Differentiated models of service delivery (DSD) for antiretroviral treatment of HIV in subSaharan Africa:

A review of the gray literature as of June 2019

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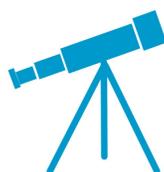
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Acronyms used in this report

AC	Adherence Clubs
ALHIV	Adolescents Living with HIV
AMBIT	Alternative Models of HIV Treatment Delivery: Optimizing the Benefits
ART	Antiretroviral Therapy
CAG	Community ART Group
CARG	Community ART Refill Group
CDDP	Community Drug Distribution Point
CCLAD	Community Client Led ART Delivery
CCMDD	Central Chronic Medicine Dispensing and Distribution
CHW	Community Health Worker
CLG	Client Led Group
DMD	Decentralized Medication Delivery
DSD	Differentiated Service Delivery
FAG	Facility ART Group
FBG	Facility Based Group
FBIM	Facility Based Individual Model
FTDR	Fast Track Drug Refill
FSW	Female Sex Workers
HCWLG	Healthcare Worker Led Group
HP	Health Post
KP	Key Population
LTFU	Lost To Follow Up
MMP	Multi Month Prescribing
MMS	Multi Month Scripting
MSM	Men who have Sex with Men
OFBIM	Out of Facility Based Individual Model
PEPFAR	The President's Emergency Plan For AIDS Relief
PLHIV	People Living With HIV
PRP	Pharmacy Only Refill Program
SFLA	Spaced and Fast Lane Appointment
SMA	Six Monthly Appointment
UAG	Urban Adherence Group
VL	Viral Load

I. INTRODUCTION

To achieve global targets for the treatment and prevention of HIV, most high prevalence countries are working towards scaling up alternative service delivery approaches, or differentiated service delivery (DSD) models. DSD models aim to achieve a number of potential benefits to both providers and patients, including better clinical outcomes, greater patient satisfaction, lower cost, and more efficient and convenient service delivery.

To date, most DSD model development and implementation has been limited to HIV positive patients on antiretroviral therapy (ART), and in particular to those deemed "stable" on ART. Models such as adherence clubs, community adherence groups, fast-track appointments, and multi-month dispensing are now being implemented and evaluated to assess their effect on achieving the benefits listed above.[1–3] A few of these evaluations have been published in the formal literature,[4–6] but given the recent, rapid, and extensive development of DSD guidelines and programs in many sub-Saharan African countries, most evaluations of implementation and outcomes remain unpublished, in the form of project reports, presentations, and other informal documents.

To complement the formal literature and facilitate access to the full evidence base on DSD outcomes, we conducted a comprehensive search of unpublished reports and other data sources posted online or directly from DSD implementers. We also searched for ongoing DSD studies that have not yet reported any results. We included randomized controlled trials, observational studies, and program evaluations, both quantitative and qualitative, with or without a comparison group, in sub-Saharan Africa. To ensure that our results came as close as possible to reflecting the current situation, this review was limited to data generated in 2016 or later.

This review is one component of a larger program of research on DSD models called AMBIT (Alternative Models of HIV Treatment Delivery: Optimizing the Benefits). The search we describe below was implemented in parallel with a formal systematic review of published papers and abstracts on DSD models in sub-Saharan Africa. The two reviews (published and gray), taken together, should provide a current and comprehensive picture of what is currently known about DSD models for ART in sub-Saharan Africa.

II. METHODS

Unlike the published literature, there is not a finite set of locations where gray documents can be found. We attempted as comprehensive a search as possible using search engines, websites of major funders and partners, and our own knowledge of HIV treatment programs in sub-Saharan Africa. We anticipate that some eligible reports have been missed, and we also expect some readers to bring additional documents to our attention upon reading this review. Depending on the number and scope of these new documents, this review may be updated periodically.

Search process

Inclusion and exclusion criteria

We operationally defined gray literature to include:

- Poster and slide presentations
- Institutional (government, partner, project) reports
- Ongoing and not-yet-published trials and observational studies
- Ongoing and not-yet-published program evaluations

We excluded peer reviewed journal articles and publicly available, peer reviewed abstracts from major conferences such as AIDS and CROI, as these were included in the parallel formal systematic review. For ongoing trials and program evaluations, we focused on the major clinical trial repositories and on stakeholder project repositories which contained evaluations describing methods and outcomes of DSD implementation (Appendix 1). To achieve a more specific search, we developed separate search strategies for AMBIT's three main countries of interest (South Africa, Malawi, and Zambia) and searched the relevant country domains (.gov.za; .gov.mw; .gov.zm; .za; .mw; .zm). Search strings and terms are detailed in Appendices 2 and 3. Search inclusion and exclusion criteria are shown in Table 1.

Organization, program, and government websites

For documents posted online by implementing organizations and governments, we identified relevant organizations and websites by soliciting recommendations from content experts and reviewing published lists of organizations relevant to the search area. We limited the advanced search to specific websites, country domains of interest, and the time period from 01/01/2016 to 06/30/2019. We then performed text searches in the advanced search screen of google.com using Boolean operators. For all hits that were relevant to DSD, we reviewed the table of contents and/or the executive summary/abstract and used the inclusion/exclusion criteria presented in Table 1 to determine eligibility for the gray review.

Ongoing and not-yet-published studies

To find relevant ongoing trials and observational studies, we first searched broadly for all HIV trials in sub-Saharan Africa using the built-in search engines of the biggest trial databases in the United States, Africa, and Europe (Appendix 1). Trial titles that were relevant to DSD were selected for full review and Table 1 inclusion/exclusion criteria applied. For all studies meeting these criteria, we recorded the trial registration number, retention date, recruitment status, study title, study start/projected end dates, sponsor/implementer ID, and country of implementation. The total number of studies screened and retained from each database was recorded and summarized and data fields extracted as listed in Appendix 4. Protocols for studies with results already published were excluded when the associated publication was identified, as it was then included in the formal review.

Ongoing program evaluations

Finally, we speculated that there are program evaluations of DSD models currently underway and that these would be mentioned on implementing partners' and funders' websites. We first conducted a Google search to identify implementing partners and international funders who implement, evaluate, or support the evaluation of HIV treatment delivery (Appendix 1). Each project evaluation database (3ie, Poverty Action Lab, USAID, PEPFAR) and grant disbursement listing (Global Fund, World Bank) was then searched for any ongoing HIV evaluations that have been posted since 01/01/2016. The evaluation titles were reviewed and those relevant to DSD were selected for full review per inclusion/exclusion criteria.

Published evaluations, those with incomplete DSD model descriptions, and those not designed to collected outcome data per our inclusion/exclusion criteria were excluded.

Table 1. Search inclusion and exclusion criteria

| Criterion	Include	Exclude
Population	• All ages • All genders • Confirmed HIV positive status • All risk groups (general, priority, key) • Any regimen of lifelong antiretroviral treatment • Any treatment status (stable, newly initiated, not stable) • In sub-Saharan Africa	On ART for prevention (PEP or PrEP) or pregnant women in PMTCT programs
Intervention	• Delivery of lifelong ART that differs from standard or traditional care in terms of population, location, frequency, provider cadre, or services provided.	Report about solely standard or traditional model for delivering ART, prior to any differentiation based on population, location, frequency, provider cadre, or services provided
Model characteristics	Reports at least one of the following characteristics: • Location—Is care provided in the clinic, on the clinic campus, in the community or workplace, at home? • Frequency—How often does the patient interact with the healthcare system for each type of service (drug pickup, medical consultation?) • Provider—Which cadre of clinical or lay staff provides the service? For example, nurses may conduct the medical visits, while "expert patients" deliver drugs to the patient's house. • Types of services provided—What occurs at each visit or interaction? Does visit include concomitant care or medication delivery for comorbidities?	Insufficient detail provided to describe the model
Comparator	Not required—single arm evaluations are eligible	None
Outcomes	Reports at least one of the following outcomes: • Coverage of population in need • Uptake by patients • Clinical outcome (e.g. retention in care, viral suppression, etc.) • Cost or resource utilization • Acceptability to patients or providers • Feasibility to implement	Insufficient detail provided to estimate at least one outcome
Timing	A majority of follow up data report on the delivery of antiretroviral treatment in or after January 2016	Majority of follow up data generated before January 2016
Sector	Services provided to the public sector through the government managed public health infrastructure or through partner/NGO/private programs or facilities that serve the uninsured sector	Services or programs for privately (commercially) insured patients

Definitions of models

Categories

We grouped the differentiated models into four categories: facility based individual models, out of facility individual models, healthcare worker led groups, and client led groups. This taxonomy was outlined by Grimsrud et al in 2017 and has been adopted widely to categorize DSD models.[7] Note that in this report, the term "model category" refers to one of the four categories described below. A "model" refers to specific model of service delivery within a category (
).

🔵 **Facility based individual models** (FBIMs) are models that provide all services at the healthcare facility to an individual. Typically FBIMs separate ART refill visits from clinical consultations and allow clients to bypass clinical staff and adherence support to refill their medications. We note that FBIMs are not simply traditional, facility-based care, but rather models of service delivery designed to achieve DSD goals. Examples include multi-month scripting and facility fast-track.

🔵 **Out of facility based individual models** (OFBIMs) provide care in the community to each individual patient. Examples include home ART delivery, decentralized medication delivery, and mobile clinics.

🔵 **Healthcare worker led groups** (HCWLGs) are a group model typically supported by a clinically trained healthcare worker or a lay health worker. Examples include adherence clubs and 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. Examples include community adherence groups and urban adherence groups.

Figure 1. Individual and group differentiated service delivery models
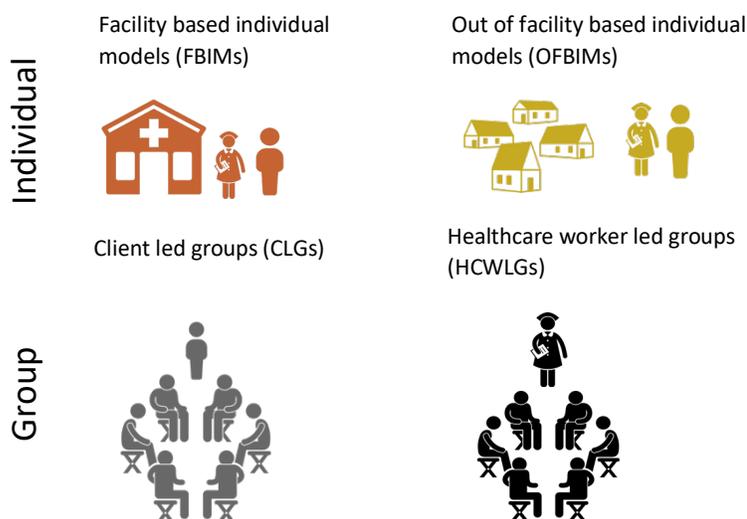
Further examples of the types of models that were included in each category are reported in Appendices 2 and 3. A full list of how each model included in the review was categorized is provided in Appendix 5.

Characteristics

Within the four categories, we characterized each model in terms of location, frequency, provider and types of services, as proposed by Duncombe and colleagues and illustrated in **Error! Reference source not found.**.[8]

🌐 **Provider** was identified by professional cadre for two essential ART services – clinical care and ART dispensation.

🌐 **Location** was identified as providing services in one of three settings: 1) at the heath facility only; 2) at the health facility and in the community and 3) in the community only.

🌐 **Types of services** captured services beyond basic ART dispensing, laboratory monitoring, and clinical care.

🌐 **Frequency** was defined as the number of times a patient interacts with the health system (established clinic or DSD service) to receive care under a particular model in a 12-month period.

Figure 2. Model categorization by provider, location, types of services, frequency
(Adapted by the authors from Mukumbang and colleagues (2017)2)
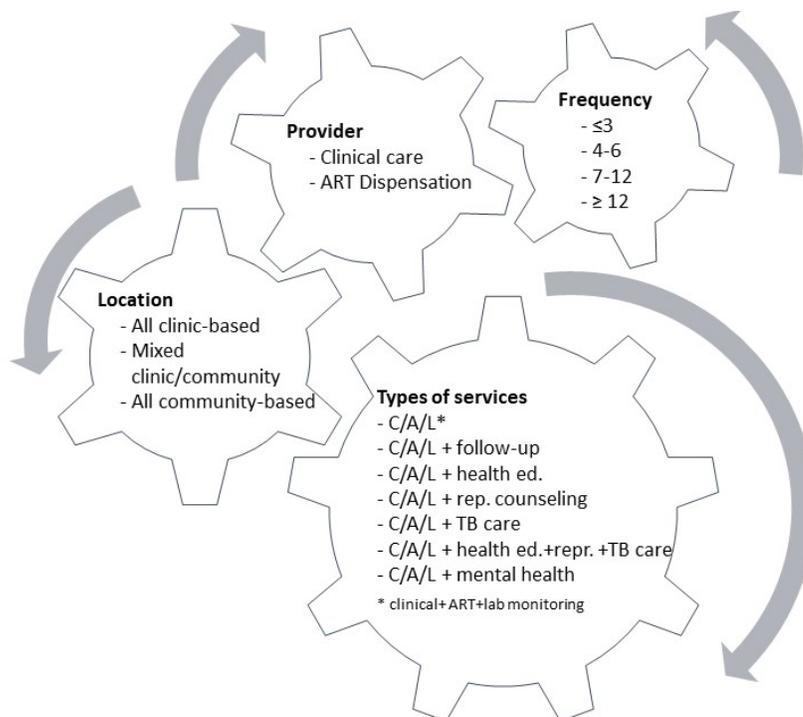
Outcomes

The documents included here reported a wide range of outcomes, often with varying definitions of the same outcomes and/or differing time periods, indicators, or inclusion criteria. To the extent possible, we standardized reported outcomes as follows:

- **Coverage** was defined as the proportion of eligible patients enrolled in each model over a specified time period (e.g. 12 months). Since very few documents reported coverage in this manner, we created two proxy coverage outcomes: a) proportion of eligible patients enrolled in any of the DSD models offered nationally; and b) proportion of facilities offering at least one DSD model nationally.

- **Uptake** refers to the proportion of patients enrolled in a DSD model of those who were offered enrolment (had the opportunity to enroll). Only a few documents adhered to this definition, however—most reported absolute numbers of HIV-positive individuals enrolled in the DSD model only. True uptake rates cannot be accurately calculated given the lack of data on the total number of patients offered enrolment.

- **Treatment outcomes** included viral load suppression, adherence and retention. We used source documents' thresholds for viral suppression where reported; if no threshold was reported, we assumed that viral suppression indicated a viral load <1000 copies, as this was the level used in most national guidelines between 2016 and 2018. For studies where absolute viral load was reported, we calculated the suppression rate using the relevant threshold. Where a virologic failure rate was reported, we defined suppression as the non-failure rate. Retention refers to the proportion of patients retained in the ART program at a certain time point after treatment initiation. Where a loss to follow up rate was reported, we recalculated it as retention. Adherence was reported as defined by the source documents although the definition was often not specified.

- **Cost** was defined as any estimate of provider or patient resource utilization to receive or provide care, both direct and indirect.

- **Acceptability** included facilitators and barriers to implementation by providers and participation by patients.

- **Feasibility** captured indicators of routine implementation successes and failures, such as drug stock-outs, supply chain bottlenecks, impact on clinic congestion, and medicine wastage due to expiry.

Data analysis

Documents meeting inclusion criteria for this search reflected a very wide range of models of service delivery, populations served, implementers, and funders. Outcomes reported also varied tremendously, from qualitative comments about feasibility to quantified rates of viral suppression to provider costs per patient. For this reason, we made no attempt to aggregate results for any of the reported models or outcomes. Instead, we stratified presentation of findings by model category and/or outcome to emphasize common themes and take-home messages. Stratification by model type, including all outcomes for each type of model, is provided in Appendix 6.

III. RESULTS

Search results

A total of 6,529 sources were screened from 47 organization websites. Of these, 136 documents received full text review (Figure 3) and 32 reports met the inclusion criteria for the review. Documents shared with us by subject matter experts and internal/external collaborators were also included for full text review. The most frequent reason for exclusion after the full text review was a lack of an empirical patient cohort that would allow for reporting of any of the outcomes (Table 2).

**Figure 3. Gray literature search flow chart**
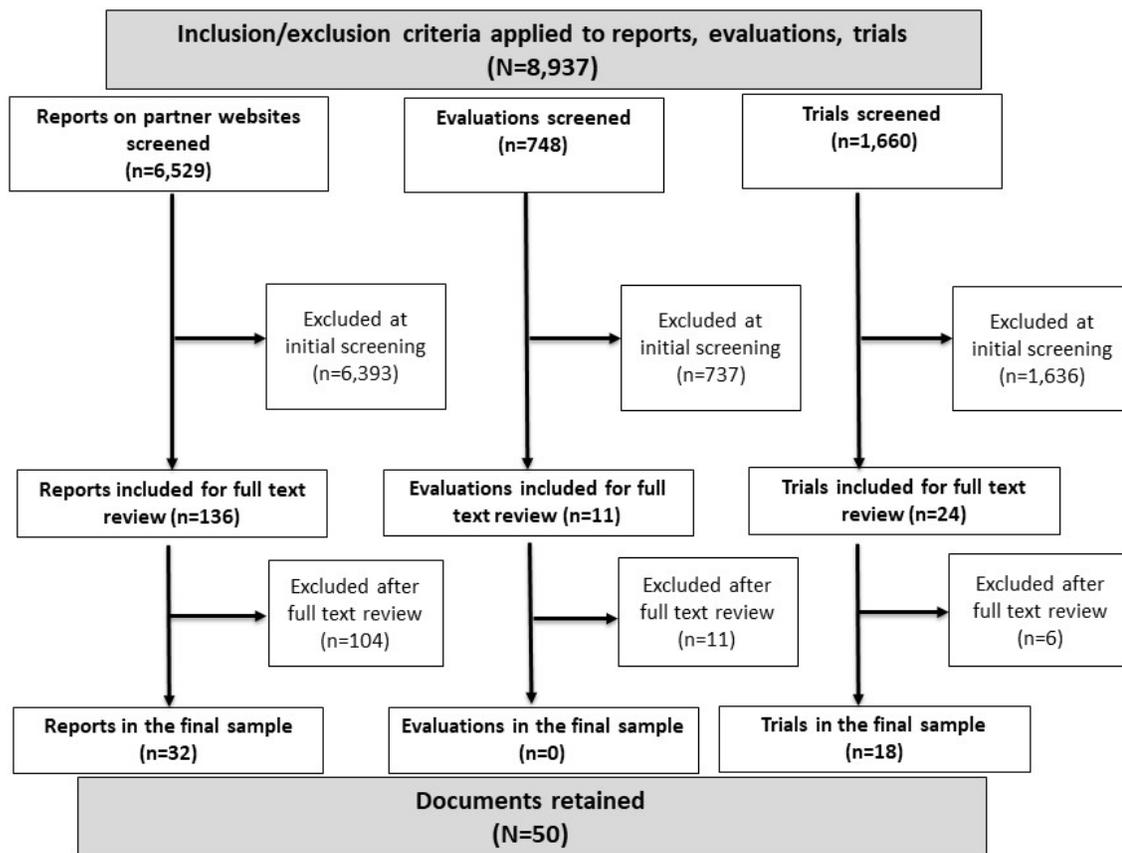
Table 2. Reasons for document exclusion after full text review

Reason for exclusion	104	(100%)
Duplicate data	9	(9%)
No DSD model characteristics	3	(3%)
No outcomes reported	78	(75%)
Study population	6	(6%)
Data time period	6	(6%)
Study design	1	(1%)
Published peer reviewed manuscript	1	(1%)

In addition, we screened 1,660 published protocols and registry entries), with 24 retained for full text review and 18 eligible for inclusion All 11 program evaluations identified in the search were excluded after full text review because they did not describe the DSD model in sufficient detail.

Table 3 presents the characteristics of the source documents included in the review. Individual reports are listed in Appendix 5. Of the 50 reports included in the review, roughly half (n=23) were slide or poster presentations and the rest were implementation reports, technical briefs, or case examples. As shown in Table3, the total of 50 reports described 101 DSD models. Most documents were cohort studies (26%) or nonanalytic, descriptive program data (24%) with no identifiable study design. Over half of the ongoing studies (n=18) were randomized controlled trials (56%).

Table 3. Characteristics of reports included in the review

Characteristic	Reports		Studies		Total	
Source documents	**N=32**		**N=18**		**N=50**	
Study or evaluation design						
Cohort	12	(38%)	1	(6%)	13	(26%)
Cross-sectional	4	(13%)	0	(0%)	4	(8%)
Mixed-methods	3	(9%)	7	(39%)	10	(20%)
Qualitative	1	(3%)	0	(0%)	1	(2%)
Randomized control trial	0	(0%)	10	(56%)	10	(20%)
Program data	12	(38%)	0	(0%)	12	(24%)
Models described	**N=75**		**N=26**		**N=101**	
Country*						
Côte D'Ivoire	2	(3%)	0	(0%)	2	(2%)
Ethiopia	1	(1%)	0	(0%)	1	(1%)
Kenya	7	(9%)	1	(4%)	8	(8%)
Lesotho	0	(0%)	4	(15%)	4	(4%)
Malawi	4	(5%)	0	(0%)	4	(4%)
Mozambique	3	(4%)	0	(0%)	3	(3%)
Namibia	1	(1%)	0	(0%)	1	(1%)
Nigeria	0	(0%)	1	(4%)	1	(1%)
South Africa	16	(21%)	7	(27%)	23	(23%)
Eswatini	9	(12%)	1	(4%)	10	(10%)
Tanzania	8	(11%)	0	(0%)	8	(8%)
Uganda	7	(9%)	1	(4%)	8	(8%)
Zambia	10	(13%)	8	(31%)	18	(18%)
Zimbabwe	7	(9%)	3	(12%)	10	(10%)
Category						
Facility based individual	18	(24%)	9	(35%)	27	(27%)
Out of facility based individual	20	(27%)	5	(19%)	25	(25%)
Healthcare worker led groups	21	(28%)	7	(27%)	28	(28%)
Client led groups	13	(17%)	5	(19%)	18	(18%)
Other DSD†	3	(4%)	0	(0%)	3	(3%)
Outcomes reported*						
Coverage	39	(52%)	0	(0%)	39	(39%)
Uptake	5	(7%)	5	(19%)	10	(10%)
Treatment outcome	23	(31%)	26	(100%)	49	(49%)
Cost	7	(9%)	13	(50%)	20	(20%)
Feasibility	8	(11%)	7	(27%)	15	(15%)
Acceptability	14	(19%)	16	(62%)	30	(30%)

*Some reports described more than one outcome or activities in more than one country.
†Three models reported unclear/unidentified model categories since they combined services from all four categories. These three models have been included in the individual model count (n=75). They were excluded from tables describing model characteristics and patient demographics.

Fourteen countries in sub-Saharan Africa were represented in the review (Figure 4). Individual country government domain searches did not result in any additional reports. South Africa and Zambia accounted for the largest shares of the DSD models included, 23% and 18% respectively. Three completed studies and ongoing trials were implemented in more than one country.

Facility based individual models (27%) and healthcare worker led groups (27%) were the most commonly reported DSD categories, while client led groups were the least common (18%). Three models described unclear/unidentifiable model categories since they appeared to combine services delivered across the four model categories. Authors reported them as: facility based models, mixed models,

community based models without describing whether these were group or individual models. These three models were included in the total model count (n=75) and outcomes tables (Tables 6-11), but they were excluded from the tables with model descriptions and patient demographics since they did not provide sufficient detail on these characteristics (Table 4).[9]

Many source documents contained more than one outcome and/or outcome metric; the most frequently reported outcomes were treatment outcomes (49%) and coverage (39%). Appendix 5 provides details on each outcome reported per model.

Figure 3. Countries that contributed outcome data reported in this review

Model characteristics

Characteristics of the patients and models described in the sources included in the review are presented in Table 3.

Table 2. Patient and model characteristics by model category, including ongoing studies

Characteristic	Facility based individual N=27		Out of facility individual N=25		HCW led group N=28		Client led group N=18		Total N=98	
Patient characteristics										
Patient type eligible										
All	6	(22%)	9	(36%)	9	(32%)	3	(17%)	27	(28%)
Stable	18	(67%)	16	(64%)	19	(68%)	13	(72%)	66	(67%)
Newly initiated	1	(4%)	0	(0%)	0	(0%)	0	(0%)	1	(1%)
Suspected failing or unsuppressed	2	(7%)	0	(0%)	0	(0%)	1	(6%)	3	(3%)
Not reported	0	(0%)	0	(0%)	0	(0%)	1	(6%)	1	(1%)
Population eligible										
Adolescents	4	(15%)	1	(4%)	7	(25%)	5	(28%)	17	(17%)
Children	1	(4%)	1	(4%)	1	(4%)	0	(0%)	3	(3%)
Children and adolescents	1	(4%)	0	(0%)	0	(0%)	0	(0%)	1	(1%)
Patients with comorbidities	0	(0%)	1	(4%)	0	(0%)	0	(0%)	1	(1%)
FSW and/or MSM	0	(0%)	2	(8%)	0	(0%)	1	(6%)	3	(3%)
General population	21	(78%)	20	(80%)	20	(71%)	12	(67%)	73	(74%)
Model characteristics										
Clinical care provider cadre										
Medical doctor	4	(15%)	2	(8%)	1	(4%)	2	(11%)	9	(9%)
Nurse	2	(7%)	0	(0%)	5	(18%)	0	(0%)	7	(7%)
CHW	1	(4%)	4	(16%)	2	(7%)	2	(11%)	9	(9%)
Non-specified clinician	3	(11%)	6	(24%)	7	(25%)	5	(28%)	21	(21%)
Unclear/not reported	17	(63%)	13	(52%)	13	(46%)	9	(50%)	52	(53%)
ART dispenser cadre										
Pharmacist	4	(15%)	1	(4%)	2	(7%)	0	(0%)	7	(7%)
Nurse	1	(4%)	4	(16%)	0	(0%)	0	(0%)	5	(5%)
CHW	0	(0%)	5	(20%)	3	(11%)	4	(22%)	12	(12%)
Designated patient	0	(0%)	1	(4%)	0	(0%)	7	(39%)	8	(8%)
Non-specified clinician	0	(0%)	1	(4%)	3	(11%)	0	(0%)	4	(4%)
Lay counselor	0	(0%)	0	(0%)	10	(36%)	1	(6%)	11	(11%)
Unclear/not reported	22	(81%)	13	(52%)	10	(36%)	6	(33%)	51	(52%)
Location of service delivery										
All clinic based	27	(100%)	0	(0%)	16	(57%)	2	(11%)	45	(46%)
Mixed clinic/community	0	(0%)	16	(64%)	10	(36%)	15	(83%)	41	(41%)
All community based	0	(0%)	9	(36%)	2	(7%)	1	(6%)	12	(12%)
Types of services										
C/A/L*	16	(59%)	12	(48%)	13	(46%)	11	(61%)	52	(53%)
C/A/L + follow-up	0	(0%)	0	(0%)	2	(7%)	0	(0%)	2	(2%)
C/A/L + health education	0	(0%)	1	(4%)	5	(18%)	0	(0%)	6	(6%)
C/A/L + reproductive health counseling	0	(0%)	0	(0%)	1	(4%)	0	(0%)	1	(1%)
C/A/L + TB care	1	(4%)	5	(20%)	1	(4%)	1	(6%)	8	(8%)
C/A/L + reproductive health counseling + TB care	0	(0%)	0	(0%)	1	(4%)	0	(0%)	1	(1%)
C/A/L + mental health	2	(7%)	0	(0%)	0	(0%)	0	(0%)	2	(2%)

Characteristic	Facility based individual N=27		Out of facility individual N=25		HCW led group N=28		Client led group N=18		Total N=98	
Not reported	8	(30%)	7	(28%)	5	(18%)	6	(33%)	26	(27%)
Frequency of interactions/year										
≤3	4	(15%)	2	(8%)	2	(7%)	1	(6%)	9	(9%)
46	1	(4%)	5	(20%)	7	(25%)	4	(22%)	17	(17%)
712	1	(4%)	1	(4%)	3	(11%)	3	(17%)	8	(8%)
≥12	2	(7%)	4	(16%)	4	(14%)	3	(17%)	13	(13%)
Not reported	19	(70%)	13	(52%)	12	(43%)	7	(39%)	51	(52%)

CHW, community health worker

*C/A/L= Clinical care, ARVs, and laboratory monitoring. All DSD models for ART were assumed to include these services.

As Table 3 makes clear, there were a great deal of data that were unclear or not reported in the reports. Very few described all the characteristics listed in the table, and for some characteristics a large majority were missing information (for example less than 50% reported the clinical care provider cadre). As a result, we know little about some of the key differentiators that define DSDs, such as the frequency of provider interactions per year (less than half (48%) reported this overall and only 30% reported this for facility based individual models) and the cadres providing clinical care and dispensing ARVs (missing 53% and 52% respectively). Types of services provided was also poorly specified in many of the source documents; while we assumed that all models provide ARV medications and guideline-specified laboratory tests, additional services, such as the facility-based adherence counseling that is common in conventional care, were often not indicated. Given the large gaps in data, few generalizations can be made about model categories. Below we briefly comment on characteristics that are either relatively common for the category or distinguish it from other categories.

Facility based individual models (FBIMs)

One third of all reported models were FBIMs (n=27), most commonly fast-track dispensing and multi-month prescribing. For those that indicated provider cadre, nearly all providers were trained clinicians, not lay providers. The specific cadre providing clinical care was not reported in more than half of the models (63%), however, and 81% of ART dispenser cadres were not reported. Unlike most models in other model categories, FBIMs were occasionally not limited to stable patients, with some accepting unsuppressed patients (n=2). Although all care was delivered at the facility, a few models offered differentiation in service types in addition to HIV clinical care, ART dispensing, and laboratory monitoring. For example, one model included TB care and two provided mental healthcare. Only 8 of 27 sources on FBIMs reported visit frequency; three of which still required 7 or more interactions between patients and the health system per year (Table 3).

Out of facility based individual models (OFBIMs)

OFBIMs, which include such approaches as decentralized medication pickup, home ART delivery, and mobile clinics, represented just under a quarter of the models reported (n=25). Nearly two thirds (64%) combined facility-based and community-based services, with the rest providing services only in the community. Missing data are problematic here as well, but of the 12 models where interaction frequency was reported, 5 required 7 or more interactions between patients and the health system per year (Table 3). A total of three of these OFBIM models were focused on key populations or patients with comorbid infections.[10–12]

Healthcare worker led groups (HCWLGs)

HCWLGs represented over a quarter of all models (n=28, 29%) and included adherence clubs and youth clubs, among others. They were most likely to be based in the health facility, but some provided services both in the community and at the facility (36%). ART dispensing was often provided by lay counselors (36%), who were often involved in peer psychosocial support and health education (

Interaction frequency was reported for 16 of the 28 HCWLGs; of these, nine (56%) required 6 or fewer interactions per year. Those which required more frequent interaction with the healthcare system were teen clubs, which involved monthly meetings, or adherence clubs with bimonthly club meetings in addition to clinical care visits.

Client led groups (CLGs)

CLGs, most of which were community adherence groups known as CAGs, were the least represented category (n=18, 18%) (Table 4). In these models, medications were often dispensed by a designated patient (39%) or community health worker (22%). For most of these models (83%) care was provided both at the facility and within the community and included the core service package of clinical care, ARVs and lab monitoring, with 1 also offering TB care (Table 3). Eleven of 18 CLGs reported visit frequency, with 6/11 (55%) requiring 7 or more interactions per year, reflecting the fact that most client led groups require monthly group meetings in addition to individual clinical visits.

Despite interaction frequency being one of the key characteristics of DSD models, among all the 98 models included in the review, less than (n=47) reported frequency of interactions. Of these, 26 (55%) required 6 or fewer interactions per year, and 21 (45%) required 7 or more. Only 9 of the 47 (19%) required 3 or fewer interactions per year, suggesting that reduction in patient interaction with the health system is not as common a characteristic of the DSD implemented between 2016 and 2019 as is often assumed.

Outcomes

Outcomes reported

The number of documents reporting each outcome, by model category, is shown Table 4, with further details in Appendix 6. The most commonly reported outcomes were those pertaining to treatment (viral suppression, retention) (49%), followed by coverage (39%) and acceptability (22%). Tables 6-9 report each of the outcomes. Each source document may report more than one outcome. Table 4 includes outcomes that will be reported in currently ongoing trials, while tables 6-9 include only existing outcomes from completed studies.

Each instance of model implementation (n=101) is coded with a unique ID consisting of the abbreviation of the model category (FBIM, OFBIM, CLG, or HCWLG) preceded by a source document identifying number. If the same source document reports more than one model in the same category, they are distinguished a lowercase suffix (e.g., 2FBIMa, 2FBIMb). IDs can be matched to specific sources in Appendix 5. The three models that could not be categorized were labeled 16OTMa, 16OTMb, and 16OTMc.

Table 3. Numbers of each type of outcome reported, by model category

Outcome, n (%)[a]	Facility based individual N=27		Out of facility individual N=25		HCW led group N=28		Client led group N=18		Other model[b] N=3		Total N=101	
Coverage	14	(52%)	8	(32%)	11	(39%)	6	(33%)	0	(0%)	39	(39%)
Uptake	2	(7%)	2	(8%)	2	(7%)	4	(22%)	0	(0%)	10	(10%)
Treatment	11	(41%)	12	(48%)	14	(50%)	10	(56%)	2	(67%)	49	(49%)
Adherence	1	(4%)	1	(4%)	3	(11%)	0	(0%)	0	(0%)	5	(5%)
Retention	9	(33%)	7	(28%)	11	(39%)	6	(33%)	2	(67%)	35	(35%)
Viral suppression	9	(33%)	5	(20%)	9	(32%)	3	(17%)	2	(67%)	28	(28%)
Cost	3	(11%)	5	(20%)	4	(14%)	5	(28%)	3	(100%)	5	(5%)
Feasibility	1	(4%)	0	(4%)	2	(4%)	3	(17%)	0	(0%)	3	(3%)
Acceptability	5	(19%)	4	(4%)	7	(0%)	7	(39%)	0	(0%)	22	(22%)

[a] >1 outcome may be reported per model.
[b] Three models could not be assigned to a model category since they appeared to combine services delivered across the four model categories. Authors reported them as: facility based models, mixed models, community based models without describing whether these were group or individual models. These three models have been included as part of individual model count (n=75) and the outcome tables.

Coverage

Coverage is reported in Table 6. Categories are mutually exclusive; each model appears in only one model category. Coverage proportions ranged from 10 to 98%. The populations included in denominators also varied widely, and each reported coverage rate should be considered in light of the population it represents.

> ***Coverage*** *is defined as the proportion of eligible patients enrolled in each model. Since very few documents reported coverage in this manner, though, we created two proxy coverage outcomes: a) proportion of eligible patients enrolled in any of the DSD models offered nationally; and b) proportion of facilities offering at least one DSD model nationally.*

Table 4. DSD model coverage

ID	Source	Country	Models	Numerator	Denominator	%
Metric: Proportion of facilities offering at least 1 DSD model				**HIV facilities offering ≥ 1 DSD model (n)**	**Total number of HIV facilities (n)**	**Coverage %**
10FBIMa, 10FBIMb, 10CLG	Couto 2018[13]	Mozambique	Community adherence support groups, three-month drug distribution, six-month clinical visit spacing	1,377	1,407	98%
2FBIMa, 2FBIMb, 2HCWLG, 2CLG, 2OFBIMa, 2OFBIMb, 2OFBIMc	Lumano-Mulenga 2019[14]	Zambia	Community adherence groups/clubs, fast track, multi-month scripting, urban/rural adherence groups, CCMDD external pickup point, health post model dispensation, home ART delivery	303	2,961	10%
4CLG, 4FBIMa, 4HCWLGa, 4OFBIM, 4FBIMb, 4HCWLGb	Apollo 2018[15]	Zimbabwe	Community ART refill group, fast track refill, family refill, facility club refill, Zvandiri model, outreach models	901	1,601	56%

ID	Source	Country	Models	Numerator	Denominator	%
31FBIMa, 31FBIMb, 31HCWLG, 31CLG	Kimani 2018[16]	Kenya	Community ART groups, fast track, six monthly appointments, facility ART groups	1,464	3,546	41%
Metric: Proportion of eligible patients enrolled in any DSD model				**Eligible patients enrolled in any of the DSDs offered nationally (n)**	**Total number of eligible patients (n)**	**Coverage %**
8FBIM, 8HCWLG	Bohoussou 2018[17]	Côte d'Ivoire	Fast track ART refill, facility adherence club	30,518	41,071	74%
30FBIM, 30HCWLG, 30OFBIM	Molapo 2018[18]	South Africa	Spaced and fast lane appointments, adherence clubs, central chronic medicine dispensing and distribution(community-based pickup points)	NA	NA	10%
23FBIM, 23HCWLGa, 23HCWLGb, 23HCWLGc, 23CLG, 23OFBIM	Kambale 2018[19]	Eswatini	Community-based ART groups, fast track, teen club, facility treatment clubs for adults, family centered model, outreach model	20,889	134,906	15.5%
Metric: Proportion of eligible patients enrolled in specific DSD models				**Eligible patients enrolled in a specific DSD model (%)**	**Total number of eligible patients (n)**	**Coverage %**
11OFBIM	Davey 2016[20]	South Africa	CCMDD external pickup point	49,881	122,163	41%
11HCWLG	Davey 2016[20]	South Africa	Adherence club	37,907	122,163	31%
11FBIM	Davey 2016[20]	South Africa	Facility fast track	34,375	122,163	28%
24FBIM	Kiggundu 2018[21]	Uganda	Fast track drug refill	88,832	171,932	52%
24OFBIM	Kiggundu 2018 [21]	Uganda	Community drug distribution points	31,000	171,932	18%
24HCWLG	Kiggundu 2018[21]	Uganda	Facility based group	22,947	171,932	13%
24CLG	Kiggundu 2018 [21]	Uganda	Community client led ART delivery	29,153	171,932	17%
1FBIM	Abebe 2018[22]	Ethiopia	Appointment spacing	148,117	~223,762ǂ	66%

ǂAuthors calculated coverage rates based on the given numerator and denominator

Uptake is poorly reported in the source documents (Table 7). Only 5 models in 4 countries (Uganda, Tanzania, Namibia, and Zambia) reported uptake as a proportion of clients enrolled among those offered enrolment. Among these models the proportion enrolled had a large range (16% to 95%). (Many reports indicated the absolute number of enrolled clients but did not indicate how many patients

Uptake refers to the proportion of patients enrolled in a DSD model of those who were offered enrolment (had the opportunity to enroll).

were offered enrollment; Appendix 6 shows absolute numbers enrolled.)

Table 5. DSD model uptake (% enrolled of those offered enrollment)

ID code	Source	Country	Model	% enrolled
50OFBIM	Zulu 2018[23]	Uganda	Community drug distribution	66%ǂ
29OFBIMb	MOH Tanzania 2017[11]	Tanzania	TB Tanzania program	95%
50CLGa	Zulu 2018[23]	Namibia	Community based ART	16%
50CLGb	Zulu 2018[23]	Zambia	Community based ART	18%
35CLG	Mwamba 2018[24]	Zambia	Community adherence groups	33%§

ǂApproximate proportion as stated by the authors
§ Author calculated

Treatment outcomes

In Table 8, we report treatment outcomes including viral suppression, retention, and adherence. Among 30 models with treatment outcomes reported, only 8 offered standard of care comparisons that allow determination of whether outcomes in DSD models differed from those in SOC. Among these 8, viral suppression was nearly identical between SOC and DSD models; suppression rates ranged from 74 to 80%,

> ***Treatment outcomes*** *include viral load suppression adherence, retention, and TB treatment success. We used source documents' thresholds for viral suppression where reported; if no threshold was reported, we assumed that viral suppression indicated a viral load <1000 copies, as this was the level used in most national guidelines between 2016 and 2018. Adherence and retention were reported as defined by the source documents.*

somewhat below the target of 90% for patients who were considered stable on ART at model entry. Retention in care was higher (at or above 90%) in the two group DSD models with a comparator reported (community-based adherence groups in Zambia and adherence clubs in South Africa) but lower in the one individual DSD model (DMD in South Africa) with SOC information. Two studies reported adherence as an outcome, although neither defined how adherence was measured. In South Africa, the DMD program showed an 8-29% improvement in adherence and in Malawi teen clubs led to a 4% improvement.

Models with no comparison reported viral suppression between 68 and 100%. Retention ranged from 77-100%, with no clear pattern by model category; 8/15 models (53%) reported retention exceeding 90%.

Table 6. Treatment outcomes

ID code	Source	Country	Model(s)	N	% achieving specified outcome		Outcome detail
Models with standard of care comparators reported					*DSD*	*SOC*	
VL<1000							
19OFBIM	HE²RO and BU 2018[25]	South[a] Africa	Decentralized medication delivery (DMD)	576	77.2%[1]	74.3%	Suppression at 12 months
7HCWLG	BIPAI 2016[26]	Malawi	Teen club	800	77%	77%	Unreported time period
19HCWLG	HE²RO and BU 2018[25]	South[a] Africa	Adherence club	576	80%[2]	79.6%	Suppression at 12 months

18

ID code	Source	Country	Model(s)	N	% achieving specified outcome		Outcome detail
Retention in care							
19OFBIM	HE[2]RO and BU 2018[25]	South Africa	Decentralized medication delivery (DMD)	576	81.5[3]%	87.2%	Retention at 12 months
19HCWLG	HE[2]RO and BU 2018[25]	South Africa	Adherence club	576	89.5[4]%	81.6%	Retention at 12 months
40CLG	PEPFAR 2018[27]	Zambia	Community-based adherence groups	4,876	97%	76%	Unreported time period
Adherence							
7HCWLG	BIPAI 2016[26]	Malawi	Teen club	800	81%	77%	Unknown time period
41OFBIM	Roberts 2018[28]‡	South Africa	Central chronic medicine dispensing and distribution at pickup points		90-99%	70-82%	Unreported time period, reported as a range
Models without comparators reported							
VL<1000							
25FBIM	Kimayio 2017[29]	Kenya[a]	Failed second line differentiated care	23	100%		Unreported time period
38FBIM	Pahad 2019[30]	South Africa	iACT support groups for newly initiated patients	4,569	45%		% improved likelihood of viral suppression at 12 months
43OFBIM	Ssuuna 2018[31]	Uganda	Community pharmacy program	8,820	99%		Suppression at 12 months
34HCWLG	MSH 2018[32]	Malawi	Teen club	1,646	83%		Suppression at 6 months
44CLG	TASO 2017[33]	Uganda and Kenya	Community client led ART delivery	215	90.9%		Suppression at 9 months
16OTMa	Forsythe 2019[9]	Tanzania	Facility-based service model	25,115	68%		Unreported time period
16OTMb	Forsythe 2019[9]	Tanzania	Community and facility service model	25,115	77.9%		Unreported time period
Retention in care							
43OFBIM	Ssuuna 2018[31]	Uganda	Community pharmacy program	8,820	98%		Retention at 12 months
51OFBIM	Zulu 2018[23]	Uganda	Community drug distribution		98%		Unreported time period
29OFBIMa	MOH Tanzania 2017[11]	Tanzania	Pick n Go Program	567	83%		Unreported time period
39OFBIM	Pasipamire 2016[34]	Eswatini	Outreach care		77%		Retention at 12 months

ID code	Source	Country	Model(s)	N	% achieving specified outcome	Outcome detail
38FBIM	Pahad 2019[30]	South Africa	iACT support groups for newly initiated patients	4,569	76%	% improved likelihood of retention at 12 months
29HCWLGb	MOH Tanzania 2017[11]	Tanzania	Partnership for free survival program		95%	Unreported time period
34HCWLG	MSH 2018[32]	Malawi	Teen club	1,646	97%[§]	Retention at 12 months
6HCWLG	Berrada 2019[35]	South Africa	Adherence club	171,374	92%	Retention at 26 months
39HCWLG	Pasipamire 2016[34]	Eswatini	Facility-based treatment club		96%	Retention at 12 months
32HCWLG	MSF 2016[36]	South Africa	Youth clubs	337	82%	Retention at 12 months
51CLGa	Zulu 2018[23]	Namibia	Community-based ART	9,271	86-100%	Unreported time period, reported as a range
39CLG	Pasipamire 2016[34]	Eswatini	Outreach model		81%	Retention at 12 months
51CLGb	Zulu 2018[23]	Zambia	Community-based ART	5,980	100%	Unreported time period
16OTMa	Forsythe 2019[9]	Tanzania	Facility-based service model	25,115	97.1%	Retention at 12 months
16OTMb	Forsythe 2019[9]	Tanzania	Community and facility service model	25,115	96.6%	Retention at 12 months

a. Suppression defined by authors as <1000 copies/mL

ɫ. Unclear in the source document whether the estimate includes adherence among patients who receive ART through CCMDD only at ART pickup points or patients receiving ART through CCMDD on other models as well e.g. adherence clubs and spaced and fastlane appointments

1. Difference in differences (covariate adjusted and cluster adjusted): 1.0% (12.2% to 10.1%)

2. Difference in differences (covariate adjusted and cluster adjusted): 3.8% (6.9% to 14.4%)

3. Difference in differences (covariate adjusted and cluster adjusted): 5.9% (12.5% to 0.8%)

4. Difference in differences (covariate adjusted and cluster adjusted): 8.3% (1.1% to 15.6%)

Cost

Two sources reported costs of DSD models to providers. Both sources estimated costs from guidelines, rather than patient records. In Tanzania, the cost of provider interactions was substantially lower than SOC when shifted wholly or partly to the community—from $108/patient/year to $45 or $20/patient year, respectively—but this excluded the cost of ARV medications and laboratory tests.[9] In Malawi, the incremental costs of teen clubs, on top of existing ART costs, were $30/patient year.[26]

Cost was defined as any estimate of provider or patient resource utilization to receive or provide care, both direct and indirect.

Three sources reported patient costs, for four DSD models, as shown in Table 9. Community based ART pick-up points in South Africa greatly reduced patient travel costs/year; other results were reported without a standard of care comparison.

Table 9. Patient cost of receiving HIV care through DSD models

ID code	Source	Country	Model	Travel cost (USD)	Time or distance
Out of facility based individual models					
17OFBIM	HE²RO and BU 2018[37]	South Africa	Centralized chronic medicines dispensing and distribution	$1.07/visit	12.9% patients >1 hour travel time to pick-up point
41OFBIM	Roberts 2018[28]	South Africa	Community based ART pickup points	83% reduction in travel cost/year*	
43OFBIM	Ssuuna 2018[31]	Uganda	Community pharmacies**		9.0 wait hrs/year
Healthcare worker led groups					
17HCWLG	HE²RO and BU 2018[37]	South Africa	Adherence club	$0.80/visit	20% of patients > 1 hour travel time from AC meeting point

*Unclear in the source document whether the estimate includes cost for patients who receive ART through CCMDD only at ART pickup points or patients receiving ART through CCMDD on other models as well e.g. adherence clubs and spaced and fast-lane appointments

** Assumed minimum frequency to annualize

Further information on DSD model costs to providers and patients is provided in separate reports.[38,39]

Acceptability and feasibility

> **Acceptability** included facilitators and barriers to implementation by providers and participation by patients. **Feasibility** captured indicators of routine implementation successes and failures, such as drug stock-outs, supply chain bottlenecks, impact on clinic congestion, and medicine wastage due to expiry.

We organized acceptability and feasibility by facilitators, successes, barriers, and failures to DSD model implementation (Table 7). Facility based individual models were generally viewed positively by both patients and providers, with concerns expressed by providers about potential pitfalls that had not yet been experienced, such as the selling of ARVs. Out of facility based individual models were valued for saving patients travel time and costs; providers noted the challenge of data collection in these models. Patients and providers also generally liked healthcare worker led groups, emphasizing the decongestion of the clinic and reduced waiting times associated with these models. Client led groups seemed to be less well received, with patients noting a number of drawbacks and few benefits.

Table 7. Acceptability and feasibility of DSD models

Model category	Facilitators to and benefits of implementation	Barriers and drawbacks to implementation	Sources
Facility based individual models	• No reports of unwanted HIV disclosure • ARVs are easily and safely stored at home • No reports of ARV trade or misuse • Reduced patient travel cost due to decreased visit frequency • Improved freedom for employment and family travel • No reports of ARV shortages or expiration • Time savings for both clinic staff and clients within the clinic and for clients between visits.	• Patients report some stigma while carrying large ARV supply • Providers are concerned about ARV sharing which makes pill count difficult • Providers are concerned about delayed care-seeking for other conditions • Stock-outs of ARVs and supply chain inconsistencies	20FBIM 29FBIM

Model category	Facilitators to and benefits of implementation	Barriers and drawbacks to implementation	Sources
Out of facility based individual models	• Reduced patient travel cost • Facility decongestion and better care for sicker patients	• Providers are concerned about additional burden due to data collection responsibilities • Providers point out frequent drug stock-outs and supply chain problems • Patients lack clarity with regards to how models work	17OFBIM 18OFBIM
Healthcare worker led groups	• Better linkage to care and tracking of LTFU • More opportunities for task-sharing between clinic staff, resulting in less wait time for patients to see clinicians • Facility decongestion and improved social support for patients to cope with treatment challenges • Models that allow for family members to pick up ARVs on behalf of the patients are especially convenient • Reduced transport cost for patients • Reduced sense of stigma	• Patients lack clarity with regards to how models work • Patients report challenges to ART supply to the adherence clubs • Inadequate medical recordkeeping • Providers are concerned about the increased burden on staff • Providers are concerned about incorrect patient differentiation	29HCWLGa 6HCWLG 17HCWLG 18HCWLG
Client led groups		• Patients prefer meeting with the health provider one-to-one to protect confidentiality • Providers express concern about the disorganization of medical records • Some patients are dissatisfied with the efficiency of drug pickups • Providers are concerned about the lack of sufficient resources to perform what is expected from them for DSD	45CLG 35CLG

IV. DISCUSSION

This report of unpublished, non-peer-reviewed sources of information about differentiated service delivery (DSD) models for HIV treatment in Africa is intended to complement a parallel systematic review of published sources of evidence. As might be expected, unpublished sources vary even more widely than do published ones in quality of data, depth and breadth of analysis, and thoughtfulness of interpretation. Most had no peer review, and few offered comparisons of DSD model outcomes with those of standard of care. Since many were produced by DSD implementers, moreover, objectivity cannot be taken for granted. Most implementers want their interventions to work, and less is presented or posted about those that do not work than those that do. For these reasons, we regard the models described in this report as examples of DSD models being implemented in various settings, rather than as representative of what is happening at health system level.

Despite these many provisos, the diversity of models and outcomes reported here help illustrate the universe of differentiated service delivery between 2016 and 2019. Many evaluations of service delivery will never be published formally, making unpublished sources the only available sources of information. Because of the time required for an article to be published, unpublished sources may also contain more recent evidence. Our goal with both reviews was to gather what information exists, both to inform current debates and to identify the most pressing gaps in the evidence base. This review of unpublished sources can help achieve both objectives.

Because of the tremendous heterogeneity of the documents included in this review, we have not attempted to draw general conclusions or estimate summary statistics for any of our outcomes. There were few if any apparent trends in outcomes; where a comparator was provided, most categories of DSD models generated outcomes that were only slightly better or slightly worse than standard of care. The models described here, however, have a few other common characteristics.

- First, the most commonly offered DSD models in the gray literature were facility based individual models (33%). Even among healthcare worker led groups, most care is provided at the facility (36%), and where the clinical care provider is identified, it is most frequently a non-specified clinician rather than a community health worker or other lay cadre, for all the models described. This is not surprising, as facility-based service delivery by a trained clinician is what both providers and patients are familiar with, and it likely requires less startup investment, in terms of training and deployment of personnel and access to infrastructure, than the other categories do. At the same time, it suggests that implementers have focused more on the health system efficiency gains of DSD models through streamlining services at the facility than on decentralizing services into the community. Moreover, previous studies have shown that patients are often apprehensive of the idea of bringing care closer to their place of residence, mainly due to fears of stigmatization or accidental disclosure of HIV status.[40,41]

- Second, few DSD models go beyond basic ART delivery in their service package. Like standard of care, they dispense medications, perform laboratory tests, and typically offer some form of adherence counseling and referral for conditions requiring clinical investigation. Only a handful integrate other services, such as TB or NCD management or reproductive health. To the extent that DSD models are seen as a way to make HIV treatment delivery more efficient, limiting the service package to ART seems reasonable, but it also perpetuates the vertical, disease-specific approach of HIV clinics which may make health access for patients with multiple comorbid conditions less efficient. This review thus provides further support for Grimsrud and colleagues' recommendation that research on integration of care for comorbidities and coinfections be a main DSD research priority moving forward.[7]

- Third, two thirds of all the models in the review enrolled only stable adult patients from the general population. This population was the original target of DSD models and continues to be the focus of DSD implementation. Since stable adults make up a large majority of ART patients in most settings, the net benefits of DSD models can be maximized by serving stable adults. On the other hand, these patients have, by definition, already achieved success on ART under standard of care. It may be that patients who do not fulfil criteria for stability or are members of high-risk populations are in greater need of alternative delivery models, as they face greater obstacles to remaining in care. We did identify a few small-scale implementation efforts focused on MSM and FSW, a handful aimed at children and adolescents, and one or two designed for patients with or at risk of advanced disease. None provided enough information to compare their outcomes to standard of care, however.

- Fourth, there is no consistency in monitoring of or reporting on DSD model implementation. In this review, the vast range of indicators and metrics being applied to DSD evaluation thwarted efforts to generalize from individual reports. This is particularly true for coverage and uptake, where there are no accepted definitions to standardize numerators and denominators or place reported values in context. Existing ART monitoring and evaluation systems are not yet equipped to measure the availability, utilization, or performance of DSD models,[42] and the number of implementing partners involved in most countries makes it difficult to know the real number of sites offering any DSD

model, the kinds of models offered at each site, or the numbers of patients participating. DSD coverage is inconsistently reported and indicators vary between granular (proportion of eligible patients on a specific DSD model at a specific site)[21] and broad (proportion of facilities providing at least one DSD model).[13]

- Fifth, as mentioned above very few studies provided comparative data, making it impossible to gauge the net impact of the DSD models on program outcomes. As other components of HIV programs, such as viral load testing and drug regimens, are strengthened over time, some secular improvement in outcomes like retention in care should be expected, independent of service delivery model. Conversely, the continued expansion of treatment programs in response to universal treatment policies and the 90-90-90 targets could cause patient outcomes to deteriorate, as higher volumes of riskier and less accessible patients are enrolled. DSD models could offset this trend, but without comparative data, it is not possible to say.

- Sixth, despite a widespread conviction that DSD models utilize provider resources more efficiently,[43,44] we found little information on costs of providing ART under differentiated models, and none to support the expectation that substantial cost savings to providers will ensue. Further information from our reviews about both provider and patient costs of DSD models is available in separate reports.[38,39]

- Seventh, although cost savings to providers are not convincingly documented, cost savings to patients are incurred fairly consistently.

- Finally, the gray literature points to some issues around the acceptability, barriers, and facilitators of DSD models that have not been extensively reported in the published literature. Patients were generally pleased with the greater convenience of DSD models, and most patient concerns pertained to the models not working better. Providers, in contrast, expressed a number of largely logistical concerns about the supply chain, division of labor, process of patient differentiation, and management of nontraditional service delivery. Concerns were expressed by both patients and providers about lack of clarity on how DSD models work and disorganization of patient record management at the facility level. Most of these concerns result from challenges with implementation of the DSD models, rather than the basic design of the models themselves, and some may reflect the newness of the DSD enterprise. Future evaluations may find that many of the growing pains have been resolved.

A range of limitations of the documents we reviewed and the data reported in them have been discussed at length above, and are not unexpected from unpublished sources. Beyond the publication bias inherent in systematic reviews, however, we also experienced a number of challenges in conducting the gray literature search. We developed our search string based on the language most frequently used to describe DSD models by consulting the published literature, subject matter experts, and a medical librarian, but there is a chance that we missed some relevant documents due to Google's automatic filtering feature. The original search and screening for eligibility of sources was conducted only by a single reviewer (SK). Due to the transient nature of the documents published on the internet, a lack of archiving, and the changing nature of website domains, documents included may disappear over time.[45] Most importantly, a majority of the documents identified in the original search contained inadequate descriptions of DSD models, no DSD-relevant implementation data, and no denominators, no comparators, and no effect size.[45] Most of these sources were excluded from the review, as they did not offer anything that we could work with and did not meeting the inclusion criteria listed in Table 1.

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VII. APPENDICES

Appendix 1. List of clinical trial and program evaluation databases reviewed

Site	URL
Trial databases	
National Institutes of Health's database of clinical trials for numerous medical conditions, including HIV disease.	https://clinicaltrials.gov/ct2/home
EU Clinical Trials Register	https://www.clinicaltrialsregister.eu/ctrsearch/search?query=HIV
Pan-african Clinical Trials Registry	https://pactr.samrc.ac.za/
WHO International Clinical Trials platform	http://apps.who.int/trialsearch/Default.aspx
A UK organization listing randomized controlled trials.	http://www.isrctn.com/search?q=
Study evaluation databases	
International Initiative for Impact Evaluation: Find Evidence	http://www.3ieimpact.org/evidencehub/impactevaluationrepository
Abdul Latif Jameel Poverty Action Lab: Evaluations	https://www.povertyactionlab.org/evaluations
Innovations for Poverty Action (IPA): Search Projects	https://www.povertyaction.org/searchstudies?field_status_value=All&title=hiv
University of California Center for Effective Global Action (CEGA): Research Projects	http://cega.berkeley.edu/evidence/
Asian Development Bank: Independent Evaluation's Evaluation Resources	https://www.adb.org/site/evaluation/ongoingevaluations
OECD Development Assistance Committee: Evaluation Resource Center (DEReC)	http://www.oecd.org/derec/home/?hf=5&b=0&s=score
USAID: Development Experience Clearinghouse	https://dec.usaid.gov/dec/search/SearchResults.aspx?q=ZG9jdW1lbnRzLndlYl9jb2xsZWN0aW9uOigiRk9SV0FSRCBldmFsdWF0aW9uIik=&ctID=ODVhZjk4NWQtM2YyMi00YjRmLTkxNjktZTcxMjM2NDBmY2Uy&svODVhZjk4NWQtM2YyMi00YjRmLTkxNjktZTcxMjM2NDBmY2UyIXZpZXdZdJRF83MTk3Zjk4My04MmRlLT
World Bank: Independent Evaluation Group's "Impact Evaluations"	https://ieg.worldbankgroup.org/iegsearch?field_report_type_tags_1=287&search_api_fulltext=hiv&field_topic=All&field_report_type_tags%5B%5D=15629616&type_1%5B%5D=evaluation&type_1%5B%5D=reports&content_type_1=evaluationreports&field_sub_category=All&field_organization_tags=All&type_2_op=or&type_2%5B%5D=evaluation&type_2%5B%5D=reports&sort_by=search_api_relevance&sort_order=DESC
PEPFAR Evaluations	https://data.pepfar.gov/evaluations
Global Fund Evaluations Data Sets, Grant Agreement Progress Updates	https://dataservice.theglobalfund.org/downloads

Appendix 2. Google search strings and the terms used to develop them

Category	Terms	Search Strings
Facility based individual models	Fast track refill Facility fast track Fast lane Streamlined care Partner collection Decentralized care Pharmacy refill Six-month appointment Multi-month prescriptions (MMS)	HIV AND (fast track OR fast lane OR streamline OR partner collection OR decentralize OR pharmacy refill OR six-month appointment OR multi-month prescription OR MMS OR medicine distribution OR community distribution OR mobile ART OR CCMD)
Out of facility based individual models	Central Chronic Medicine Dispensing and Distribution(CCMD) Community ART distribution Mobile ART	
Client led groups	Community adherence groups (CAGs) Community ART groups Community client led ART delivery (CCLADs) Family member refill	HIV AND (adherence groups OR ART groups OR community ART delivery OR family refill OR CAG OR CCLAD OR teen clubs OR youth clubs OR family clubs OR rollout clubs OR adherence clubs)
Health care worker led groups	Teen clubs Youth clubs Family clubs Rollout clubs Adherence clubs	
Other, generic	Model(s) of care Decentralized care Integrated cate Client-centered Task-shifting Differentiated care Differentiated service delivery Differentiated model(s) of care Differentiated model(s)	HIV AND (model OR integrate OR decentralize OR client-centered OR task-shifting OR differentiate OR care)

Appendix 3: Country-specific search terms

Country	Types of models	Terms
South Africa	Fast Track Initiation Counselling (FTIC) Enhanced Adherence Counselling (EAC) Adherence Club (AC) Decentralised medication delivery (DMD) Central Chronic Medicine Dispensing and Distribution (CCMMDD) Spaced and fast lane appointment systems (SFLA) Tracing and Retention in Care (TRIC) Child and Adolescent Disclosure Counselling (CADC)	HIV AND (Fast track initiation OR Enhanced Counselling OR Adherence Club OR Decentralized OR Spaced OR fast lane OR Tracing and Retention OR Child Counselling OR FTIC OR EAC OR AC OR DMD OR CCMMDD OR SFLA OR TRIC OR CADC)
Malawi	Fast track refill (FTR)/ Facility Fast Track (FFF) Community Adherence Groups (CAG) Multi-month Scripting (MMS) Six-monthly appointment program	HIV AND (Fast track refill OR Facility fast track OR Community Adherence group OR Multi-month scripting OR Six-monthly appointment program OR FTR OR FFF OR CAG OR MMS)
Zambia	Community Adherence Groups (CAGs) Urban Adherence Groups (UAGs) Fast Track (FT) Streamlined ART Initiation (START) Mobile ART Delivery Program Central Chronic Medicine Dispensing and Distribution (CCMDD)	HIV AND (Community Adherence Groups OR Urban Adherence Groups OR Fast track OR Fast-track OR Central Chronic Medicine Dispensing and Distribution OR Streamline ART Initiation OR Mobile ART OR CAG OR UAG OR FT OR START OR CCMDD)

Appendix 4: Fields extracted from reports and trials

Category	Data extracted
Document identifiers	URL/ Trial registration number Implementing organization or Sponsor/implementer Author(s)/PI Document title Publication type (poster presentation, report, trial) Publication date (if applicable) Publication country/setting
Study design	Design (cross-sectional, longitudinal, trial, etc.) Data collection year Projected study end date (if applicable)
Population and participants	Age group (adults, adolescents, children) Risk group (general population, people who inject drugs, men who have sex with men, transgender people, sex workers, health care workers) Total cohort size or estimated enrolment Patient type (stable, failing, both) Duration of follow up (months)
Intervention	Location of service delivery Frequency of interaction Health care provider cadres ART regimen/line Types of services provided
Outcomes	Sector Uptake (value, unit, detail) Cost (value, unit, detail) Treatment Outcome (Outcome type, detail/definition, value, unit, effect size, confidence Interval) Acceptability Feasibility Additional outcomes reported

Appendix 5: Models included in the review

Model	Model Name	Country(s)	Dates observed	Cohort size/estimated enrolment	Patients eligible (population, condition)	Age	Freq. *	Location	Clinical provider	ARV dispenser	Types of services	Outcomes
1FBIM[22]	Appointment spacing	Ethiopia	2018	~223,762 patients	General, stable	Adults	2	All at the facility			C/A/L	Coverage
2FBIM1[14]	Fast-track	Zambia	2018	2,961 HIV facilities	General, stable	Adults		All at the facility				Coverage
2FBIMb[14]	Multi-month scripting	Zambia	2018	2,961 HIV facilities	General, stable	Adults		All at the facility				Coverage
2HCWLG[14]	Urban/rural adherence groups	Zambia	2018	2,961 HIV facilities	General, stable	Adults		Mixed				Coverage
2CLG[14]	Community adherence groups/clubs	Zambia	2018	2,961 HIV facilities	General, stable	Adults		Mixed				Coverage
2OFBIMa[14]	CCMDD external pickup point	Zambia	2018	2,961 HIV facilities	General, stable	Adults		Mixed				Coverage
2OFBIMb[14]	Health post model	Zambia	2018	2,961 HIV facilities	General, stable	Adults		Mixed				Coverage
2OFBIMc[14]	Home ART delivery	Zambia	2018	2,961 HIV facilities	General, stable	Adults		All in the community				Coverage
3FBIM[46]	community adolescent treatment supporters	Zimbabwe		840 patients	General, all	Adolescents	24	All at the facility			C/A/L + mental health	Treatment outcome, acceptability
4CLG[15]	Community ART refill group	Zimbabwe	2018	1,601 health facilities	General, stable	Adults		Mixed				Coverage
4FBIMa[15]	Fast track refill	Zimbabwe	2018	1,601 health facilities	General, stable	Adults		All at the facility				Coverage
4HCWLGa[15]	Facility club refill	Zimbabwe	2018	1,601 health facilities	General, stable	Adults		All at the facility				Coverage
4OFBIM[15]	Outreach models	Zimbabwe	2018	1,601 health facilities	General, all	All		All in the community				Coverage
4FBIMb[15]	Family refill	Zimbabwe	2018	1,601 health facilities	General, stable	Adults		All at the facility			C/A/L	Coverage
4HCWLGb[15]	Zvandiri model	Zimbabwe	2018	1,601 health facilities	General, all	All		All at the facility			C/A/L + follow-up	Coverage
5OFBIMa[47]	Home ART initiation and mobile van care	South Africa and Uganda		1,200 patients	General, all	Adults		All in the community	CHW	CHW		Treatment outcome, acceptability
5OFBIMb[47]	Clinical ART initiation and mobile van care	South Africa and Uganda		1,200 patients	General, all	Adults		Mixed	CHW	CHW		Treatment outcome, acceptability
6HCWLG[35]	Adherence club	South Africa	2018	171,374 ART clients decanted to DSD	General, stable	Adults		All at the facility		Lay counselor	C/A/L	Treatment outcome
7HCWLG[26]	Teen club	Malawi	2016	800 ALHIV enrolled in DSD	General, all	Adolescents	12	All at the facility		Lay counselor	C/A/L + health educ. + reproduct. counseling +	Treatment outcome, cost

Model	Model Name	Country(s)	Dates observed	Cohort size/estimated enrolment	Patients eligible (population, condition)	Age	Freq. *	Location	Clinical provider	ARV dispenser	Types of services	Outcomes
											TB care	
8FBIM[17]	Fast track ART refill	Côte D'Ivoire	2018	41,071 patients eligible for DSD	General, stable	Adults		All at the facility			C/A/L	Coverage
8HCWLG[17]	Facility adherence club	Côte D'Ivoire	2018	41,071 patients eligible for DSD	General, stable	Adults		All at the facility	Non-specified clinician	Non-specified clinician	C/A/L	Coverage
9FBIMa[48]	Facility–fast track	Zambia		3,600	General, all	Adults, adolescents and children		All at the facility	CHW	Pharmacist	C/A/L	Uptake, treatment outcome, cost, acceptability
9FBIMb[48]	START	Zambia		3,600	General, all	Adults, adolescents and children		All at the facility	Non-specified clinician		C/A/L	Uptake, treatment outcome, cost, acceptability
9CLG[48]	Community adherence group	Zambia		3,600	General, all	Adults, adolescents and children	13	Mixed	CHW	Designated patient	C/A/L	Uptake, treatment outcome, cost, acceptability
9HCWLG[48]	Urban adherence group	Zambia		3,600	General, all	Adults, adolescents and children	4	Mixed	CHW	Pharmacist	C/A/L	Uptake, treatment outcome, cost, acceptability
10FBIMa[13]	Three–month drug distribution	Mozambique	2018	1,407 facilities offering at least one DSD	General, stable	Adults		All at the facility				Coverage
10FBIMb[13]	Six–month clinical visit spacing	Mozambique	2018	1,407 facilities offering at least one DSD	General, stable	Adults		All at the facility				Coverage
10CLG[13]	Community adherence support groups	Mozambique	2018	1,407 facilities offering at least one DSD	General, stable	Adults		Mixed				Coverage
11FBIM[20]	Facility fast track	South Africa	2017	122,163 patients eligible for DSD	General, stable	Adults		All at the facility			C/A/L	Coverage
11HCWLG[20]	Adherence club	South Africa	2017	122,163 patients eligible for DSD	General, stable	Adults		Mixed			C/A/L	Coverage
11OFBIM[20]	CCMDD external pickup point	South Africa	2017	122,163 patients eligible for DSD	General, stable	Adults		Mixed			C/A/L	Coverage
12FBIM[49]	Family–based ART care	Eswatini		660 patients	Children, any	Children		All at the facility				Treatment outcome, acceptability
13CLGa[50]	Three month ART supply at CAGs	Lesotho		5,760 patients	General, stable	Adults	4	Mixed	Non-specified clinician			Treatment outcome, acceptability
13CLGb[50]	Six month ART supply at outreach	Lesotho		5,760 patients	General, stable	Adults	2	Mixed	Non-specified clinician	CHW		Treatment outcome, acceptability

Model	Model Name	Country(s)	Dates observed	Cohort size/estimated enrolment	Patients eligible (population, condition)	Age	Freq. *	Location	Clinical provider	ARV dispenser	Types of services	Outcomes
	sites (distribution points)											
14FBIMa[51]	3month ART dispensing	Zambia and Malawi		8,200 patients	General, stable	Adults	3	All at the facility			C/A/L	Treatment outcome, cost
14FBIMb[51]	6month ART dispensing	Zambia and Malawi		8,200 patients	General, stable	Adults	6	All at the facility			C/A/L	Treatment outcome, cost
15FBIM[52]	Transitional care for ALHIV from pediatric to adult care	Nigeria		216 patients	Adolescents, all	Adolescents		All at the facility	Doctor		C/A/L	Treatment outcome, acceptability
16OTMa[9]	Facility-based service model	Tanzania	2017	25,115 patients reached by DSD	General, all	Adolescents		All at the facility			C/A/L + follow-up	Uptake, cost, treatment outcome
16 OTMb[9]	Community and facility service model	Tanzania	2017	25,115 patients reached by DSD	General, all	Adolescents		Mixed			C/A/L + follow-up	Uptake, cost, treatment outcome
16OTMc[9]	Community service model	Tanzania	2017	25,115 patients reached by DSD	General, all	Adolescents		All at the community			C/A/L + follow-up	Uptake, cost, treatment outcome
17OFBIM[37]	Decentralized Medication Delivery (DMD)	South Africa	2017	146 patients (both DMD and AC)	General, stable	Adults		Mixed			C/A/L	Cost, acceptability
17HCWLG[37]	Adherence club	South Africa	2017	146 patients (both DMD and AC)	General, stable	Adults	7	Mixed	Non-specified clinician	Lay counselor	C/A/L	Cost, acceptability
18OFBIM[53]	Decentralized Medication Delivery (DMD)	South Africa	2017	48 providers	General, stable	Adults		Mixed			C/A/L	Acceptability
18HCWLG[53]	Adherence club	South Africa	2017	48 providers	General, stable	Adults	7	Mixed	Non-specified clinician	Lay counselor	C/A/L	Acceptability
19HCWLG[25]	Adherence club	South Africa	2017	1,152 patients (DMD and AC)	General, stable	Adults	7	Mixed	Non-specified clinician	Lay counselor	C/A/L	Treatment outcome
19OFBIM[25]	Decentralized Medication Delivery (DMD)	South Africa	2017	1,152 patients (DMD and AC)	General, stable	Adults		Mixed	Non-specified clinician		C/A/L	Treatment outcome
20FBIM[54]	Multi-month prescription	Malawi	2018	97 (35 providers and 62 patients)	General, stable	Adults		All at the facility	Doctor	Nurse	C/A/L	Acceptability
21HCWLG[55]	Community adherence clubs	Zambia		3,120 patients	General, stable	Adults	6	Mixed	CHW	CHW	C/A/L	Treatment outcome
21OFBIM[55]	Homebased ART delivery	Zambia		3,120 patients	General, stable	Adults	6	All at the community	CHW	CHW	C/A/L	Treatment outcome
22OFBIM[56]	Miner-friendly model	Lesotho		641 patients	Adolescents, all	Adults, adolescents and children		All at the community			C/A/L+TB care	Treatment outcome
23FBIM[19]	Fast track	Eswatini	2018	134,906 patients eligible for DSD	General, stable	Adults		All at the facility				Coverage

Model	Model Name	Country(s)	Dates observed	Cohort size/estimated enrolment	Patients eligible (population, condition)	Age	Freq. *	Location	Clinical provider	ARV dispenser	Types of services	Outcomes
23HCWLGa[19]	Teen club	Eswatini	2018	134,906 patients eligible for DSD	General, any	Adults, adolescents and children		All at the facility				Coverage
23HCWLGb[19]	Facility treatment clubs for adults	Eswatini	2018	134,906 patients eligible for DSD	General, stable	Adults		All at the facility				Coverage
23HCWLGc[19]	Family centered model	Eswatini	2018	134,906 patients eligible for DSD	General, stable	Adults		All at the facility				Coverage
23CLG[19]	Community-based ART groups	Eswatini	2018	134,906 patients eligible for DSD	General, stable	Adults		Mixed				Coverage
23OFBIM[19]	Outreach models	Eswatini	2018	134,906 patients eligible for DSD	General, stable	Adults		All at the community				Coverage
24HCWLG[21]	Facility based group	Uganda	2018	171,932 patients enrolled in any DSD	General, all	All	12	All at the facility	Nurse		C/A/L+TB care	Coverage
24FBIM[21]	Fast track drug refill	Uganda	2018	171,932 patients enrolled in any DSD	General, stable	Adults		All at the facility	Non-specified clinician		C/A/L+TB care	Coverage
24CLG[21]	Community client led ART delivery	Uganda	2018	171,932 patients enrolled in any DSD	General, stable	Adults		Mixed	CHW		C/A/L+TB care	Coverage
24OFBIM[21]	Community drug distribution points	Uganda	2018	171,932 patients enrolled in any DSD	General, stable	Adults	6	Mixed	CHW		C/A/L+TB care	Coverage
25FBIM[29]	Failed second line differentiated care	Kenya	2017	164 total patients referred to DSD, 23 changed to 3rd line	General, unsuppressed/failing	Adults		All at the facility	Doctor	Pharmacist	C/A/L	Treatment outcome
26OFBIM[57]	Village-based ART refill	Lesotho	2020	262 patients	General, all	Adults	2	Mixed	Non-specified clinician	CHW	C/A/L+TB care	Treatment Outcome
27OFBIMa[12]	Outreach care for KPs 1	Kenya		233 MSM/MSW in DSD	FSW and/or MSM, all	All	16	Mixed	Non-specified clinician	Non-specified clinician	C/A/L	Raw # PLHIV on model
27OFBIMb[12]	Outreach care for KPs 2	Malawi		1,278 FSWs in DSD	FSW and/or MSM, all	All		Mixed	Non-specified clinician	Designated patient	C/A/L	Raw # PLHIV on model
28CLGa[58]	3 month ART dispensing in CARG	Zimbabwe		5,760 patients	General, stable	Adults, adolescents and children	6	Mixed		Designated patient	C/A/L	Treatment outcome, cost, acceptability
28CLGb[58]	6month ART dispensing in CARG	Zimbabwe		5,760 patients	General, stable	Adults, adolescents and children	4	Mixed		Designated patient	C/A/L	Treatment outcome, cost, acceptability
29FBIM[11]	The multi-month prescribing BIPAI	Tanzania			Children and adolescents, stable	Adults, adolescents and children		All at the facility	Doctor	Pharmacist	C/A/L	Raw # PLHIV on model
29OFBIMa[11]	Pick n Go management and development for health	Tanzania		567 patients on DSD	Children, stable	Adults, adolescents and children	6	All at the community		Nurse	C/A/L	Treatment outcome
29HCWLGa[11]	Expert client peer support	Tanzania			Children, all	Adults, adolescents and children		Mixed	Non-specified clinician	Lay counselor	C/A/L + follow-up	Acceptability

Model	Model Name	Country(s)	Dates observed	Cohort size/estimated enrolment	Patients eligible (population, condition)	Age	Freq. *	Location	Clinical provider	ARV dispenser	Types of services	Outcomes
29HCWLGb[11]	Partnership for free survival program	Tanzania			Adolescents, all	Adolescents	12	All at the facility			C/A/L + health education	Treatment outcome
29OFBIMb[11]	TB Tanzania program	Tanzania			Patients with comorbidities, all	All	24	Mixed	Non-specified clinician	Nurse	C/A/L +TB care	Uptake, treatment outcome
30FBIM[18]	Spaced and fast lane appointments	South Africa	2018	1,905,036 ART patients	General, stable	Adults	3	All at the facility	Non-specified clinician	Pharmacist	C/A/L	Coverage
30HCWLG[18]	Adherence clubs	South Africa	2018	1,905,036 ART patients	General, stable	Adults	3	Mixed	Non-specified clinician	Lay counselor	C/A/L	Coverage
30OFBIM[18]	Central Chronic Medicine Dispensing and Distribution (CCMDD) (Community-based pickup points)	South Africa	2018	1,905,036 ART patients	General, stable	Adults	3	Mixed	Non-specified clinician	Pharmacist	CP	Coverage
31FBIMa[16]	Fast track	Kenya	2018	3,546 HIV facilities	General, stable	Adults		All at the facility			C/A/L	Coverage
31FBIMb[16]	Six monthly appointments	Kenya	2018	3,546 HIV facilities	General, stable	Adults	2	All at the facility			C/A/L	Coverage
31HCWLG[16]	Facility ART groups	Kenya	2018	3,546 HIV facilities	General, stable	Adults		All at the facility		Non-specified clinician	C/A/L	Coverage
31CLG[16]	Community ART groups	Kenya	2018	3,546 HIV facilities	General, stable	Adults		Mixed		Designated patient	C/A/L	Coverage
32HCWLG[36]	Youth clubs	South Africa	2016	337 ALHIV enrolled in DSD	Adolescents, all	Adolescents	6	All at the facility	Nurse	Lay counselor	C/A/L	Treatment outcome
33HCWLG[59]	6 month dispensing in adherence clubs	South Africa		2,162 patients	General, stable	Adults	3	All at the facility	Doctor	Pharmacist	C/A/L	Treatment outcome
34HCWLG[32]	Teen club	Malawi	2017	1,646 ALHIV enrolled in DSD	Adolescents, all	Adolescents	12	All at the facility		Lay counselor	C/A/L + reproductive counseling	Treatment outcome
35CLG[24]	Community adherence groups	Zambia	2017	1,035 patients with documented VL result	General, unsuppressed/failing	Adults, adolescents and children		Mixed	Doctor	Lay counselor	C/A/L	Uptake, acceptability
36HCWLG[60]	Adherence club care	South Africa		214 patients	General, stable	Adults	4	All at the community	Nurse	CHW	C/A/L+ health education	Treatment outcome, acceptability
37HCWLG[61]	Postpartum adherence club	South Africa		388 patients	General, stable	Adults	4	All at the community	Nurse	CHW	C/A/L + health education	Treatment outcome, cost, acceptability
38FBIM[30]	iACT Cohort groups – support for newly diagnosed	South Africa	2019	4,569 patients	General, newly initiated	All	8	All at the facility	Nurse		C/A/L	Treatment outcome

Model	Model Name	Country(s)	Dates observed	Cohort size/estimated enrolment	Patients eligible (population, condition)	Age	Freq. *	Location	Clinical provider	ARV dispenser	Types of services	Outcomes
39HCWLG[34]	Facility based treatment clubs	Eswatini	2016		General, stable	Adults	4	All at the facility	Non-specified clinician	Non-specified clinician	C/A/L + health education	Treatment outcome
39CLG[34]	Community ART groups	Eswatini	2016		General, stable	Adults	12	Mixed	Non-specified clinician	Designated patient	C/A/L	Treatment outcome
39OFBIM[34]	Outreach care	Eswatini	2016		General, stable	Adults	12	All at the community			C/A/L	Treatment outcome
40CLG[27]	Community-based adherence groups	Zambia	2018	4,876 patients in DSD	Adolescents, stable	Adults, adolescents and children	6	All at the facility	Non-specified clinician	CHW	C/A/L	Treatment outcome
41OFBIM[28]	Central Chronic Medicine Dispensing and Distribution (CCMDD) at Pickup Points	South Africa		1,535,126 active registered patients, including patients on ARV, and those not on ARVs	General, stable	Adults	14	Mixed			C/A/L	Treatment outcome, cost
42FBIM[62]	Nurse-delivered cognitive behavioral therapy	South Africa		160 patients	General, unsuppressed/failing	Adults		All at the facility	Nurse		C/A/L + mental health	Treatment outcome
43OFBIM[31]	Community pharmacy program	Uganda	2018	8,820 PLHIV enrolled in DSD	General, stable	Adults	8	Mixed	Doctor	Nurse	C/A/L + health education	Treatment outcome, cost
44CLG[33]	Community client led art delivery	Uganda	2017	215 FSWs enrolled in DSD	FSW and/or MSM, any	All	8	All at the community	Doctor	Designated patient	C/A/L	Treatment outcome
45CLG[63]	Community adherence groups	Kenya	2018	48 providers	General	Adults	14	All at the facility	Non-specified clinician	Designated patient	C/A/L	Acceptability
46OFBIM[10]	ART outreach model	Zimbabwe	2017	1,014 PLHIV in DSD	General, any	All	24	All at the community	Doctor	Nurse	C/A/L +TB care	Raw # PLHIV on model
47HCWLG[64]	Microclinic intervention	Kenya		360 patients	General, stable	Adults		All at the facility			C/A/L + health education	Treatment outcome
48FBIM[65]	Early ART initiation clubs	South Africa		300 patients	General, any	Adults	12	All at the facility				Treatment outcome
49HCWLG[66]	Community-based adherence club	South Africa		800 patients	General, stable	Adults	6	Mixed	Nurse	Lay counselor	C/A/L	Uptake, treatment outcome, acceptability
50OFBIM[23]	Community drug distribution	Uganda	2017	80,000 patients supported by TASO	General, stable	Adults	6	Mixed		CHW	C/A/L	Uptake, treatment outcome
50CLGa[23]	Community-based ART 1	Namibia		9,271 patients in DSD	General, any	All	6	Mixed		CHW	C/A/L	Uptake, treatment outcome
50CLGb[23]	Community-based ART 2	Zambia		5,980 patients in DSD	General, stable	Adults	8	Mixed		CHW	C/A/L	Uptake, treatment outcome

* Frequency includes clinic visits and DSD interactions off-site.

Appendix 6: Outcomes by model category and outcome type

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
Facility based individual models							
Coverage (%) – Eligible patients enrolled in a specific DSD model							
11FBIM	South Africa	Facility fast track	28 %		122,163§	34,375	PLHIV enrolled among eligible
24FBIM	Uganda	Fast track drug refill	52%		171,932§	88,832	PLHIV enrolled among eligible
1FBIM	Ethiopia	Appointment spacing	66%		~223,762ŧ	148,117	PLHIV enrolled among eligible
*Uptake (n)**							
23FBIM	Swaziland	Fast track	11,634				PLHIV enrolled in care
2FBIMa	Zambia	Fast track	6,128				PLHIV enrolled in care
2FBIMb	Zambia	Multi-month scripting	3,104				PLHIV enrolled in care
30FBIM	South Africa	Spaced and fast lane appointments	929,570				PLHIV enrolled in care
Treatment outcomes – viral load <1000 (%)							
25FBIM	Kenya	Failed second line differentiated care	100%		23		Unreported time period
38FBIM	South Africa	iACT support groups for newly initiated patients	45%		4,569		% improved likelihood of viral suppression at 12 months
Treatment outcomes – retention (%)							
38FBIM	South Africa	iACT support groups for newly initiated patients	76%		4,569		% improved likelihood of retention at 12 months
Acceptability							
20FBIM	Malawi	Multi-month prescription		- No reports of unwanted HIV disclosure - ARVs are easily and safely stored at home - No reports of ARV trade or misuse - Reduced patient travel cost due to decreased visit frequency - Improved freedom for employment and family travel - No reports of ARV shortages or expiration - Patients report some stigma while carrying large ARV supply - Providers are concerned about ARV sharing which makes pill count difficult - Providers are concerned about delayed care-seeking for other conditions			
Feasibility							
29FBIM	Tanzania	Multi-month prescribing		- Significant time savings for both clinic staff and clients within the clinic, and for clients between visits. - A frequent challenge is stock-out of ART and supply chain inconsistency.			
Out of facility based individual models (OFBIM)							
Coverage (%) – Eligible patients enrolled in a specific DSD model							
11OFBIM	South Africa	CCMDD with external pickup point	41%		122,163§	49,881	PLHIV enrolled among eligible
24OFBIM	Uganda	Community drug distribution points	18%		171,932§	31,000	PLHIV enrolled among eligible
*Uptake (n)**							
46OFBIM	Zimbabwe	ART outreach model	1,014				PLHIV enrolled in care
27OFBIMa	Kenya	Outreach care for KPs	233				PLHIV enrolled in care
27OFBIMb	Malawi	Outreach care for KPs	1,278				PLHIV enrolled in care
4OFBIM	Swaziland	Outreach models	3,064				PLHIV enrolled in care
30OFBIM	South Africa	Central chronic medicine dispensing and distribution at pickup points	702,106				PLHIV enrolled in care

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
2OFBIMa	Zambia	Central chronic medicine dispensing and distribution at pickup points	2,095				PLHIV enrolled in care
2OFBIMb	Zambia	Health post model dispensation	61,002				PLHIV enrolled in care
2OFBIMc	Zambia	Home ART delivery	3,693				PLHIV enrolled in care
5OFBIM	Uganda	Community drug distribution	66%		80,000		PLHIV enrolled among all clients offered (%)
29OFBIMb	Tanzania	TB Tanzania program	95%				PLHIV enrolled among all clients offered (%)

Treatment outcomes – viral load <1000 (%)

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
43OFBIM	Uganda	Community pharmacy program	99%		8,820		Suppression at 12 months
19OFBIM	South Africa	Decentralized medication delivery (DMD)	77.2[1] %	74.3%	576		Suppression at 12 months

Treatment outcomes – retention (%)

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
43OFBIM	Uganda	Community Pharmacy Program	98%		8,820		Retention at 12 months
5OFBIM	Uganda	Community drug distribution	98%				Unknown Time
29OFBIMa	Tanzania	Pick n Go Program	83%		567		Unknown Time
39OFBIM	Swaziland	Combination ART refill	77%				Retention at 12 months
19OFBIM	South Africa	Decentralized medication delivery (DMD)	81.5[2] %	87.2%	567		Retention at 12 months

Treatment outcomes – adherence (%)

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
41OFBIM	South Africa	Central Chronic Medicine Dispensing and Distribution at pickup points	90-99%	70-82%			Range

Cost

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
17OFBIM	South Africa	Decentralized medication delivery (DMD)	83%				Reduction in patient annual cost to ART pickup
17OFBIM	South Africa	Decentralized medication delivery (DMD)	12.9%			84	Patients traveling > 1 hour to DMD
17OFBIM	South Africa	Decentralized medication delivery (DMD)	1.07 USD/pickup			84	Cost per DMD pickup
43OFBIM	Uganda	Community pharmacies	9.0 wait hrs/year				Wait time to care/year

Acceptability

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
18OFBIM	South Africa	Decentralized medication delivery (DMD)		- Providers report having more time to care for sicker patients - Lack of clarity among patients about how the models work			
17OFBIM	South Africa	Decentralized medication delivery (DMD)		- Leads to facility decongestion, reduced cost to patient and better care for sicker patients - Providers are concerned about additional burden due to data collection responsibilities - Providers point out frequent drug stockouts and supply chain problems - Lack of clarity among patients about how the OFBIM models work			

Healthcare worker led groups (HCWLG)

Coverage (%) – Eligible patients enrolled in a specific DSD model

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
11HCWLG	South Africa	Adherence cub	31%		122,163§	37,907	PLHIV enrolled among eligible
24HCWLG	Uganda	Facility based group	13%		171,932§	22,947	PLHIV enrolled among eligible

Uptake (n)*

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
23HCWLGa	Swaziland	Teen clubs	4,088				PLHIV enrolled in care
23HCWLGb	Swaziland	Facility treatment clubs for adults	586				PLHIV enrolled in care
23HCWLGc	Swaziland	Family centered model	493				PLHIV enrolled in care
30HCWLG	South Africa	Adherence clubs	273,360				PLHIV enrolled in care
2HCWLG	Zambia	Urban/rural adherence groups	5,558				PLHIV enrolled in care

Treatment outcomes – viral load <1000 (%)

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
34HCWLG	Malawi	Teen clubs	83%		1,646		Suppression at 6 months
7HCWLG	Malawi	Teen clubs	77%	77%	800		
19HCWLG	South Africa	Adherence clubs	80[3]%	79.6%	576		Suppression at 12 months
Treatment outcomes – retention (%)							
29HCWLGb	Tanzania	Partnership for free survival Program	95%				Unknown time
34HCWLG	Malawi	Teen club	97[§]%		1,646		Retention at 12 months
39HCWLG	Swaziland	Facility based treatment club	96%				Retention at 12 months
32HCWLG	South Africa	Youth clubs	82%		337		Retention at 12 months
6HCWLG	South Africa	Adherence club	92%		171,374		Retention at 26 months
19HCWLG	South Africa	Adherence club	89.5[4]%	81.6%	576		Suppression at 12 months
Treatment outcomes – adherence (%)							
Malawi	7HCWLG	Teen club	81%	77%	800		Unknown time period
Cost							
17HCWLG	South Africa	Adherence clubs	0.8 USD/visit		57		Cost per AC visit
17HCWLG	South Africa	Adherence clubs	20%		57		Patients traveling > 1 hour to AC
7HCWLG	Malawi	Teen club	30 USD pt/year		800		Incremental program costs/patient/year[¶]
Acceptability							
29HCWLGa	Tanzania	Expert client peer support					- Improved linkage to care and tracking of LTFU - More opportunities for task-sharing between clinic staff, resulting in less wait time for patients to see clinicians
6HCWLG	South Africa	Adherence club					- Improved social support for patients to deal with treatment challenges - Patients report challenges to ART supply to the adherence clubs
17HCWLG	South Africa	Adherence club					- Reduced transport cost for patients - Reduced sense of stigma - Patients report that providers give unclear instructions on how clubs work - Patients report lack of adequate medical record keeping
18HCWLG	South Africa	Adherence club					- Facility decongestion and improved social support for patients to cope with treatment challenges - Patients report lack of clarity on how the model works - Increased staff burden - Incorrect patient differentiation
Client led groups (CLG)							
Coverage (%) – Eligible patients enrolled in a specific DSD model							
24CLG	Uganda	Community client led ART delivery	17%		171,932[§]	29,153	PLHIV enrolled among eligible
Uptake (n)*							
23CLG	Swaziland	Community-based ART groups	1,025				PLHIV enrolled in care
2CLG	Zambia	Community adherence groups/clubs	17,081				PLHIV enrolled in care
51CLGa	Namibia	Community-based ART	16%		9,271		PLHIV enrolled among all clients offered (%)
51CLGb	Zambia	Community-based ART	18%		5,980		PLHIV enrolled among all clients offered (%)
35CLG	Zambia	Community adherence groups	33[§]%		57		PLHIV enrolled among all clients offered (%)

Model	Country	Model name	Outcome DSD	Outcome SOC	Denominator	Numerator	Detail
Treatment outcomes – viral load <1000 (%)							
44CLG	Uganda	Community client led ART delivery	90.9%		215		Suppression at 9 months
Treatment outcomes – retention (%)							
51CLGa	Namibia	Community-based ART	86-100%		9,271		Unknown time, Reported as range
51CLGb	Zambia	Community-based ART	100%		5,980		Not reported
39CLG	Swaziland	Community ART groups	81%				Retention at 12 months
40CLG	Zambia	Community-based adherence groups	97%	76%	4,876		Unknown time
Acceptability							
45CLG	Kenya	Community adherence groups			Providers express concern about the disorganization of medical records - Some patients are dissatisfied with the efficiency of drug pickups - Providers are concerned about the lack of sufficient tools to perform what is expected from them for DSD		
35CLG	Zambia	Community adherence groups			- Patients prefer more one-on-one meetings with their health care providers.		

* Uptake includes absolute number of enrolled clients for reports which did not indicate how many patients were offered enrollment

§ Author calculated

ǂ Author calculated coverage rates based on the given numerator and denominator

¶Excludes costs of ARVs and laboratory tests; includes only additional services associated with DSDs. No cost year indicated

1. Difference in differences (covariate adjusted and cluster adjusted): 1.0% (12.2% to 10.1%)
2. Difference in differences (covariate adjusted and cluster adjusted): 5.9% (12.5% to 0.8%)
3. Difference in differences (covariate adjusted and cluster adjusted): 3.8% (6.9% to 14.4%)
4. Difference in differences (covariate adjusted and cluster adjusted): 8.3% (1.1% to 15.6%)