ALTERNATIVE MODELS OF ART DELIVERY: OPTIMIZING THE BENEFITS

DO DIFFERENTIATED SERVICE DELIVERY MODELS FOR HIV TREATMENT SAVE MONEY?
Evidence from implementation studies conducted in sub-Saharan Africa in 2017-2019

Background

- In sub-Saharan Africa, many countries are scaling up alternative service delivery approaches, or differentiated service delivery (DSD) models, for the treatment of HIV. DSD models alter the location, frequency, provider, or other characteristics of HIV treatment delivery.
- In addition to improving treatment outcomes and patient satisfaction, DSD models are expected to reduce the cost of service delivery to both the health system and the patient, especially for the large number of stable patients in most national ART programs. This expectation follows logically on the notion that most DSD models are designed to be "less intensive" than conventional care and therefore presumably utilize fewer resources per patient served.
- Until recently, little has been known about the costs of DSD models to health systems (providers) or to patients themselves, compared to the costs of non-differentiated care.
- Now several newly-completed studies, in Lesotho, Malawi, Uganda, Zambia, and Zimbabwe, estimate the costs of DSD models implemented routinely or as pragmatic trials, allowing us to compare the true costs and outcomes of differentiated service delivery to conventional (non- or pre-differentiated), facility-based care in a number of settings in sub-Saharan Africa.

The studies

- The studies were conducted under USAID's EQUIP Health Project, with support from PEPFAR. They include three cluster randomized trials and two observational studies:
  - Two cluster randomized trials of community-based models of multimonth dispensing, in Lesotho and Zimbabwe [1,2].
  - The cluster randomized INTERVAL trial in Malawi and Zambia of facility-based multimonth dispensing [3].
  - An observational evaluation of five partner-driven models being piloted in Zambia [4].
  - An observational evaluation of the five Ministry of Health-approved models in widespread use in Uganda [5].
- Most of the studies reported a primary outcome of retention in care 12 months after study enrollment.
- The costs of treatment delivery to the health system, usually including ARV and non-ARV medications, clinic visits and DSD-specific interactions, laboratory tests, and infrastructure and other fixed costs were estimated per patient 12 months after study enrollment.
- Most of the patients enrolled in the studies met national criteria for being stable on ART in each country; all were adults.
- In some studies, the cost per patient per year for treatment in DSD model was compared to the cost of conventional; in others, different DSD models were compared to one another.
- Some of the studies also estimated transport and time costs to patients themselves, using questionnaire data and/or assumptions about waiting times.

AMBIT Policy Brief
Number 5 (v 1.0), 16 February 2021
https://sites.bu.edu/ambit/
www.equiphealth.org

Results

Table 1. Retention at 12 months and average annual cost per patient to health system (provider), by country and model, in USD

Country (dates of observation) and model	Sample size	% retained at 12 months	Mean annual provider cost per patient in USD 2018 (SD or 95% CI)	ARV medications as % of mean annual provider cost[a]	Mean patient transport costs per year[b]	Mean patient time costs per year[c]
Lesotho cluster-randomized trial (2017-2019) [1]						
Facility care with 3-month refills (conventional)	1,898	97.1%	$122.28 (23.91)	69.0%	$11.45	$32.97
Community ART groups with 3-month refills (CAGs)	1,558	96.5%	$114.20 (23.03)	75.4%	$2.62	$13.63
Community distribution points with 6-month refills	1,880	94.7%	$112.58 (21.44)	77.3%	$4.83	$13.94
Zimbabwe cluster randomized-trial[d] (2017-2019) [2]						
Facility dispensing with 3-month refills (conventional)	1,916	91.0%	$192.68 (191.25-194.12)	83.6%	n.a.	n.a.
Community ART groups with 3-month refills (CAGs)	1,334	93.3%	$178.87 (177.26-180.49)	88.3%	n.a.	n.a.
Community ART groups with 6-month refills (CAGs)	1,545	93.6%	$178.01 (176.54-179.48)	90.4%	n.a.	n.a.
Malawi cluster-randomized trial (excludes laboratory costs) (INTERVAL) (2017-2019) [3]						
Facility conventional care	1,532	89.7%	$86.50 (84.50-88.42)[e]	87%[f]	$1.56	$5.30
Facility dispensing with 3-month refills	1,430	90.2%	$86.00 (83.99-87.91)[e]	88%[f]	$1.53	$6.63
Facility dispensing with 6-month refills	1,588	93.2%	$84.60 (82.62-86.54)[e]	91%[f]	$2.27	$3.98
Zambia cluster-randomized trial (excludes laboratory costs) (INTERVAL) (2017-2019) [3]						
Facility conventional care	1,480	74.6%	$132.00 (130.43-134.35)[e]	76%[f]	$1.67	$15.00
Facility dispensing with 3-month refills	1,296	82.3%	$134.00 (132.09-136.02)[e]	75%[f]	$1.58	$20.00
Facility dispensing with 6-month refills	1,393	89.7%	$128.00 (125.64-129.57)[e]	83%[f]	$1.20	$9.98
Zambia observational cohort[g] (2015-2018) [4]						
Facility conventional care	1,174	80.7%	$100.09 (61.59)	86.0%	n.a.	n.a.
Community adherence groups (CAGs)	754	83.2%	$116.25 (67.83)[f]	76.6%	n.a.	n.a.
Urban adherence groups	193	94.8%	$147.01 (57.15)[f]	69.3%	n.a.	n.a.
Mobile ART delivery	216	68.5%[h]	$122.46 (70.10)[e]	59.9%	n.a.	n.a.
Home ART delivery	169	79.3%	$137.18 (57.02)[f]	64.1%	n.a.	n.a.
Uganda observational cohort[i] (2017-2018) [5]						
Facility-based individual management (conventional)	126	96.8%	$152.49 (72.04)	75.6%	n.a.	n.a.
Facility-based groups (pregnant/post-partum women)	115	95.7%	$141.29 (33.70)	68.6%	n.a.	n.a.
Fast-track drug refills	132	99.2%	$166.48 (82.51)	80.5%	n.a.	n.a.
Client-led ART delivery (CAGs)	130	97.7%	$150.07 (54.94)	68.8%	n.a.	n.a.
Community distribution points	132	100.0%	$146.42 (59.52)	77.0%	n.a.	n.a.

[a]Expenditure on ARVs per patient is actual; reflects the observed mix of regimens and quantities dispensed for the cohort, not the procurement cost of a one-year supply of ARVs.
[b]Values shown are averages over entire cohorts. Most patients incurred no costs for transport. Patients who did incur costs paid substantially more per individual than the averages shown.
[c]Time required for clinic visits and DSD model interactions reported by study participants multiplied by country's minimum wage.
[d]Costs presented in USD 2020 for this study.
[e]Excludes cost of laboratory tests; one viral load test per year, as called for by national guidelines, would add approximately $19 to the mean annual cost per patient per year.
[f]Proportion allocated to ARV medications is for patients retained at 12 months only.
[g]Costs shown are lower-range scenario estimates; see source for higher-range estimates.
[h]Model included newly initiating ART patients, rather than solely those already on ART for 6-12 months.
[i]Costs shown are for second observation period (months 13-24); see source for first period. Uganda models included second-line ART patients, comprising 5-17% of the patients sampled, depending on the model. Source also provides viral suppression rates, which ranged from 88-94%.

Table 2. Interactions with healthcare system as indicated by guidelines and observed in studies, by country and model (means/year)

Note: In this table, "facility visit" refers to a conventional clinic visit in which a clinical provider is consulted and medications dispensed and/or viral load test conducted if due; "other DSD model interactions" are all types of interactions between patients and healthcare providers that are integral to each model of care, such as off-site medication pickups, group meetings, and community outreach interactions. We also note that records of DSD interactions were incomplete for the two observational studies, and Table 2 includes some estimates we made based on available data and assumptions.

Country and model	Facility visits recommended per year (mean)		Other DSD model interactions recommended per year (mean)		Total visits + DSD interactions/year (mean)	
	Guidelines	Observed	Guidelines	Observed	Guidelines	Observed
Lesotho cluster-randomized trial [1][a]						
Facility care with 3-month refills (conventional)	4	4.65	0	0	4	4.65
Community ART groups (CAGs) with 3-month refills	1	1.04[c]	3	4.65[c]	4	5.69
Community distribution points with 6-month refills	1	1.72[c]	1	0.96[c]	2	2.68
Zimbabwe cluster randomized-trial [2][a]						
Facility dispensing with 3-month refills (conventional)	4	3.23	0	0	4	3.23
Community ART groups (CAGs) with 3-month refills	1	2.88	3	4.49	4	7.37
Community ART groups (CAGs) with 6-month refills	1	1.83	1	1.71	2	3.54
Malawi cluster-randomized trial (INTERVAL)[b] [3]						
Facility conventional care	4	5.4	0	0	4	5.4
Facility dispensing with 3-month refills	4	4.9	0	0	4	4.9
Facility dispensing with 6-month refills	2	2.9	0	0	2	2.9
Zambia cluster-randomized trial (INTERVAL)[b] [3]						
Facility conventional care	4	4.6	0	0	4	4.6
Facility dispensing with 3-month refills	4	4.7	0	0	4	4.7
Facility dispensing with 6-month refills	2	2.8	0	0	2	2.8
Zambia observational cohort[a] [4]						
Facility conventional care	4-12	2.55	0	0	4	2.55
Community adherence groups (CAGs)	2	2.64[d]	12	10	14	12.64
Urban adherence groups	2	3.06[d]	4	4.54	6	7.6
Mobile ART delivery	0	0.00	6	4.87	6	4.87
Home ART delivery	1	3.03[d]	6	3.29	7	6.32
Uganda observational cohort[a] [5]						
Facility-based individual management (conventional)	12	7.89	0	0	12	7.89
Facility-based groups (pregnant/post-partum women)	2-6	9.46	4-12	6.95	6	16.41
Fast-track drug refills	6	5.86	0	0	6	5.86
Client-led ART delivery (CAGs)	2	6.06	2	2.05	4	8.11
Community distribution points	2	6.07	4	1.92	6	7.99

[a]Observed number of facility visits scheduled and unscheduled HIV-related facility visits only; excludes non-HIV visits.
[b]Observed number of facility visits is for ARV refill visits only; excludes non-HIV and non-ARV refill visits.
[c]Numbers of facility visits and DSD interactions in Lesotho estimated from medical records that did not distinguish between facility visits and DSD interactions.
[d]Numbers shown for Zambia observational cohort are for lower-range scenario.

Discussion and conclusions

- The proportion of patients retained in care at 12 months was non-inferior to conventional care for most models and higher for some models. In Uganda, the only country for which viral suppression data were collected, 90-92% of patients retained in care had undetectable viral loads in all models except facility-based groups, where 98% of participants retained in care had undetectable viral loads (see source report for further details).

- Some DSD models were more expensive than conventional care and others less expensive.
  - In most cases, cost differences between models were modest, mainly due to the large share of total cost/patient attributable to ARV medications, whose cost does not vary with model of care.
  - Models that incorporated six-month medication dispensing were consistently less expensive than conventional care, though savings were small.
- Direct comparison of the costs of different models should be done with caution, especially for the observational studies, as not all models are perfect substitutes for one another. Patient populations served, geographic settings, and other patient characteristics may vary by model. The models in the randomized trials are substitutes, but not all ART patients served by a facility will be eligible for these models, which only enrolled adults who were stable on treatment, and not all ART patients will choose one of these models in preference to conventional care.
- ARV medications account for between 60% and 90% total estimated cost/patient in all models of care, and one viral load test/year, usually at a cost of $15-20/test, accounts for an average of 10% more. There is thus relatively little room left for cost savings through more efficient service delivery approaches.
- Where reported, costs to patients were substantially less in DSD models than in conventional care. Patients reported cutting their own out-of-pocket expenditures and/or opportunity costs by between a quarter and a half per year, generally due to the reduced number of full clinic visits required by DSD models. We note that a majority of patients do not incur any out-of-pocket expenses for transport, however, which limits the potential for patient savings on transport costs.
- In many of the models, patients made more or fewer clinic visits and/or participated in more or fewer DSD model interactions than was called for by guidelines. This may have reflected poor fidelity to guidelines on the part of providers, patient preferences for more or less frequent interaction, drug stockouts that required more frequent medication pickups, larger medication quantities dispensed for some patients, and/or other reasons. In practice, some DSD models proved not to be “less intensive” than conventional care. In these models, resource allocation shifted from the clinic to the DSD model but did not truly diminish.
- By definition, stable adult patients have already shown that they can remain in care and are virally suppressed, and they are likely thus the least expensive patients in conventional care. Shifting them to DSD models may leave the expensive patients in conventional care, simply reallocating overall health system costs, rather than reducing them. A model that enrolls only stable patients and produces relatively good outcomes at relatively low costs, compared to the conventional care average, is not surprising. To understand DSD model costs, it is important to include an entire ART population or program, not just those who are eligible for a stable patient model.

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