



PATIENT BENEFITS AND COSTS ASSOCIATED WITH DIFFERENTIATED MODELS OF SERVICE DELIVERY FOR HIV TREATMENT IN SUB-SAHARAN AFRICA

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INTRODUCTION

As of December 2018, 16.4 million people were reported to be receiving antiretroviral therapy (ART) for HIV in sub-Saharan Africa.¹ To achieve global “90-90-90” targets for HIV diagnosis, treatment, and viral suppression, another three million patients must be added to national HIV treatment programs during the coming decade in eastern and southern Africa.¹ At the same time, donor funding for HIV has plateaued, leading to calls for greater efficiency in service delivery.²

One response to this challenge is the development of “differentiated service delivery models” (DSD models) for HIV treatment. DSD models, which typically reduce clinic visits and/or move services out of the clinic, aim to improve clinical outcomes of treatment, such as retention in care and viral suppression; make treatment more patient-centric by lessening the burden of frequent clinic visits; and reduce costs to both the healthcare system and to patients.

Costs and benefits of DSDs to patients themselves (as opposed to costs and benefits to providers and funders) are often omitted from evaluations of specific models of service delivery and from mathematical modeling of potential impact. As part of a larger rapid review of the published and gray literature on the outcomes of DSDs since 2016, in this report we present and discuss the subset of sources that provide empirical information on patient costs and benefits and the acceptability of DSDs to patients.

METHODS

Methods for the rapid review of published sources followed those recommended by the WHO, with protocol registration in PROSPERO.³ Inclusion/ exclusion criteria and search terms are shown in Appendix 1. For review of the gray (unpublished) literature, we included poster and slide presentations and institutional (government, partner, project) reports, identified by screening websites of DSD implementing partners, government ministries of health, and research organizations.⁴ The systematic review search included articles published January 1, 2016–November 30, 2018. The gray literature search included reports published January 1, 2016–June 21, 2019.

One of the challenging aspects of the review was a lack of a consistent definition of what constitutes a DSD model of ART provision. For both systematic and gray literature reviews we adopted an approach proposed by Grimsrud and Duncombe which specifies that models

can be differentiated by provider (which cadres provide care?), location (is care provided in the clinic/off-site?), frequency (how often does the patient interact with the healthcare system?), and intensity (what services are provided in the model?).^{5,6}

In the literature review, costs and benefits included:

- **Costs**, defined to include differences in monetary and in-kind resource usage from the patient perspective. Costs included monetary payment for travel and service, value of wages lost, and time spent traveling, waiting for, and/or receiving services. Cost savings (e.g. a reduction in transport fares paid) are reflected as negative costs.
- **Benefits and drawbacks**, or self-reported positive and negative aspects of DSD participation (facilitators and barriers). Benefits are reported per model category as opposed to per model/source document to avoid repetition.
- **Satisfaction**, a self-reported measure of patient satisfaction with services.
- **Preferences**, meaning patients’ preferences for being enrolled in a DSD model compared to the traditional or standard of care (SOC) model.

We categorized the models using the taxonomy proposed by Grimsrud and colleagues.⁶

- **Facility based individual models (FBIMs)** are models that provide one-to-one HIV services at the healthcare facility (e.g. Multi-Month Scripting, Facility Fast Track, Enhanced Adherence Counseling)
- **Out-of-facility based individual models (OFBIMs)** provide care in the community to each individual patient (e.g. Home ART delivery, Decentralized Medication Delivery, Mobile Clinics).
- **Healthcare worker led groups (HCWLGs)**, are a group model typically supported by a clinically trained healthcare worker or a lay health worker (e.g. Adherence Clubs, Teen Clubs)
- **Client led groups (CLGs)** are a group model that provides services either in the community or at the facility and are led by patients (Community Adherence Groups, Urban Adherence Groups).

Our data extraction tool captured unique differentiated service delivery models as separate entries regardless of whether the source documents reported one or many models. The tables below report results per individual model.

RESULTS

The two reviews identified 54 publications (journal papers and peer-reviewed abstracts) and 34 reports and other unpublished documents that met inclusion criteria. Among these, 29 documents, from 11 countries (Figure 1) reported one or more costs or benefits to patients and are included in this sub-review. A list of sources, by model category and country, can be found in Appendix 2. Below we summarize results for each type of cost or benefit, by model category, and report individual results in the tables. The number of estimates for each category was generally quite small, making generalization difficult. Equally limiting is that many documents did not provide any comparative information, but simply reported outcomes for the DSD model(s). We cannot know how DSD models compared to standard of care for these models. In the tables, we list the results with comparative information first, then those without comparisons.



Figure 1. Countries with reports of patients' benefits and costs of DSD models

COSTS

Costs for travel and time are reported in Table 1. In Malawi, all the models studied by Prust et al. (2017) reduced both travel costs and time substantially, compared to standard of care.⁷ Community ARV delivery cut travel costs in Tanzania⁸ and Youth care clubs also reduced visit time.⁹ No reports suggested that patient costs, whether for money or time, were higher than for the associated non-differentiated care.

Table 1. Patient cost of receiving HIV care through DSD models*

Country	Model	DSD		SOC	
		Travel cost (USD)	Time or distance	Travel cost (USD)	Time or distance
Facility based individual models					
Malawi	Fast track refills ^{7**}	\$2.30/year	20.9 hrs/year	\$7.00/year	74.7 hrs./year
	Multimonth scripting ⁷	\$2.30/year	24.9 hrs/year	\$7.00/year	74.7 hrs./year
Out of facility based individual models					
South Africa	Centralized chronic medicines dispensing and distribution (CCMDD) ¹⁰	\$1.07/visit	12.9% patients >1 hour travel time to pickup point		
South Africa	Community based ART pick-up points ¹¹	83% reduction in travel cost/year			
Tanzania	ARV community delivery ⁸	\$0.40/year		\$3.30/year	
Uganda	Community pharmacies ^{12***}		9.0 wait hrs/year		
Healthcare worker led groups					
South Africa	Youth care club ^{9***}		13.8 visit hrs./year		48.0 visit hrs./year
	Adherence club ¹⁰	\$0.80/visit	20% of patients > 1 hour travel time from AC meeting point		
Client led groups					
Malawi	Community ART group (CAG) ⁷	\$1.20/year	36.8 hrs/year	\$7.00/year	74.7 hrs./year

*Monetary costs were converted into USD using the annual average exchange rate for the local currency over the last data year.











































** Patients enrolled in FTR and receiving MMS.

***Assumed minimum frequency to annualize.

BENEFITS AND DRAWBACKS

Patients identified a wide range of potential advantages and disadvantages to DSD models, as shown in Table 2.

Table 2. Patient reported benefits and drawbacks to DSD participation

Model category		
Facility based individual models	<ul style="list-style-type: none">  Reduced waiting time^{13,14}  Facility decongestion^{13,15}  Reduced travel cost^{13,14}  More patient freedom for employment and family travel¹⁶  Potential for improved adherence and retention¹⁷  No reports of unwanted disclosure¹⁶  Patients successfully carried large supply of ARVs¹⁶  Patients successfully stored drugs for a long time¹⁶  No problems with lost or stolen medications¹⁶ 	<ul style="list-style-type: none">  Concerns regarding safety and storage of medication for a long period of time at home for models that include multi-month dispensation¹⁸  Drug stock-outs and supply chain issues^{13,15}  Inconsistent implementation across facilities¹³  Long wait times during clinic visits¹⁹  Some concerns about stigma¹⁶
Out of facility based individual models	<ul style="list-style-type: none">  Benefits for female sex workers (FSW)²⁰  Reduced waiting time  Reduced transport cost  Minimizes sex work-related stigma and risks of inadvertent status disclosure.  Provides a safety net for FSW who have missed ART pickup  Improves tracing of FSW 	<ul style="list-style-type: none">  Patient fear of stigmatization^{14,20}  FSWs are concerned about the branding of mobile clinics which may lead to accidental HIV disclosure^{14,20}
Healthcare worker led groups	<ul style="list-style-type: none">  Provides a group identity/peer support²¹  Empowers patients to stay adherent and remain in care²¹  Less time consuming (short queues)²²  More convenient for employed patients²³  Reduces stigma²⁴  Helps link patient to care and track LTFU²⁵ 	<ul style="list-style-type: none">  May lead to complicated patient-provider relations²⁶  Patient concern about big group size, stigma, and unintended disclosure of status²⁴  Patient concern about needing to find members to join the group²⁷  Patient concern about models being time consuming and inefficient²⁸  Patient concern about ARTs not delivered in time²⁸
Client led groups	<ul style="list-style-type: none">  Improved social support¹³  Savings in transport costs²⁹  More patient freedom to engage in employment and family activities²⁹ 	<ul style="list-style-type: none">  Privacy and confidentiality concerns (fear of accidental disclosure)^{13,29}  Concerns about interpersonal conflicts between group members¹⁴  Lack of patient understanding of how models work¹³  Patients found it useful to meet with providers in person³⁰

SATISFACTION AND PREFERENCES

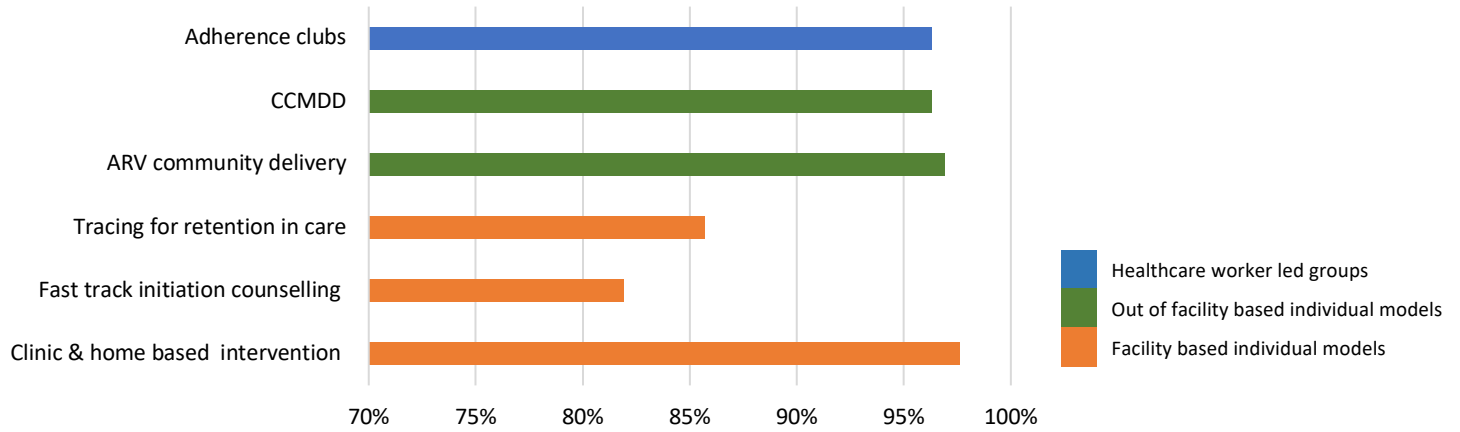
Several studies reported patients' satisfaction with models of service delivery, as shown in Table 3. For all models, satisfaction with care was high (>81%) (Figure 3; Table 3). No comparative data were reported to indicate whether patient satisfaction with DSD models was higher than with standard of care, however. Group models were less preferred than individual models, in general.

Table 3. Patient satisfaction with and preference for DSD models

Country	Model name	Satisfaction metric or model to which DSD is preferred	% of patients reporting satisfaction with DSD model	% of patients reporting that they prefer the DSD model
Facility based individual models				
Tanzania	Clinic and home based adherence intervention ³¹	% patients who were "satisfied" or "very satisfied" with care	97.6%	
South Africa	Fast track initiation counselling ¹⁰	% patients rating care as "good" or "very good"	81.9%	
South Africa	Tracing for retention in care ¹⁰	% patients rating tracer to be "good" or "very good" in terms of respect	85.7%	
Kenya	Facility fast track ³²	Compared to CAG		84.7%
Out of facility based individual models				
South Africa	Centralized chronic medicines dispensing and distribution ¹⁰	% patients who were happy to be enrolled in model	96.3%	
Tanzania	ARV community delivery ³³	% patients who were "satisfied" or "very satisfied" with ARV community delivery	96.9%	
Ghana	Refills from community based case managers for key populations ³⁴	Compared to refills by clinicians		80.0% [§]
Mozambique	Community pharmacies ³⁵	Compared to SOC		84.0%
Tanzania	Home-based delivery ³⁶	Compared to SOC		86.0%
Uganda	Community-based ART ³⁷	Compared to SOC		87.4%
Zambia	Home-based delivery ³⁸	Compared to adherence club or SOC		70.5%
Healthcare worker led groups				
South Africa	Adherence clubs ¹⁰	% patients who were "satisfied" or "very satisfied" with care	96.3%	
Zambia	Adherence clubs ³⁸	Compared to home-based delivery or SOC		15.4%
Client led groups				
Kenya	Community adherence groups ³²	Compared to facility fast track		15.3%
Zambia	Community adherence groups ³⁰	Compared to SOC		64.2%

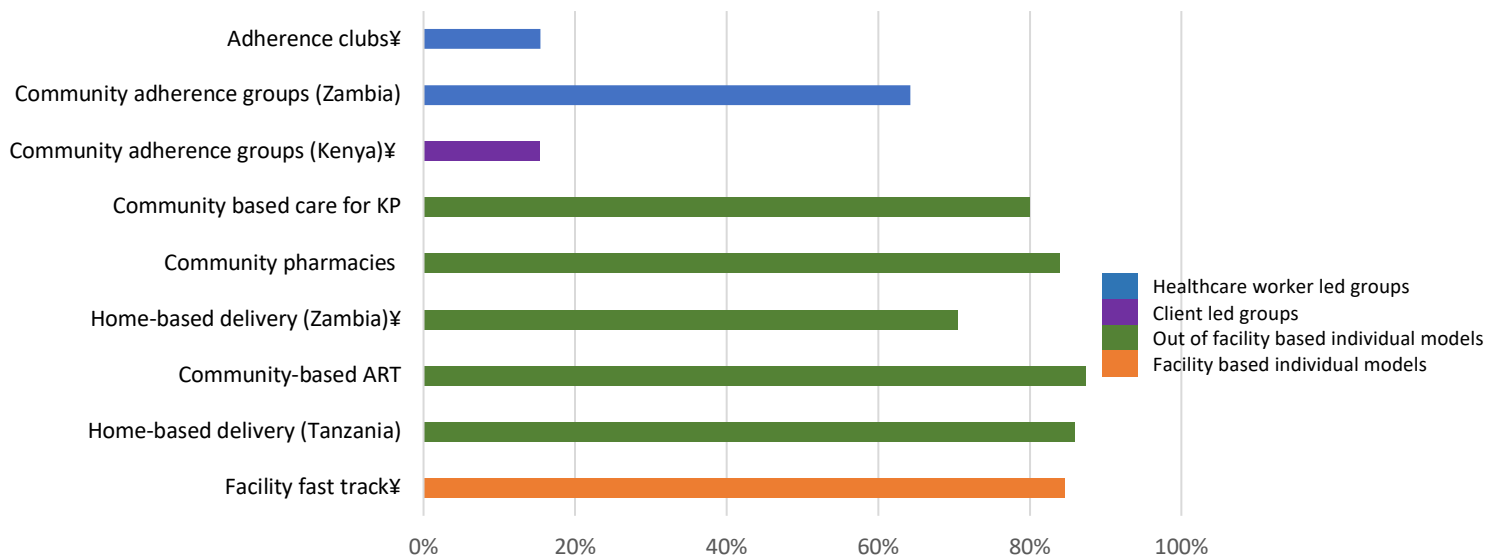
§ Preferred refills from case managers, family members, or non-clinicians.

Figure 3. Patient satisfaction with DSD models



A small handful of studies reported patients’ preferences for specific model of service delivery (Table 3; Figure 4). As shown in Figure 4 large majority of patients expressed a preference for individual models, whether at or out of a facility. Group models (adherence clubs, CAGs) were less popular.

Figure 4. Patient preferences for models of ART delivery compared to other DSD models or the SOC



¥Models where preference was expressed in comparison to one or more DSD models. Further detail on which model DSD is preferred to is listed in Table 3.

INTERPRETATION

As the tables and figures above reveal, information available about the costs and benefits of DSD to patients is scarce, and there is tremendous heterogeneity in the metrics and definitions used to capture the information that is available. Although we can propose a few general conclusions from this review of a subset of the recent literature on DSD, it is important to bear in mind that each is drawn from only a very small number of reports, giving us limited generalizability.

- In the three instances where comparative data on standard of care are reported, DSD saved patients substantial amounts of money on travel costs and greatly reduced the time required to receive ART, including time spent on transport, waiting in the queue, or having a clinic visit. There were no reports of DSD models that increased patient financial or time costs, though there is a strong likelihood of publication bias for this indicator (i.e. DSD that were found to impose additional costs on patients might not have been reported in the literature).
- Most non-quantitative reports of benefits and drawbacks cited reduced costs (both financial and time costs, often with mention of employment) among their main advantages, along with model category-specific benefits such as social support arising from group models. The main drawbacks identified were accidental HIV status disclosure and logistical concerns about how the models operated.
- Satisfaction with DSDs was very high, in all reports exceeding 80% of patients. Like costs, we expect that there is some publication bias for this indicator (i.e. DSD that were not satisfactory were not reported in the literature).
- Finally, when choosing between group models (CLG) and individual models of care (FBIM), most patients preferred the latter. When given a choice between a DSD and the standard of care, however, most (>80%) preferred a DSD model.

We also conclude that:

- There is insufficient evidence to make broad generalizations about which models are “better” or “worse” for patients. It is almost certain that perceptions of benefits and costs vary by individual patient, by facility or program, and by setting. There is also little or no information about patient preferences for one DSD model over another, as head-to-head comparisons in which patients were free to choose which model to enter are non-existent.
- None of the studies reported here linked patient satisfaction (or other costs or benefits) with clinical outcomes. Hypothetically, lower costs or larger benefits for patients should improve retention in care and viral suppression rates, but there is no evidence to support whether or not the modest clinical outcome improvements described for some DSD models are in any way related to non-clinical consequences such as lower costs.
- As with other DSD research, definitions and metrics for assessing types of costs and benefits and levels of satisfaction are inconsistent across studies, and some are difficult to interpret. Estimating savings in travel costs per clinic visit, for example, is not very meaningful without empirical data on numbers of visits.
- Finally, we note that many DSD interventions’ patient-level benefits and costs were described without any comparison values, either to the standard of care or to another model. Studies that report that a high proportion of patients were satisfied with a DSD model, for example, generally do not tell us what proportion were also satisfied with the standard of care. Since most models enroll only experienced, clinically stable ART patients who, by definition, have already overcome most obstacles to standard of care, it is possible that many of them would be satisfied either way.

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APPENDIX 1: INCLUSION/EXCLUSION CRITERIA

Parameter	Inclusion criteria	Exclusion criteria
Population	All ages and sexes; confirmed HIV positive status; on any regimen of lifelong antiretroviral treatment	Pregnant women in PMTCT programs; on ART for HIV prevention (PEP or PrEP)
Geographic region	Sub-Saharan Africa	None
Intervention	Delivery of lifelong ART that differs from standard or traditional care in terms of at least one of population, location, frequency, provider cadre, or services provided	Report solely about standard or traditional model for delivering ART, absent any differentiation based on population, location, frequency, provider cadre, or services provided
Required descriptive data about model	Describes all of patients, location, frequency, provider, provider cadre, and services provided (see below for further explanation of this criterion)*	Insufficient description of all the characteristics needed to define the model
Comparator	Not required; single arm evaluations are eligible	None
Outcomes	Reports at least one of coverage of population in need, uptake of ART, clinical outcomes, costs/resource utilization, acceptability to patients or providers, or feasibility of implementation	Insufficient detail provided to estimate at least one outcome
Timing	A majority of follow up data report on the delivery of antiretroviral treatment on or after January 1, 2016	A majority of follow up data report on the period before January 1, 2016
Sector	Services provided to the public sector through government-managed public health infrastructure or through NGO/private programs or facilities that serve the uninsured sector	Services or programs for privately (commercially) insured patients
Study design	Reports primary, patient-level data from retrospective or prospective cohorts collected under any study design (trial, observational) with or without a comparison group	Systematic or other reviews, case series or reports, treatment guidelines, mathematical models, editorials, commentaries

APPENDIX 2: SOURCES BY MODEL CATEGORY

Country	Model name	Dates of data collection	Sample size	Author	Type
Facility based individual models (FBIM)					
Ethiopia	Six-month appointment spacing	April 2017-June 2018	n=13,030 patients	Assefa 2018 ¹⁸	Abstract
Malawi	Fast-track refills; Multi-month scripting	Feb-May 2016	n=714 observations of visit time and flow	Prust 2017 ⁷	Article
Malawi	Fast-track refills; Multi-month scripting	Feb-May 2016	n=32 interviews with HCW; n=30 FGDs with 216 patients	Prust 2018 ¹³	Article
Malawi	Multi-month scripting	Nov 2016-Feb 2017	n=97 (n=62 patient data reported in this analysis)	Nyirenda 2018 (ICAP Interval Study) ¹⁶	Present.
Nigeria	Multi-month scripting	Jan-Oct 2017	n=49,680 patients	Attah 2018 ¹⁵	Abstract
Nigeria	Multi-month scripting	Oct-Dec 2017	n=15 KII with HCW n=6 FGD with patients. Total n≤48	Katchy 2018 ¹⁴	Abstract
Zambia	Facility fast track	Dec 2016-Jan 2017	n=6 FGDs with patients and professional HCW n=8 IDIs with other HCW	Jere 2018 ¹⁹	Abstract
Tanzania	Clinic and home based adherence intervention	Aug 2015-Feb 2016	n=438 patients	McCoy 2017 ³¹	Article
Kenya	Facility fast track	Jan-Sept 2017	n=3,110 patients	Obunga 2018 ³²	Abstract
South Africa	Fast track initiation counselling; early patient tracing	Nov 2016-Feb 2017	n=631 patients	HE ² RO and BU 2017 ¹⁰	Report
Out of facility based individual models (OFBIM)					
Nigeria	Community ART distribution	Oct-Dec 2017	n=15 KII with HCWs n=6 FGD with patients Total n≤48	Katchy 2018 ¹⁷	Abstract
South Africa	Central chronic medicine dispensing and distribution	Not indicated	n= 2,000,000 active registered patients	Roberts 2018 ¹¹	Present.
South Africa	Mobile ART care for FSWs	Sept-Nov 2017	n=24 FSW	Comins 2018 ²⁰	Abstract
South Africa	Decentralized medication delivery	Nov 2016-Feb 2017	n=631 (cost data for n=84)	HE ² RO 2017 ¹⁰	Report
Tanzania	ARV community delivery	Mar 2016-Oct 2017	n=2,172 patients	Geldsetzer 2018 ⁸	Article
Tanzania	ARV community delivery	Mar 2016-Jan 2017	n=334 patients	Francis 2017 ³⁶	Abstract
Uganda	Community-based ART	Nov-Dec 2016	n=604 patients	Semitala 2018 ³⁷	Abstract
Uganda	Community pharmacies	Nov 2016-Sept 2018	n=8,820 patients	Ssuuna 2018 ¹²	Present.
Zambia	Home-based delivery	May-Dec 2017	n=874 patients	Limbada 2018 ³⁸	Abstract

Country	Model name	Dates of data collection	Sample size	Author	Type
Mozambique	Community pharmacies	Oct-Nov 2017	n=406 patients	Maranga 2018 ³⁵	Abstract
Ghana	Community based care for FSW and MSM	Jan-March 2018	n=38 KPs	Benefour 2018 ³⁴	Abstract
Healthcare worker led groups (HCWLG)					
South Africa	Community based adherence clubs	Aug 7-Nov 2017	n=59 patients; n=20 HCW	Meehan 2018 ²¹	Abstract
South Africa	Post-partum adherence clubs	Jul-Sept 2016	n=19 patients; n=9 HCWs	Trafford 2018 ²²	Article
South Africa	Adherence clubs	Nov 2016-Feb 2017	n=631 (cost data for n=57)	HE ² RO 2017 ¹⁰	Report
South Africa	Adherence clubs	Nov 2016-Feb 2017	n=2,092 patients	Berrada 2019 (CaSIPO) ²⁸	Present.
South Africa	Youth care clubs	Aug 2016-Dec 2017	n=589 patients	Beery 2018 ⁹	Abstract
Zambia	Urban adherence groups	Mar-Jul 2016	n= 15 FGD with patients, family members and HCW n= 18 IDI with government officials and local leaders	Mwamba 2018 ²⁴	Abstract
Zambia	Community adherence groups	May 2016-Oct 2017	n=603 patients	Roy 2017 ²⁷	Abstract
Zambia	Urban adherence groups	May 2016-Oct 2017	n=1,096 patients	Roy 2018 ²³	Abstract
Zambia	Adherence clubs	May-Dec 2017	n=868 patients	Limbada 2018 ³⁸	Abstract
Tanzania	Expert client peer support	Not indicated	N.S	MOH Tanzania,2017 ²⁵	Report
Client led groups (CLG)					
Malawi	Community ART groups	Feb-May 2016	n=714 observations of visit time and flow	Prust 2017 ⁷	Article
Malawi	Community ART groups	Feb-May 2016	n=32 interviews with HCW; n=30 FGDs with 216 patients	Prust 2018 ¹³	Article
Nigeria	Client managed groups	Oct-Dec 2017	n=15 KII with HCWs; n=6 FGD with patients; Total n ≤48	Katchy 2018 ¹⁴	Abstract
Zimbabwe	Community ART refill groups	Oct-Dec 2017	n=20KII from provider; n= 155 CARG participants in n=20 FGDs	Mashungu 2018 ²⁹	Abstract
Kenya	Community-based ART groups	Jan-Sept 2017	n=3,110 patients	Obunga 2018 ³²	Abstract
Zambia	Community adherence groups	Not indicated	n=1,035 patients	Mwamba 2018 (CIDRZ) ³⁰	Present.

FGD – Focus group discussions

KII – Key informant Interviews

IDI – In-depth interviews

HCWs – Healthcare workers