was no difference between models 1 and 2. Viral suppression reported in our study was higher than a recent study in Nigeria which reported a viral suppression of 78% at 12 months among clients who had initiated treatment under the test and start strategy and 84% among those who had started treatment prior to the test and start policy [36]. Similarly, viral suppression from program data was reported to be 84% as of November 2019 [37]. However, data from the 2019, Nigerian HIV/AIDS Indicator and Impact Survey reported a national viral suppression rate of 45% among people living with HIV [38], and thus suggests that the viral suppression reported in this study may be overestimated as clients who are adherent to treatment may have selectively availed themselves to have their viral load test done. As stated above, client-led and provider-led interventions that increase viral load coverage are urgently needed to effectively assess and appropriately manage clients on treatment in Nigeria.

This study has some limitations. Though the study was conducted in two different geopolitical zones, Nigeria has six zones and thus the findings may not be generalizable to all DSD services. However, the two zones studied are diverse in sociocultural and religious attributes and this provides some strength in understanding DSD services among KPs in Nigeria. Adherence to treatment provides a better measurement of client's use of drugs than retention, however we were unable to measure this due to budgetary constraints. The high level of viral suppression and the prospective nature of the study, however, provides an insight into KPs adherence practice which from our study indicates that it was optimal. Lastly, though DSD may address structural barriers to uptake of services, inclusion of these indicators in future studies is recommended.

Conclusion

Differentiated Service Delivery, while promising in its capacity to ensure that people living with HIV have quicker access to treatment and thus achieve viral suppression faster also shows poor treatment outcomes in Nigeria. Linkage to treatment is poor and facilitated linkage must be deployed to ensure that at least 95% of newly diagnosed clients are initiated on treatment.

The OSS performed better than the DIC in key treatment outcomes except linkage to treatment and suggests that the operation of DSDs in Nigeria must ensure appropriate funding, to enable the system to deploy the appropriate cadre of staff both for managing the facility and supporting the community-based component of the program. Loss-to-follow up was highest in the first 60 days post-treatment and thus requires enhanced adherence counselling, closer monitoring and mechanisms to allow detailed tracking of each client, given that potentially healthy clients are being initiated on life-long ART. In addition, the low viral load coverage requires two-pronged client-led and provider-led interventions to drive the need to have viral load conducted and to effectively monitor client's response to treatment.

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Author contributions

SG and GE conceived the study. GE conducted data analysis and drafted the manuscript. LV and WT reviewed the statistical analysis and the manuscript. SG, SC, WT, II and SA provided critical review of the final manuscript.

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Data availability

Data is available from corresponding author via request.

Declarations

Ethics approval and consent to participate

The study protocol received ethical approvals from Population Council's Institutional Review Board, U.S.A and the National Health Research Ethics Committee (NHREC), Nigeria. The procedures involving human participants complied with Population Council's Institutional Review Board and the NHREC ethical standards for the conduct of research. Written informed consent was obtained from all participants by trained interviewers prior to commencement of the interviews.

Consent for publication

Not applicable.

Competing interests

GE, SG and LV received funding From USAID to conduct the study. SC and II declare no competing interest. The funders had no role in study design, data collection, data analysis or interpretation of the data.

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