Community-based service delivery of HIV treatment in Zambia: costs and outcomes

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BACKGROUND

There are 1 million Zambians receiving antiretroviral treatment (ART) for HIV, severely straining existing healthcare infrastructure and human resources.

Community-based differentiated service delivery (DSD) models of care have been implemented for a variety of reasons, including expected:

1. Reduction of provider workload
2. Improvement in quality of care
3. Improvement in patient outcomes/bring services closer to the client
4. Cost reduction due to decreased facility utilization

The costs and impact of these DSD models have not yet been evaluated in routine settings.

METHODS

We conducted a cost and outcomes analysis of ART patients who enrolled in DSD models in Zambia between 2015-2017 to estimate the average cost (reported in 2018 USD) per patient per year. We evaluated five models of care (including the standard of care as of 2018), further described in **Table 1**.

- Using patient-level data, we captured individual resource utilization in each model over the first 12 months of model participation, then estimated the cost/patient by assigning unit costs to each resource.
- Retention in care at 12 months was defined as attending a clinic visit at 12 months +/- 3 months after model entry.
- Production cost for each model was calculated as the total cost of providing treatment to all patients in each model of care divided by the number of those retained in care after 12 months.
- To account for missing patient-level data in the number of DSD interactions for three of the models, we also considered high and low visit utilization scenarios.

Table 1. Characteristics of each models of service delivery

Model	Design	Number of facility visits required	Number of DSD interactions
Current standard of care (SOC)	Conventional service delivery, without differentiation.	4	0
Community adherence groups (CAGs)	Group of ±6 people, based on residential proximity or patient preference, meet monthly at a designated place in the community. Members collect medication at clinical appointments for other CAG members, in a rotating fashion.	2	12
Urban adherence groups (UAGs)	Group of 20-30 people. Patients receive group adherence counseling by a lay health care worker (HCW), followed by pre-packed ART dispensation.	2	4
Home ART delivery (through the *community HIV epidemic control* (CHEC model)	Trained community health workers (CHWs) linked to facilities conduct home visits to deliver ART, conduct health screening, monitor adherence and refer patients as required. All community services are captured on a tablet-based SmartCare linked Community HTC or Community ART module.	1	6
Mobile ART services (mobile ART)	A mobile ART team comprised of medical professionals from a district hospital conduct biweekly visits to select rural health centers (RHCs) to provide ART services. Not limited to stable patients.	0	6

Out-of-facility ART service delivery models achieve equal or better retention in care but are more expensive for providers than traditional, facility-based care.

RESULTS

- Demographic characteristics of patients enrolled in each model of care are presented in **Table 2**.
- The unit costs per healthcare system interaction for each model of care are presented in **Figure 1**.
- Two models of care (CAG and UAG) had a higher retention rate than the standard of care (**Table 3**).
- Each DSD model of care is expected to be more expensive per patient treated and per patient retained at 12 months (**Table 3**), compared to the standard of care.

Table 2. Demographic characteristics and 12-month retention in care by differentiated model of care

	Model of service delivery				
	SOC	CAG	UAG	Home ART delivery	Mobile ART
Number enrolled	1,174	754	193	169	216
Setting (% urban (v rural))	806 (69%)	686 (91%)	193 (100%)	52 (31%)	0 (0%)
Gender, % female (n)	829 (71%)	527 (70%)	138 (72%)	125 (74%)	139 (67%)
Age at ART initiation (years) *(median (IQR))*	35 (30-42)	35 (30-41)	35 (30-41)	37 (31-45)	36 (27-45)
Age at DSD model start (years) (*median (IQR)*)	40 (34-47)	41 (36-48)	41 (36-48)	42 (35-47)	36 (27-45)
Years from ART initiation to model start date *(median (IQR))*	4 (2-7)	6 (3-9)	6 (3-9)	4 (1-5)	0 (0-0)

Figure 1. Unit cost per facility visit or DSD interaction

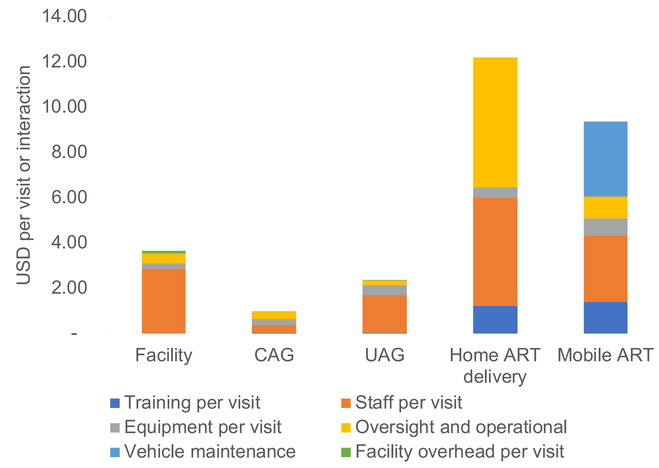

Table 3. Retention, total provider cost, and cost per patient retained

	Model of service delivery				
	SOC	CAG	UAG	Home ART Delivery	Mobile ART*
12-month retention in ART care	948/1174 (81%)**	627/754 (83%)	183/193 (95%)	134/169 (79%)	148/216 (69%)
Annual cost per person treated	$100	$116-$130†	$147-$160†	$139-$188†	$199
Annual cost per person retained at 12 months	$124	$140-$157†	$155-$169†	$176-$237†	$291

*Includes stable and unstable patients
**SOC outcomes calculated 12 months after at the equivalent model entry date, with a 90-day window period.
† Range reflects the low and high DSD utilization estimates

CONCLUSIONS

Though they **achieve equal or improved retention in care**, out-of-facility models of ART delivery should be expected to be **more expensive to providers** than traditional, facility-based care in Zambia.

Most studies find that DSD models **reduce patients' costs** of seeking treatment; Zambian patients may bear fewer costs from DSD models, even if providers do not.

Future studies should focus on comparison of these models of care to newer facility-based models of care currently implemented in Zambia, such as fast-track ART refills and 6-month ART scripting and dispensing.

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