AMBIT

Cost-effectiveness of the optimal mix of differentiated service delivery models for HIV treatment in Zambia: a mathematical modelling study

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Background

- Many countries in sub-Saharan Africa have rapidly scaled up differentiated service delivery (DSD) models for HIV treatment to provide more client-centric care and manage high numbers of clients on lifetime ART.
- In most countries, DSD models evolved organically based on the availability of infrastructure, staffing, and other resources in hand and on international recommendations.
- As a result, the current mix of models in use may or may not be optimal, in terms of effectiveness (health outcomes) or costs.
- Using data from Zambia, we modelled the cost-effectiveness of multiple potential combinations of ART delivery models to guide future implementation and scaleup to maximise the potential benefits of DSD expansion.

Methods

- Objective: Estimate the incremental cost-effectiveness ratio (ICER) to the health system per additional ART client virally suppressed and costs to clients per year.
- Developed and parameterised the ADAPT mathematical model using retrospective data from a national cohort of 846,073 ART clients (≥15 years) between January 2018-March 2022.
- Utilized retention and viral suppression rates by age, sex, setting (urban/rural), and model of HIV treatment delivery.
- Costs to clients and to providers for each model of ART delivery were estimated using previously collected data.

Model inputs

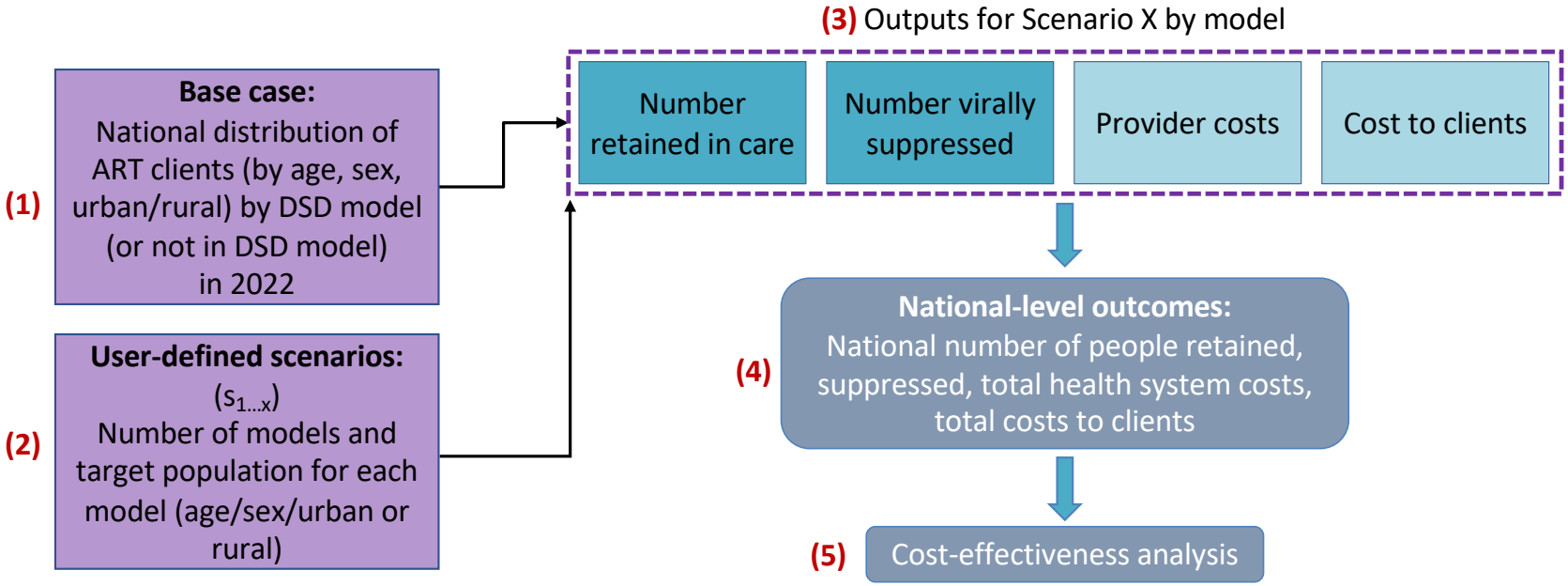
Table: National distribution of ART clients

Parameters	Disaggregation	Data Source
Health Outcomes ▪ Number on ART at baseline ▪ Viral suppression and retention rates at 12 months after ART initiation or model enrolment	▪ Sex (male/female) ▪ Settings (rural/urban) ▪ Age groups (15-19, 20-24, 25-49, 50+) ▪ ART delivery model (DSD model/Conventional care)	Electronic Medical Records ▪ SmartCare

Table: Cost data

Parameters	Disaggregation	Data Source
Costs per ART client per year ▪ Health system costs ▪ Cost to ART clients	ART delivery model ▪ DSD model ▪ Conventional care	Previously collected data ▪ Studies: EQUIP

ADAPT modelling approach



Modelled scenarios

Analysis 1: Scenario analysis for the entire ART program

Scenario	DSD model mix
Base case	Current ART program
1-10	One model at a time for all eligible clients
11-18	Two models for all eligible clients
19-26	Three models for all eligible clients

Base case: Model defined

Conventional care + 10 DSD models
Targeted approaches: All age groups

Total clients: 846,073
DSD coverage: 82.3%

Analysis 2: Scenario analysis for the targeted population

Scenario	DSD model mix
Base case	Current ART program
1-8	One model at a time for all eligible clients
9-12	Two models for all eligible clients
13-14	Three models for all eligible clients

Base case: Model defined

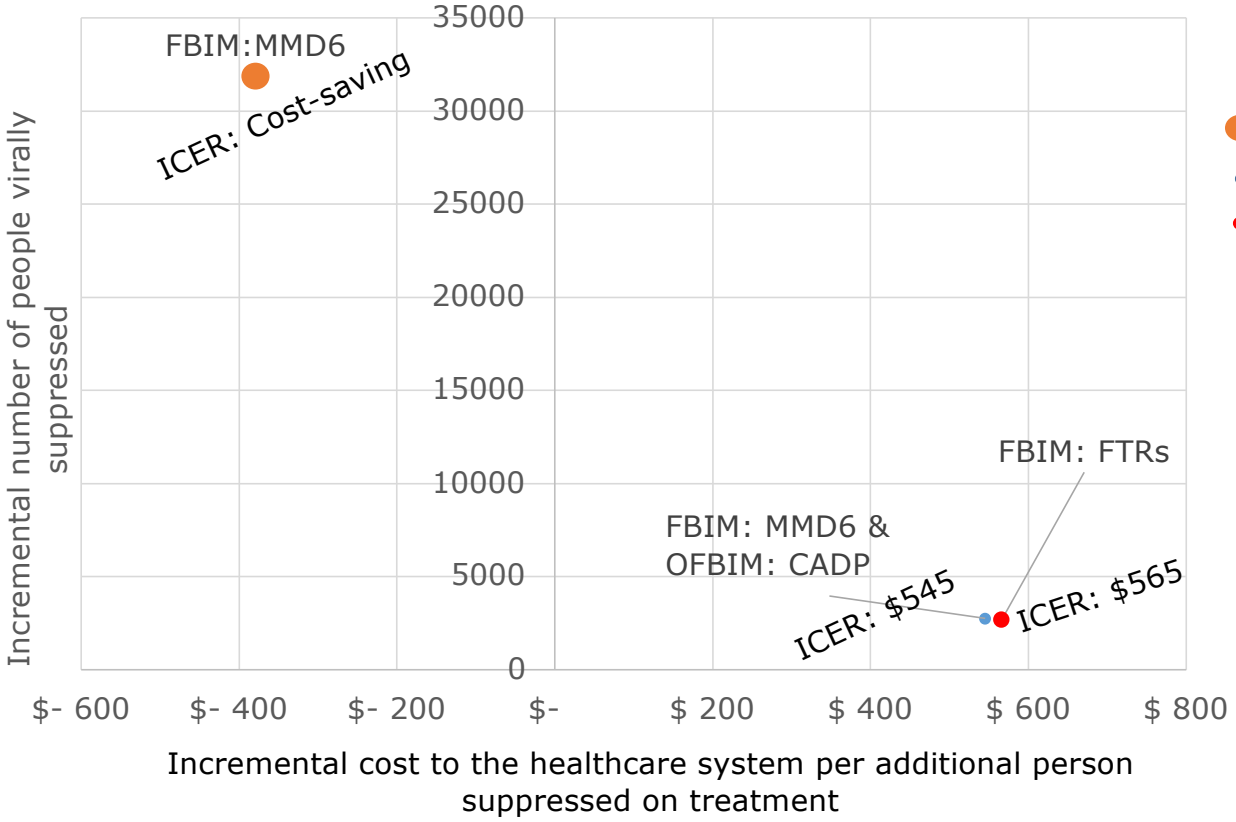
Conventional care + 8 DSD models
Targeted approaches: 15-24 yrs.

Total clients: 21,448
DSD coverage: 70.1%

- Model-specific retention rates were used as weights to decide on the distribution of clients between chosen models for scenarios.
- Only established ART clients were eligible for DSD models

Results: Cost-effectiveness frontier

Cost-effectiveness analysis of scenarios that generate more suppressed individuals than base case for the entire ART program (N=846 703)



All eligible ART clients in MMD6

All eligible in MMD6 & CADP

All eligible in fast track refills

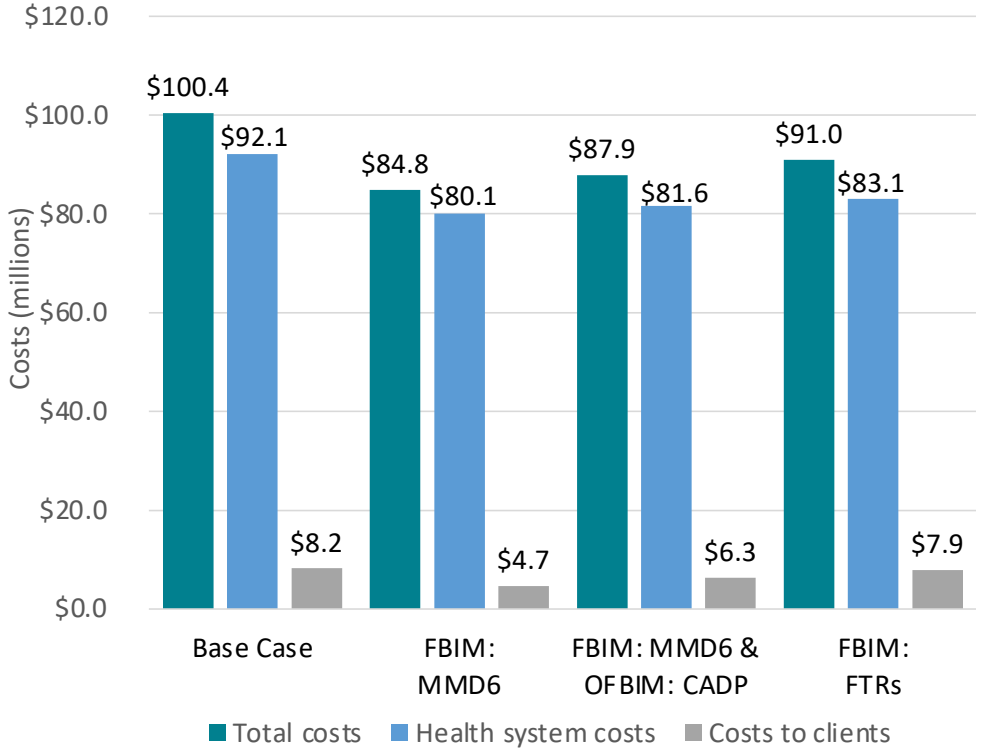
ICER: Incremental cost to the healthcare system per additional person suppressed on treatment

FBIM: Facility-based individual model
- MMD6: Six-month dispensing
- FTRs: Fast track refills

OFBIM: Out-of-facility-based individual model
CADP: Community-ART distribution points

Results: Costs (entire ART program)

Scenarios on the cost-effectiveness frontier that are cost-saving compared to the base case

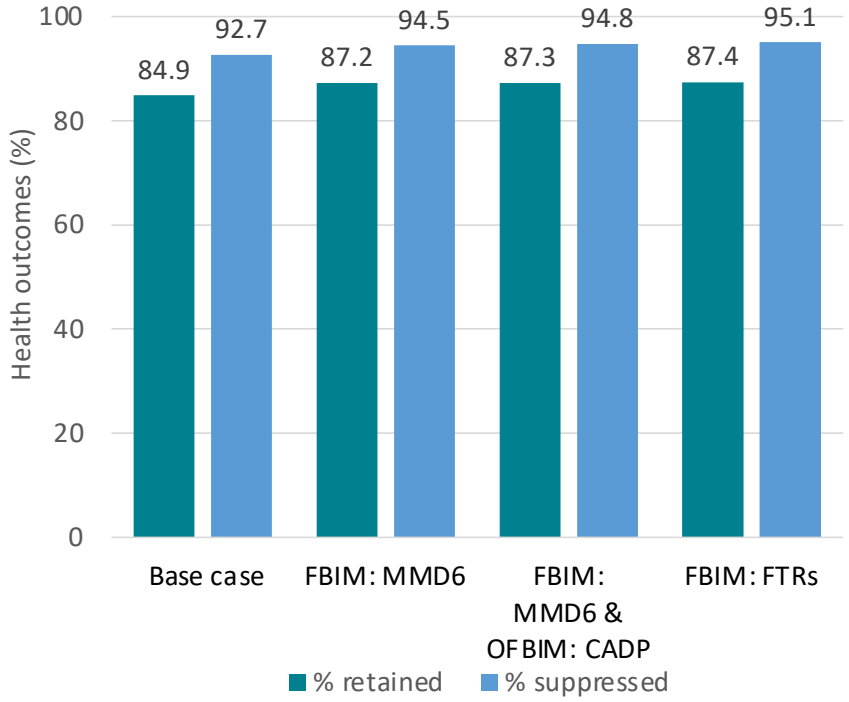


Modelled scenarios on the cost-effectiveness frontier (compared to the base case)

National Outcomes	Base case	MMD6 (%Δ)	MMD6 & CADP (%Δ)	FTRs (%Δ)
Health system costs	$92.1 mil	$80.1 mil (-13.1)	$81.6 mil (-11.4)	$83.1 mil (-9.8)
Cost to clients	$8.2 mil	$4.7 mil (-42.8)	$6.3 mil (-23.4)	$7.9 mil (-4.0)
ICER	n.a.	Cost-saving	$545	$565

Results: Health outcomes (entire ART program)

Scenarios on the cost-effectiveness frontier that generate better health outcomes than base case

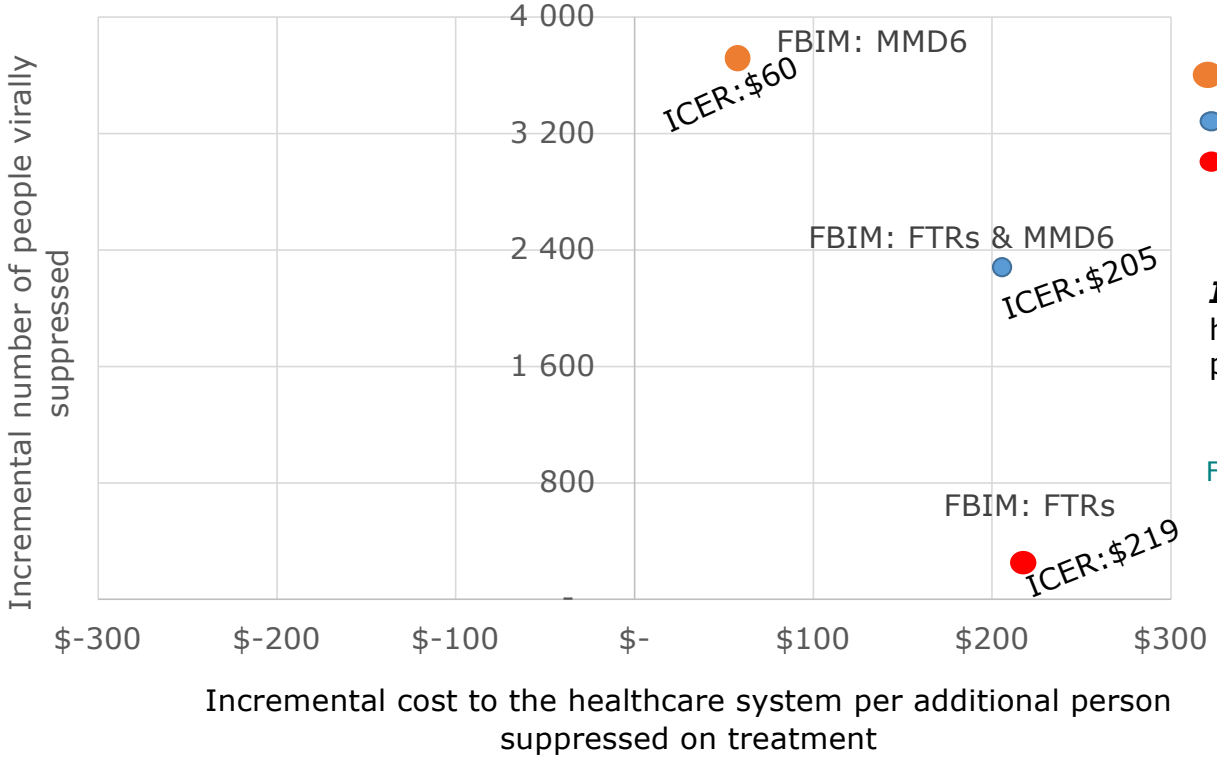


Modelled scenarios on the cost-effectiveness frontier (compared to the base case)

National Outcomes	Base case	MMD6 (%Δ)	MMD6 & CADP (%Δ)	FTRs (%Δ)
% retained	84.9	87.2 (2.3)	87.3 (2.4)	87.4 (2.5)
Number retained	718 206	738 090	738 745	739 320
% suppressed	92.7	94.5 (1.8)	94.8 (2.1)	95.1 (2.4)
Number suppressed	665 631	697 421	700 179	702 817

Results: Cost-effectiveness frontier

Cost-effectiveness frontier of scenarios that generate more suppressed individuals than base case among 15-24 year olds. (N=21 448)



All eligible ART clients in MMD6

All eligible in FTRs & MMD6

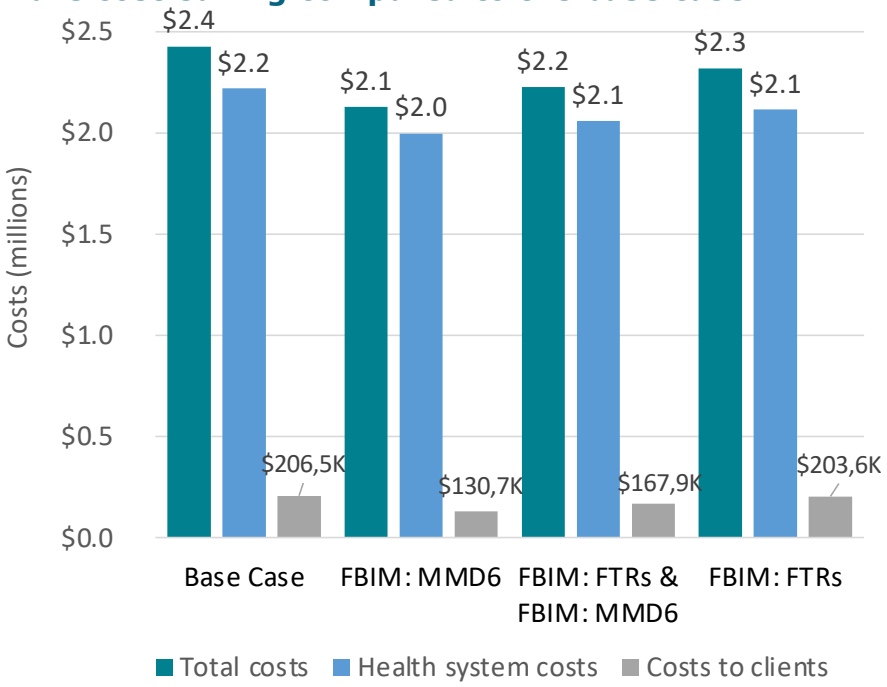
All eligible in Fast track refills

ICER: Incremental cost to the healthcare system per additional person suppressed on treatment

FBIM: Facility-based individual model
- MMD6: Six-month dispensing
- FTRs: Fast track refills

Results: Costs (targeted: 15-24 year olds)

Scenarios on the cost-effectiveness frontier that are cost-saving compared to the base case

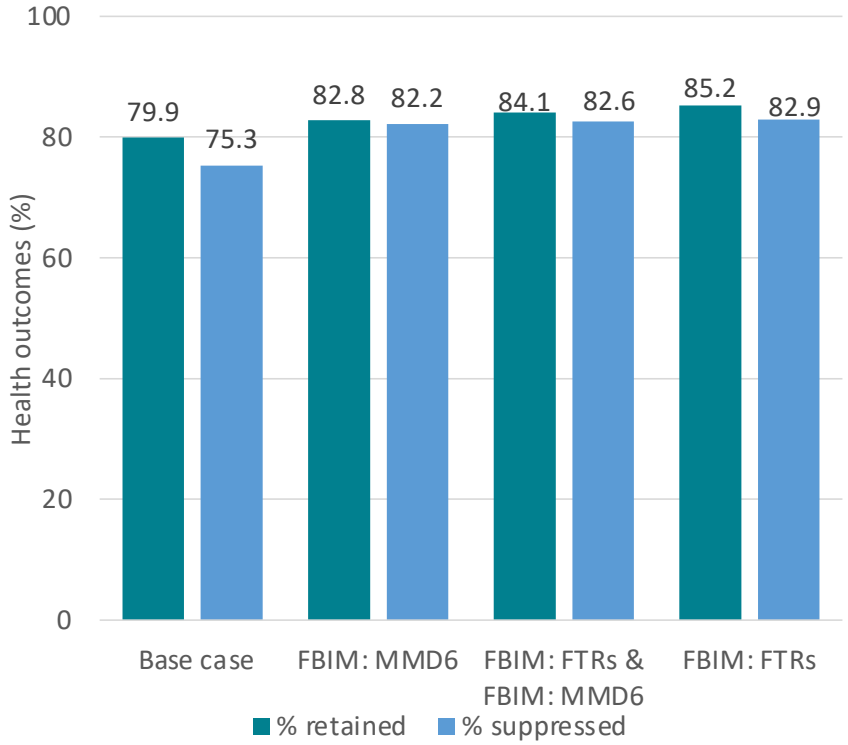


Modelled scenarios on the cost-effectiveness frontier (compared to the base case)

National Outcomes	Base case	MMD6 (%Δ)	FTRs & MMD6 (%Δ)	FTRs (%Δ)
Health system costs	$2.2 mil	$2.0 mil (-10.0)	$2.1 mil (-7.3)	$2.1 mil (-4.7)
Cost to clients	$206.5k	$130.7k (-36.7)	$130.7k (-18.7)	$203.6k (-1.4)
ICER	n.a.	$60	$205	$219

Results: Health outcomes (targeted: 15-24 year olds)

Scenarios on the cost-effectiveness frontier that generate better health outcomes than base case



Modelled scenarios on the cost-effectiveness frontier (compared to the base case)

National Outcomes	Base case	MMD6 (%Δ)	FTRs & MMD6 (%Δ)	FTRs (%Δ)
% retained	79.9	82.8 (2.9)	84.1 (4.2)	85.2 (5.3)
Number retained	17 135	17 752	18 027	18 282
% suppressed	75.3	82.2 (6.9)	82.6 (7.3)	82.9 (7.6)
Number suppressed	12 898	14 595	14 890	15 151

Conclusions

- Our model found that a combination of:
  - six-month dispensing,
  - community ART distribution points, and
  - fast-track refills

  …could optimise health outcomes and minimise costs.
- Even small improvements in health outcomes and small decreases in costs can be important!

What the ADAPT model offers

- The ADAPT model provides general guidance only:
  - It can help broadly inform policy-makers about how changes in DSD model mixes might change health and cost impacts at an aggregate level
  - It cannot determine a single “best” mix or scale of models for any specific population or setting
  - Smaller, targeted models designed by local stakeholders will still likely be needed to address the specific needs of sub-populations.
- Countries’ DSD technical working groups may wish to use ADAPT as one tool for improving HIV treatment service delivery.

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