Do DSD Models for HIV Treatment Save Money for Health Systems?

A CQUIN-AMBIT Workshop

September 22, 2020

- Please type your name, organization and email address in the chat box
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- Please ask questions to panelists in the Q&A box

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- Veuillez poser vos questions aux panélistes dans la boîte à questions et réponses

ICAP Columbia University Mailman School of Public Health

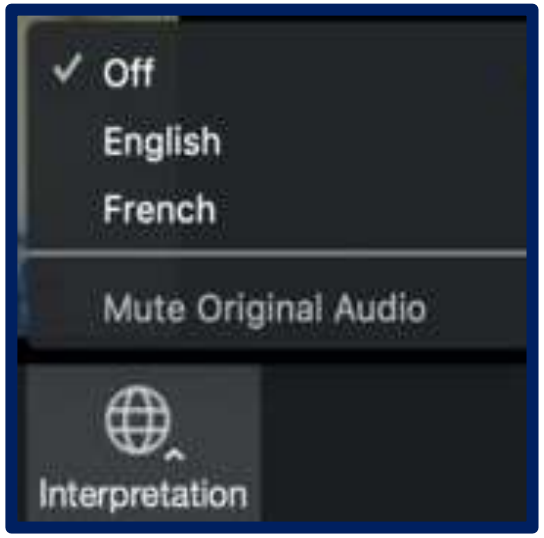
BOSTON UNIVERSITY

AMBIT

HIV LEARNING NETWORK
The CQUIN Project for Differentiated Service Delivery

Welcome/Bienvenue

- Be sure you have selected the language of your choice using the “Interpretation” menu on the bottom of your screen.
- Assurez-vous d’avoir sélectionné la langue de votre choix à l’aide du menu <<Interprétation>> en bas de votre écran Zoom.



Moderators/Modérateurs

Kate Harris
Senior Program Officer
Bill & Melinda Gates Foundation

Tom Minior
Adult Clinical Branch Chief
USAID

Audience Poll #1

- English: Do you think that less-intensive DSD treatment models cost the health system **more**, **less** or **the same** to provide compared to standard ART models?"

- French: Pensez-vous que les modèles de traitement PSD moins intensifs coûtent **plus, moins ou le même** coût au système de santé par rapport aux modèles de TARV standard?

Panelists & Agenda

Time	Session	Who
9:00 – 9:10	Introductions/welcome	Kate Harris (BMGF) and Tom Minior (USAID)
9:10 – 9:15	CQUIN opening remarks/housekeeping	Peter Preko (CQUIN)
9:15 – 9:25	Framing remarks/intro to costing	Sydney Rosen (EQUIP/AMBIT)
9:25 – 9:35	Case study #1 (Zambia)	Bevis Phiri (AMBIT)
9:35 – 9:45	Case study #2 (Uganda)	Teresa Guthrie (EQUIP)
9:45 – 9:55	Case study #3 (Zim and Lesotho)	Brooke Nichols (EQUIP/AMBIT)
9:55 – 10:05	Case study #4 (INTERVAL)	Mariet Benade (EQUIP)
10:05 – 10:15	Synthesis (“take home” messages)	Lawrence Long (EQUIP/AMBIT)
10:15 – 10:25	Q&A	Audience and presenters
10:25 – 10:50	Panel discussion	Eula Mothibi (EQUIP), Kate Ngugi (MOH Kenya), Josen Kiggundu (MOH Uganda), Anna Grimsrud (IAS)
10:50 – 11am	Wrap up	Kate Harris and Tom Minior

Presenters/Présentateurs

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ICAP Eswatini
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Sydney Rosen
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Research Fellow
EQUIP
Boston University

Lawrence Long
Assistant Professor
EQUIP/AMBIT
Boston University

Why Are We Here?

Sydney Rosen
AMBIT and EQUIP Projects
Boston University and HE^{2}RO

Why Are We Here?

(Not an existential question….)

- Introductions: The EQUIP and AMBIT Projects
- The importance of knowing the costs of DSD models
- Some definitions and methods

Introductions

Introducing us

- Boston University School of Public Health, Department of Global Health (BU)
  - 20 years' experience in research on HIV outcomes, benefits, costs, CE, and service delivery
  - Team includes ≈10 faculty-level health economists and epidemiologists.
  - http://sites.bu.edu/hiv/
- Health Economics and Epidemiology Research Office (HE^2RO), University of the Witwatersrand
  - Established in 2003 as a collaboration between Boston University and Wits University
  - ≈ 70 staff (research, research support, administrative)
  - Work ranges from outcomes analysis to costing and cost-effectiveness analysis to program evaluation and policy recommendations, primarily but not solely on HIV.
  - https://www.heroza.org/

The EQUIP and AMBIT Projects

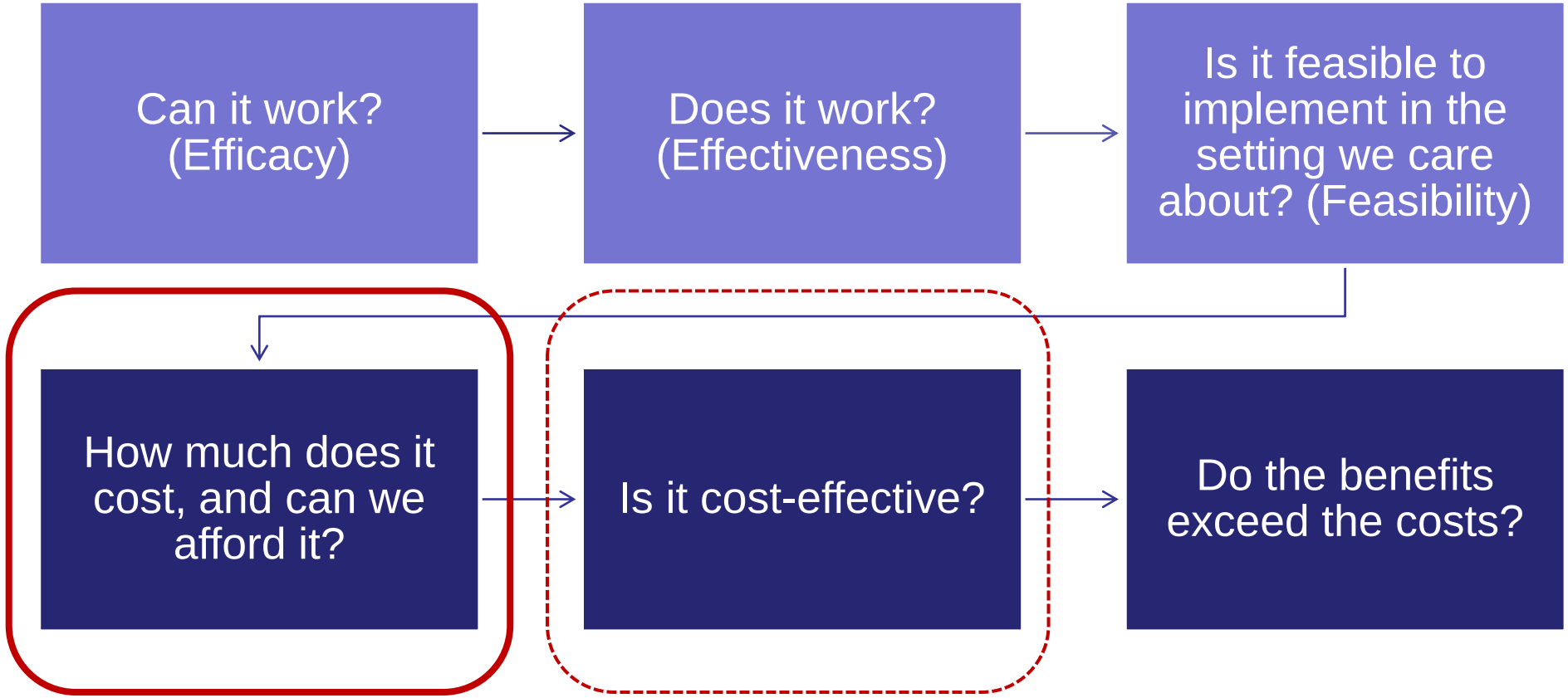
- EQUIP
  - USAID-sponsored consortium led by Right to Care in South Africa, 2016-2020
  - Overall objective was to support governments and partners to strengthen HIV interventions in PEPFAR priority countries
  - Included multiple implementation and evaluation activities pertaining to DSD models for HIV treatment, including cost analyses in Zambia, Uganda, Lesotho, Zimbabwe, and Malawi
- AMBIT (Alternative Models of ART Delivery: Optimizing the Benefits)
  - Project to describe the scale, diversity, benefits, and costs of DSD models for HIV treatment and to identify optimal allocation of resources and models
  - Activities include analysis of routine data, new data collection, and mathematical modeling
  - Three focus countries: Malawi, South Africa, and Zambia
  - All outputs available at https://sites.bu.edu/ambit/project-documents/

The Importance of Cost Data

Why Should We Care About Costs?

- Most countries are under pressure to offer HIV treatment to more patients if they are to achieve the 95-95-95 targets
- Resources available (funding + human and infrastructure capacity) are flat or declining, and there are more competing demands than ever before, even within the health sector
- If we can reduce the resource utilization/patient, then more patients can be treated with the same resources (or other good things can be done with those resources: education, housing, etc.)
- HIV treatment programs are relatively massive, and small improvements in resource allocations within them can save and improve millions of lives.
- Understanding the costs and potential cost savings (if any) from DSD models has been a long-standing priority of CQUIN participants and other DSD stakeholders.

Within the world of evaluation…



Source: Drummond et al, *Methods for the Economic Evaluation of Health Care Programmes*, 2005

Objectives of Work To Be Presented Today

- Expectations for differentiated models of service delivery for HIV treatment include:
  - Better or equivalent clinical outcomes;
  - Greater patient and provider satisfaction;
  - **Lower health system costs per patient served; and**
  - **Savings in out-of-pocket and opportunity costs to patients.**
- Little information has been available about health system costs, and no empirical estimates based on routine implementation of DSD models
- Estimates made in advance generally predict small reductions in costs to health systems per patient enrolled in a DSD model, but we know that ***implementation often diverges from guidelines***
- Existing data show substantial savings for patients, but data are limited
- Our goal was to **estimate actual costs**, in as close to routine care circumstances as possible, in multiple countries

Some Definitions and Methods

What is a cost?

- Costs start with **resources**: anything tangible or intangible used to produce the outcome of interest (usually viral suppression).
- For HIV treatment, resources used by the health system can include:
  - ✓ ARV medications
  - ✓ Other medications
  - ✓ Laboratory tests
  - ✓ Clinic visits
  - ✓ DSD model interactions outside the clinic
  - ✓ Counseling and educational sessions
  - ✓ Clinic and community infrastructure
  - ✓ Program management
  - ✓ Any other services provided or things used that help produce the observed outcomes
- Resources needed for HIV treatment also include the patient's time and transport fares (and potentially other things)
- We then estimate how much money is needed to make or obtain one unit of each resource (e.g. a nurse's monthly salary is the amount of money needed to obtain one month of the nurse's time).
- **Cost** = number of units of each resource used x monetary cost per unit.

Methodology for health system cost estimates

- ”Provider” = healthcare system
- Identify cohort of patients enrolled in the models of interest at a sample of study sites
- Follow them in their medical records for 12 months and extract:
  - Outcomes at 12 months after model enrollment (retained in care or not, suppression or not)
  - All resources used over same 12 months (medications, lab tests, clinic visits, DSD interactions, infrastructure, etc.)
- From the study sites and other sources, collect unit costs for all the resources
- For each patient, multiple the quantities of resources used x the unit costs to get an <u>average cost per patient</u>
- “<u>Production cost</u>” = all costs for the cohort divided by number of patients retained
  - Example: 200 patients in cohort; 160 retained (80%); total cost = $20,000. Then:
    - Average cost/patient =$20,000/200 = $100
    - Production cost = $20,000/160 = $125

A critical observation about DSD model costs

Conventional care

Lots of stable, adult patients who cost $100/patient each in conventional care

+

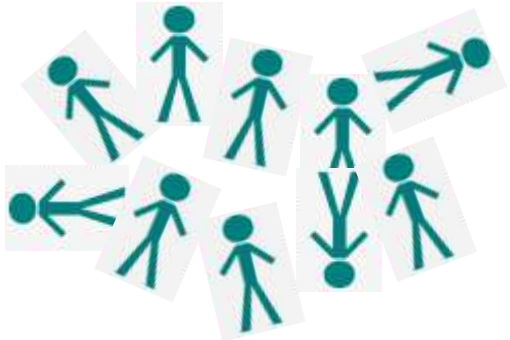
A few newly initiated, complicated, unsuppressed, and/or non-adult patients who cost $200/patient each in conventional care

=

Average cost /ART patient = $123

This is the right comparison.

Differentiated care



Stable, adult patients moved to DSD model. DSD model average c per patient = $90.

+

omplicated patients remain in conventional care. Conventional care average cost per patient = $200.

=

Average cost/ART patient = $115

This is NOT the right comparison.

No surprise that low-cost, stable patients continue to be low- cost and stable. Budget estimates should account for an entire population of patients, not just the least expensive ones!

A few other considerations before the data…

- Monetary costs capture only part of what we really care about.
  - Would like to know how DSD models affect healthcare system capacity and quality; even if cost per patient decreases, pro-active management is needed to improve capacity and quality.
- Costs are context-specific; the same model may have very different costs in different settings.
- Comparison of costs and cost-effectiveness analysis only make sense if the models being compared can substitute for one another.
  - Whether or not a model “saves” money compared to standard of care will also depend heavily on the characteristics of the relevant standard of care at that place and time.
- Up next: results of five studies of DSD model outcomes and costs, including two observational evaluations of routine implementation and three cluster-randomized trials.
  - In the three trials, patient costs are also reported.

On to the Show!

Costs and Outcomes of DSD Models for HIV Treatment in Zambia

Bevis Phiri

September 2020

Methods: Details for Zambia

- DSD models for ART in use between 2014 and 2018
- Compared each model to conventional care at a matched cohort/site without DSD options.
- Primary outcome = retention at 12 months after enrollment in DSD model or eligibility for enrollment (facility visit 9-15 months).
  - Very few patients had viral load test results in their record.
- Data from:
  - SmartCare (Zambia's EMR)
  - Own unit cost estimates
- Where non-clinic interactions were missing from SmartCare, we modeled 2 scenarios:
  - 1) Full number of recommended DSD interactions (high cost)
  - 2) DSD interactions proportionate to clinic visits (low cost)

Models evaluated for Zambia

Model	Type of model	Location of service delivery	Clinic visits/year	Other visits/year	Total interactions/ year
Conventional care	Individual	Facility	4	0	4
Mobile ART services*	Individual	Community	0	6 (rural health centre visits)	6
Home ART delivery	Individual	Home	1-2	4 (home visits)	5-6
Urban adherence groups (UAGs)	Group	Facility	2	4-6 (group at facility)	6-8
Community adherence groups (CAGs)	Group	Community	2	12 (CAG meetings)	14

Note: Newer models, including 6-month dispensing, fast-track refills, and CCMDD, were not evaluated, as implementation was too recent. In principle, 6-month dispensing can be combined with any other model for stable patients

**This model enrolled patients just starting ART, rather than ART-experienced, stable patients*

Zambia sample characteristics

Model	Conventional*	Mobile delivery	Home delivery	UAGs	CAGs
N	1174	216	169	193	754
% female	71%	67%	74%	72%	70%
Median age at DSD enrollment (years)	40†	36	42	41	41
Time on ART at baseline (years)	4	0	4	6	6
% urban	69%	0%	31%	100%	91%

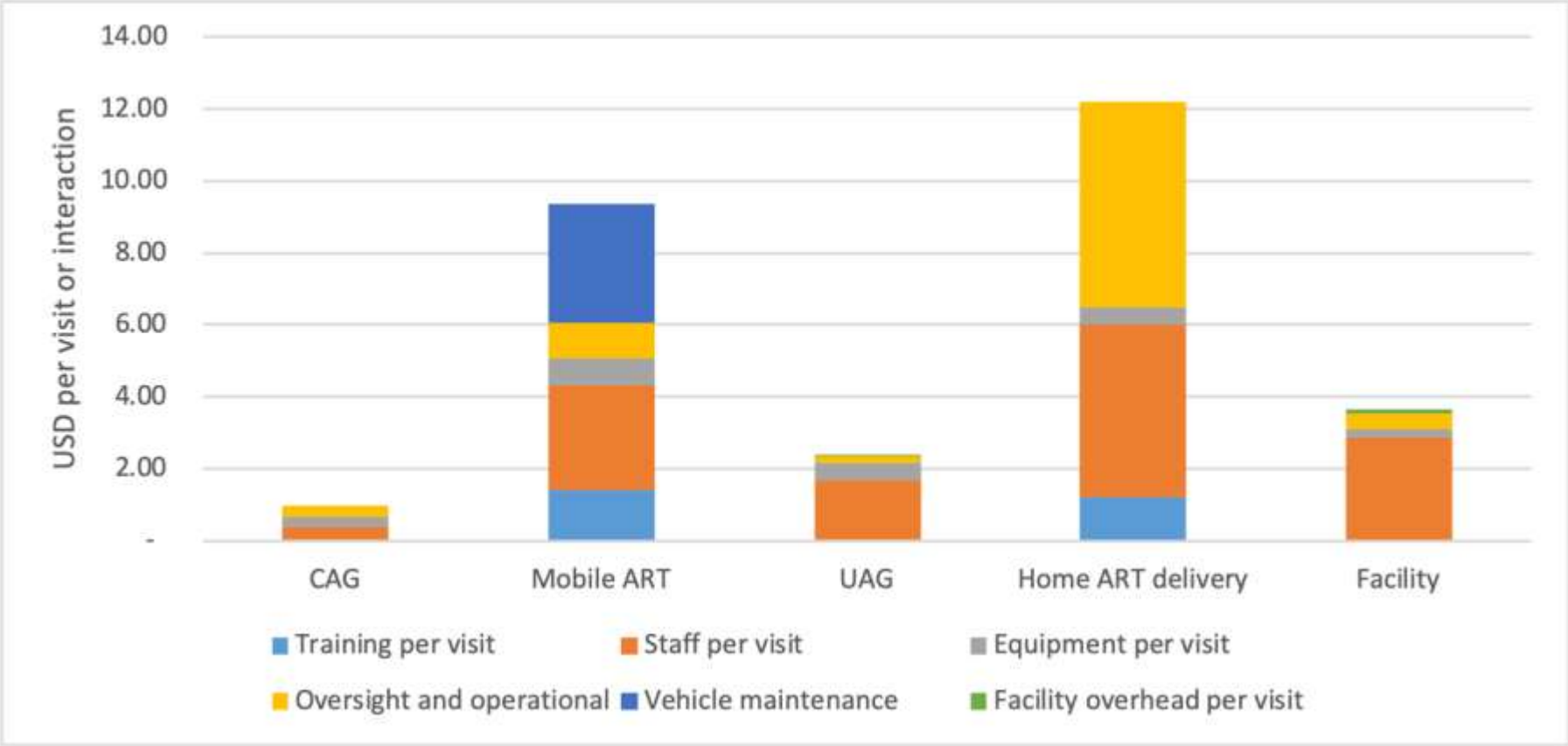
*Matched sample of patients in conventional care at healthcare facilities without DSD models
†Median age at which conventional care patients would have been eligible for other models
UAG=Urban adherence group, CAG=community adherence group

Outcomes in Zambia

Model	Retained at 12 months
Conventional care	81%
Mobile ART services	69%*
Home ART delivery	79%
Urban adherence groups (UAGs)	95%
Community adherence groups (CAGs)	83%

**This model enrolled patients at ART initiation, rather than ART-experienced, stable patients*

Cost/interaction, Zambia



Note: X-axis reflects kinds of interactions, not models; some non-conventional models include facility visits
UAG=Urban adherence group, CAG=community adherence group

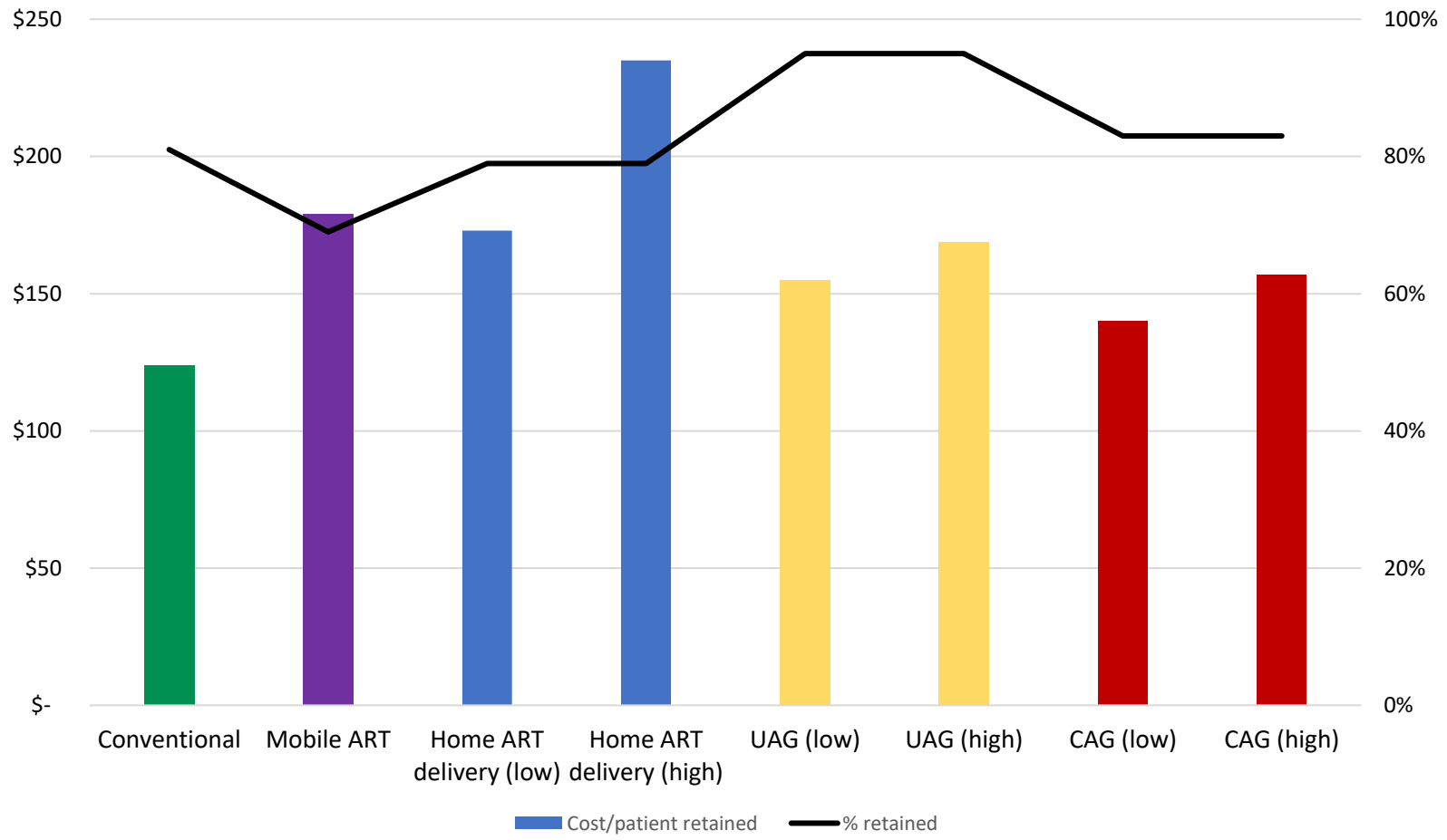
Cost per patient per year

Component	Conventional (n=1,174)	Mobile ART (n=216)	Home ART delivery (n=169)	UAG (n=193)	CAG (n=754)
ARVs	$88	$73	$88 - $127	$102 - $115	$89 - $101
Non-ARV medications	<$1	$3	<$1	<$1	<$1
Laboratory tests	$5	missing	$5	$23	$7
Facility visits (pharmacy)	$4	N/A	$3	$6	$4
Facility visits (non-pharmacy)	$5	N/A	$1	$5	$6
DSD interactions	N/A	$46	$41 - $51	$11	$10 - $12
Total cost per patient (high)	$100	$122*	$186	$160	$130
Total cost per patient (low)	$100	$122*	$137	$147	$116

**$127 /patient/year if we assume laboratory costs equal to conventional care.*

UAG=Urban adherence group, CAG=community adherence group

Production cost/patient retained, Zambia



UAG=Urban adherence group, CAG=community adherence group

Conclusions

- In Zambia, conventional care costs less than any of the alternative models (and cost will probably fall further with 6-month dispensing)
- Standard cost-effectiveness comparisons are not valid in a study like this
  - The unit of effectiveness (a retained patient) is not uniform across models, in terms of patient characteristics
  - The models are not fully interchangeable—a rural patient cannot participate in an urban adherence group, for example
- Monetary costs do not capture what we might care about most—reallocation of resources to increase efficiency

Acknowledgements

With thanks to:

- Patients and implementing partners who participated in the evaluation
- Ministry of Health, Zambia
- EQUIP Project
- Right to Care/Zambia
- HE^{2}RO (Wits University)
- USAID
- PEPFAR
- AMBIT Project
- Bill & Melinda Gates Foundation

EQUIP Uganda: Costs & Outcomes of Differentiated Models of ART Delivery in Uganda

Teresa Guthrie

September 2020

Differentiated ART models evaluated in Uganda

Model	Type of model	Location of service delivery	HCW-led vs peer-led	Population targeted	Facility visits / year	DSD interactions/ year	Total interactions / year
Facility-based individual management (FBIM)	Individual	Facility	HCW	New initiates, complicated patients, non-suppressed	8	0	8
Facility-based group (FBG)	Group	Facility or community	HCW or peer	Clients needing social support (e.g. adolescents, PLW)	9	7	16
Fast track drug refill (FDR)	Individual	Facility	HCW	Stable patients (can include 2L patients)	6	0	6
Community client-led ART delivery (CCLADs)	Group	Community	Peer	Stable patients (can include 2L patients)	6	2	8
Community drug distribution points (CDDPs)	Individual	Community	HCW	Stable patients (can include 2L patients)	6	2	8

Longer appointment spacing and multi-month scripting are offered to stable clients in all models.

Methods

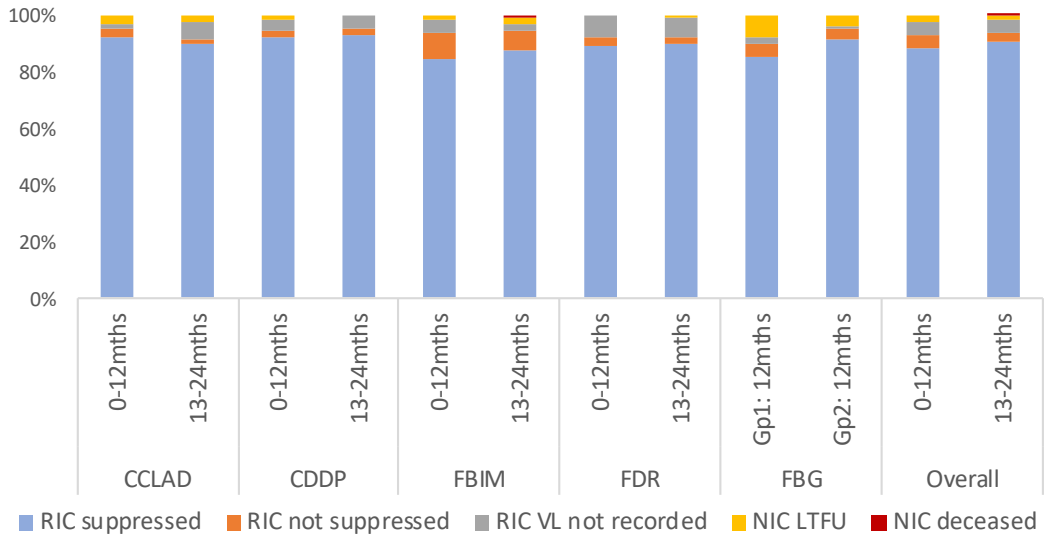
- Step-down costing for implementing partners' (IP) operational costs at and above site; micro-costing for patients' direct resource costs.
- 24 months of data collected from 20 DSDM sites, including all 5 DSDM type, through review of a cohort of patients' ART cards and DSDM registers, IP expenditure records, and interviews.
- Direct patient resource utilization included ARVs and non-ARV medications, lab tests, OI/co-morbidities prevention and treatment, facility visits, counselling sessions and DSDM events (interactions).
- Health system costs only and presented in US$ 2018.
- Outcome reported = viral suppression at 12 and 24 months.
- Records not available for patients who died; outcomes and costs include only those retained in care or lost to follow up (but not known deceased).
- DSDM registers of clients and events were poorly maintained; some resource utilization data for DSDM events (interactions) may be incomplete.

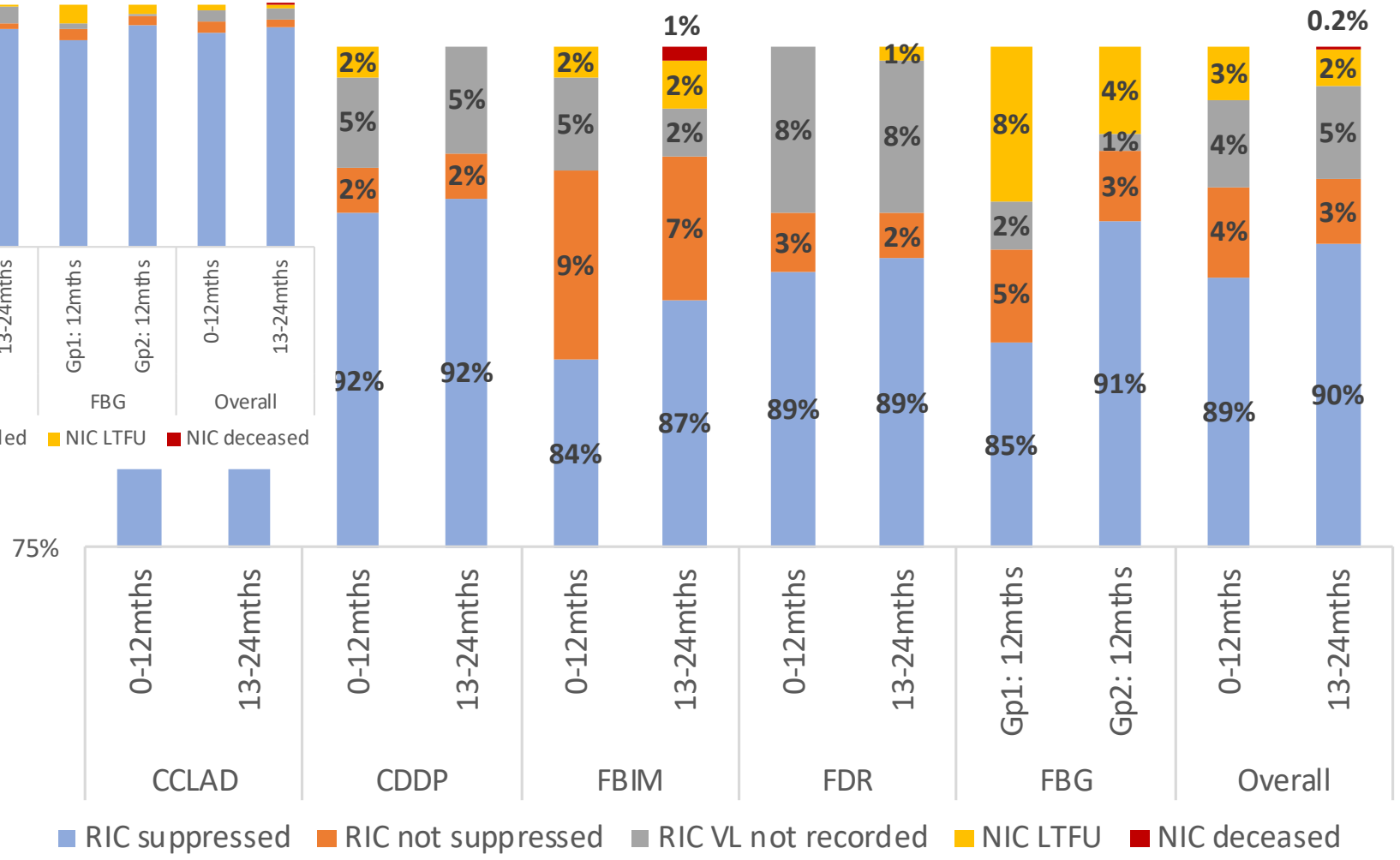
Cohort Description

Sample characteristics (n, % unless otherw specified)	CCLAD (n=131)	CDDP (n=132)	FBG1* (n=129)	FBIM (n=128)	FDR (n=133)	Total (n=653)
Sex (female)	92 (70%)	95 (72%)	129 (100%)	82 (64%)	75 (56%)	473 (72%)
Age, years (median, IQR)**	44 (40-49)	44 (38-52)	29 (25-34)	41 (34-55)	44 (35-55)	41 (32-48)
Age group						
18-24 years	2 (1.5%)	3 (2%)	23 (17.9%)	2 (1.6%)	15 (11.2%)	45 (6.8%)
25-49 years	95 (72.5%)	90 (68%)	104 (80.5%)	93 (72.6%)	81 (61%)	463 (71%)
50+ years	34 (26%)	39 (30%)	2 (1.6%)	33 (25.8%)	37 (27.8%)	145 (22.2%)
Duration on ART, years (median, IQR)**	5 (2-8)	7 (5-10)	2 (1-3)	3 (2-5)	8 (5-10)	5 (2-8)
Duration in DSDM, years (median, IQR)**	1 (1-1)	1 (1-6)	1 (1-1)	3 (2-5)***	2 (1-4)	1 (1-3)
Clients on first-line regimens**	124 (95%)	121 (92%)	120 (93%)	117 (91%)	111 (83%)	593 (91%)
Clients on second-line regimens**	7 (5%)	11 (8%)	9 (7%)	11 (9%)	22 (17%)	60 (9%)
Baseline CD4 count, cells/µl (median, IQR)****	221 (128-353)	210 (143-328)	433 (250-629)	310 (199-430)	234 (118-349)	272 (152-414)

*FBG2 clients' characteristics were similar to FGB1, therefore are not shown here.
**Age, duration on ART, duration on DSDM and regimen are measured at the time of enrollment in the study (January 2017).
***For FBIM, the duration on DSDM is equivalent to the duration on ART.
****Baseline CD4 count at time of ART initiation. Data missing for <10% of clients in all models.
Percentages are rounded and therefore may not always sum to 100%.

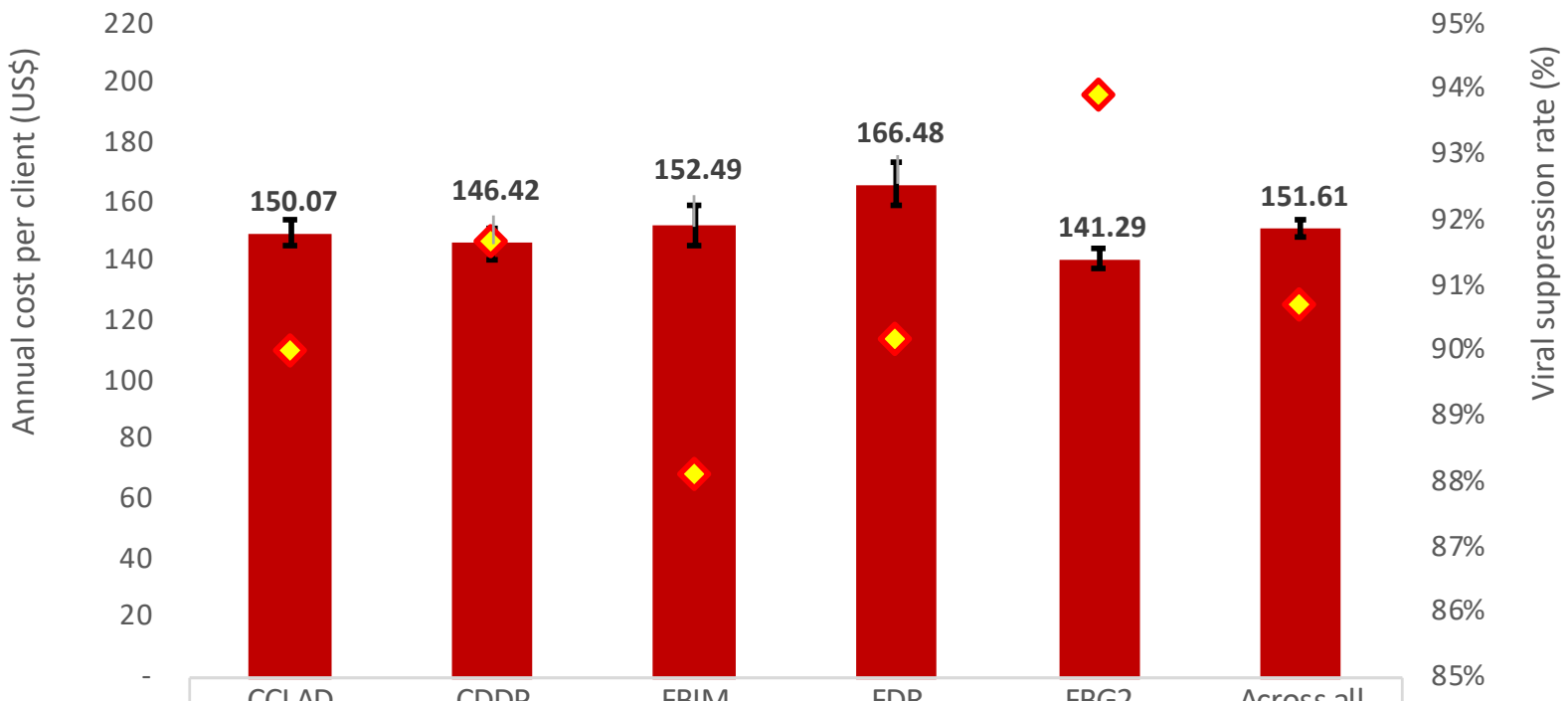
Results: Viral suppression rates (%)





CCLAD: Community client-led ART delivery. CCDP: Community drug distribution points.
FBIM: Facility based individual management. FBG: Facility based groups. FDR: Fast drug refill.

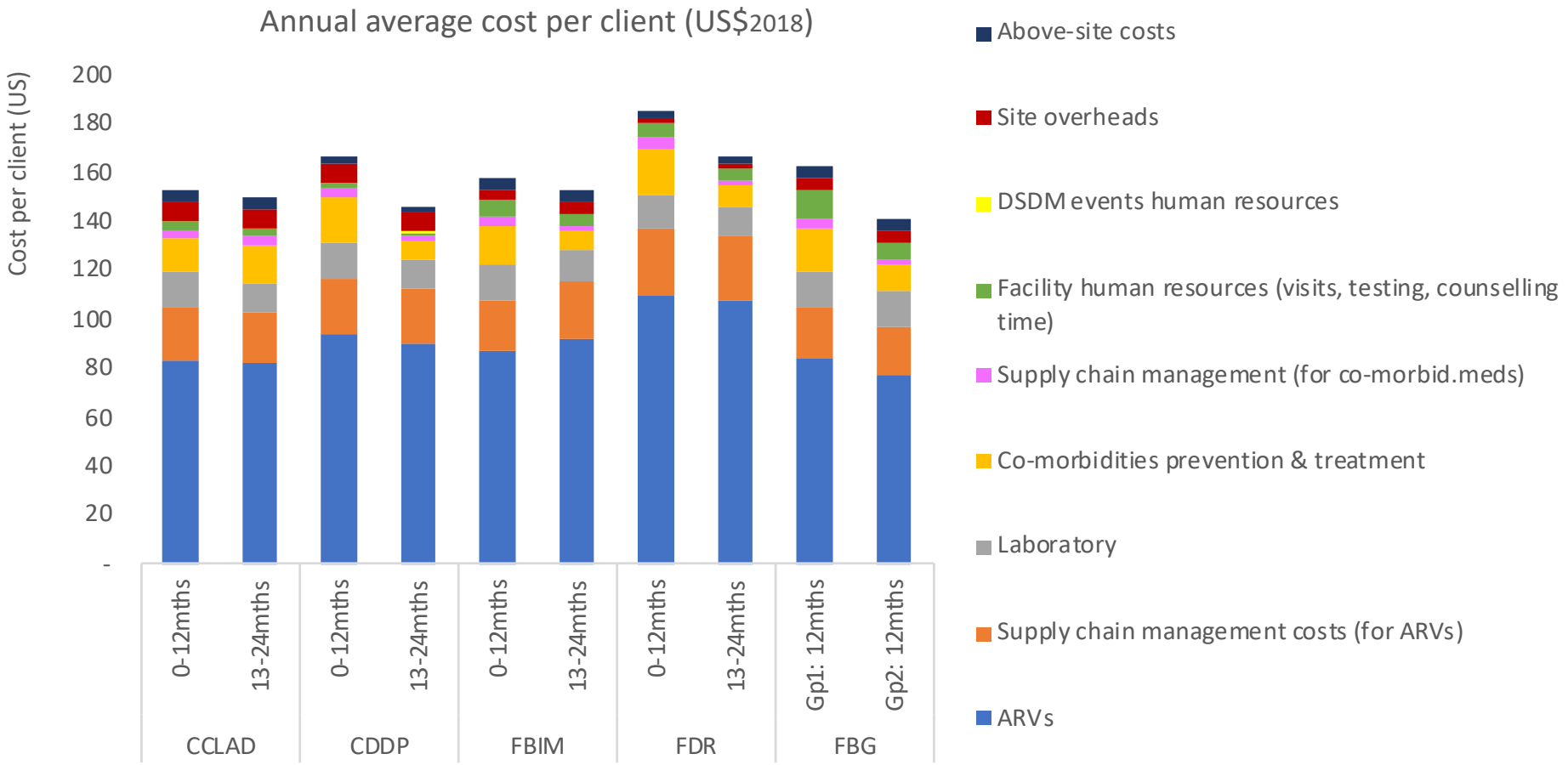
Results: Costs: Average cost per client and viral load outcome (at 24mths, US$2018, %)



	CCLAD	CDDP	FBIM	FDR	FBG2	Across all
13-24mth costs	150.07	146.42	152.49	166.48	141.29	151.61
Viral suppression rate at 24mths	90%	92%	88%	90%	94%	91%

CCLAD: Community client-led ART delivery. CCDP: Community drug distribution points.
FBIM: Facility based individual management. FBG: Facility based groups. FDR: Fast drug refill.

Results: Average cost per client per DSDM by cost component (US$2018)



CCLAD: Community client-led ART delivery. CCDP: Community drug distribution points.
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Conclusions

- The new DSDMs are not cheaper than the standard of care (FBIM) – costs across models were similar
- They are not substitutes for each other, but serve different patient needs, preferences, and settings
- They may be more acceptable to clients (not measured here but important to consider)
- The main cost drivers for all the models are the ARVs (& their supply chain management costs) and laboratory costs (the latter being mostly viral load costs) – reducing these prices could bring the greatest savings
- All the models had second-line clients, with FDR highest portion (17%) which increased their cost/patient, followed by FBIM (9%) which was slightly higher than the remaining models (5-8%)
- The **DSDM events** (mostly human resource costs) were a very small portion of the costs, and decreased between the two years

Thank you

Investigating institutions:

- EQUIP (Right to Care, Boston University, HE^{2}RO & HealthNet Consult)
- Research team: Teresa Guthrie, Charlotte Muheki, Lawrence Long, Christabel Bakiza, Arnold Taremwa, Shiba Rwakakooko, Stephen Lagony, Felix Rutaro, Raymond Maganyiro, Leah Kyomugisha, Jacqui Miot, Ross Greener, Thembi Xulu, Sydney Rosen

- Collaborators
  - Ministry of Health Uganda
  - Public health facilities
  - USAID/CDC
  - Implementing partners - thanks to all the staff who were so helpful in finding client records and answering questions

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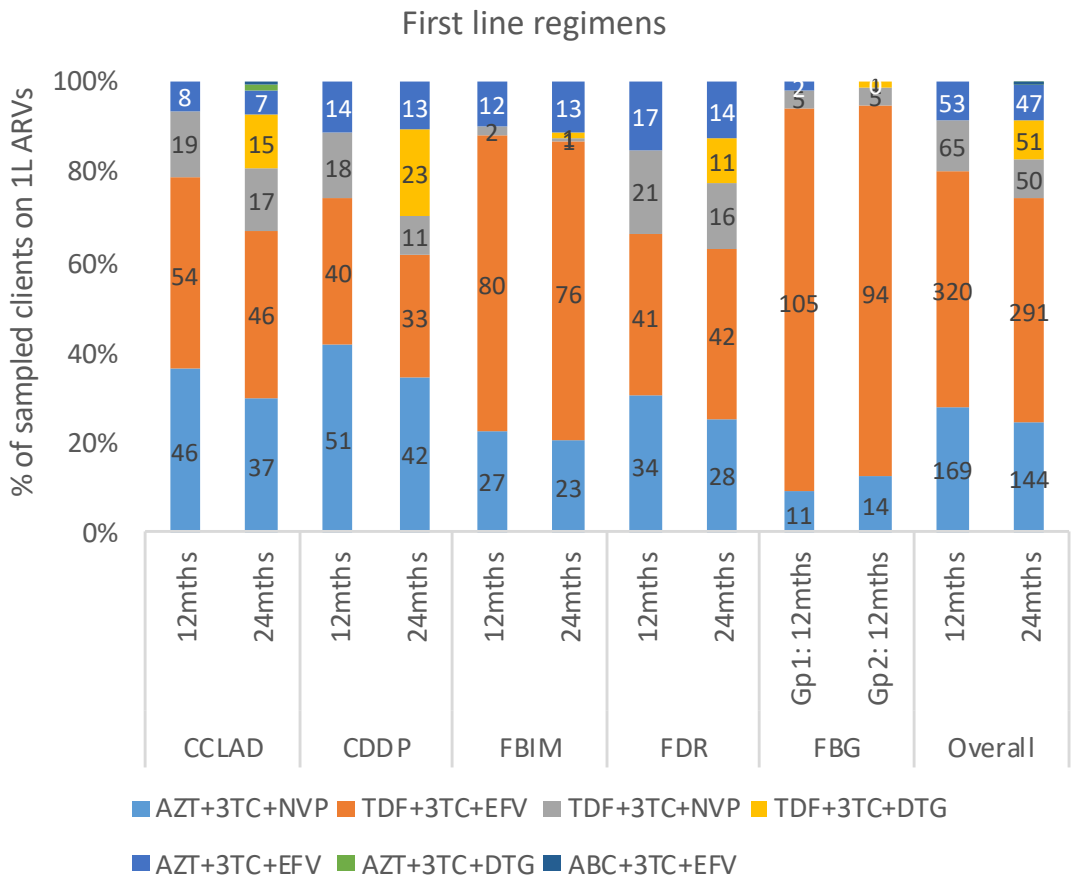
Appendices

Clients' regimens by 1L & 2L

(at 12mths & 24mths after enrolment in study, only 12mths for 2 FBG groups)



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Appendices

Clients' regimens by 1L & 2L, and cost per day (US$2018)

(at 24mths after enrolment in study, end of 2018)

Regimen (at end of 2nd 12mth period)	ARV cost /client /day	CCLAD (n=130)	CDDP (n=132)	FBG2 (n=115)	FBIM (n=126)	FDR (n=132)	Overall (N=635)
First line regimens	$	%	%	%	%	%	%
AZT+3TC+NVP	$ 0.20	28%	32%	12%	18%	21%	22.7%
TDF+3TC+EFV	$ 0.21	35%	25%	82%	60%	32%	45.8%
TDF+3TC+NVP	$ 0.21	13%	8%	4%	1%	12%	7.9%
TDF+3TC+DTG	$ 0.27	12%	17%	1%	1%	8%	8.0%
AZT+3TC+EFV	$ 0.28	5%	10%	0%	10%	11%	7.4%
AZT+3TC+DTG	$ 0.30	1%	0%	0%	0%	0%	0.2%
ABC+3TC+EFV	$ 0.31	1%	0%	0%	0%	0%	0.2%
Second line regimens							
TDF+3TC+ATV/r	$ 0.64	1%	2%	1%	4%	3%	2.2%
AZT+3TC+ATV/r	$ 0.67	0%	1%	0%	2%	2%	0.8%
ABC/3TC/ATV/r	$ 0.71	2%	1%	0%	0%	6%	1.7%
TDF+3TC+LPV/r	$ 0.75	2%	2%	0%	3%	3%	2.0%
ABC/3TC/LPV/r	$ 0.82	0%	0%	0%	0%	2%	0.3%
AZT+3TC+LPV/r	$ 0.78	1%	2%	0%	1%	1%	0.8%
Regimen, numbers of clients (n) %							
1st line		95%	92%	99%	90%	84%	92%
2nd line		5%	8%	1%	10%	16%	8%

CCLAD: Community client-led ART delivery. CCDP: Community drug distribution points.
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Appendices

ARV formulation cost per annum (US$2018)

First-line ARV regimens (fixed-dose combinations)	12 month supply***
AZT/3TC/NVP	73.61
TDF/3TC/EFV	76.04
TDF/3TC/NVP	77.26
TDF/3TC/DTG	99.16
AZT/3TC/EFV	100.38
ABC/3TC/EFV	114.37
ABC/3TC/DTG	124.71
Second-line regimens	**12 month supply*** **
ABC/3TC/NVP	102.81
AZT/3TC/DTG	110.72
TDF/3TC/ATV/r	231.78
AZT/3TC/ATV/r	243.33
ABC/3TC/ATV/r	257.33
TDF/3TC/LPV/r	274.48
AZT/3TC/LPV/r	286.04
ABC/3TC/LPV/r	300.03

Appendices

Annual diagnostic utilisation (0-12mths & 13-24mths after enrolment in study)

Test/client/annum	CCLAD (n=131)	CDDP (n=132)	FBG1 (n=129)	FBIM (n=128)	FDR (n=133)	Total (n=653)
Months 0-12						
Viral load*	1.15	1.18	1.09	1.05	1.02	1.09
Haemoglobin	0.34	0.05	0.21	0.01	0.03	0.13
CD4 count	0	0	0.02	0.05	0.11	0.04
TB sputum	0.01	0.02	0.05	0.03	0.05	0.03
All other tests	0.5	0.17	0.91	0.29	0.26	0.43
Total tests/client	1.98	1.42	2.27	1.43	1.46	1.71
Total non-VL tests/client	0.84	0.24	1.19	0.38	0.44	0.62
Months 13-24			**FBG2 (n=115)**			
Viral load*	0.83	0.92	1.15	0.98	0.92	0.95
Haemoglobin	0.13	0	0.2	0.02	0.01	0.07
CD4 count	0.04	0	0	0.04	0.01	0.02
GeneXpert **	0.01	0.01	0.01	0.02	0.02	0.01
All other tests	0.25	0.05	0.33	0.2	0.11	0.18
Total tests/client	1.25	0.97	1.69	1.26	1.07	1.24
Total non-VL tests/client	0.42	0.05	0.54	0.29	0.15	0.28
% change in frequency of all tests between periods	-37%	-32%	-26%	-12%	-27%	-27%

* Viral load test frequency is guided by the MOH Treatment Guidelines. Other tests are done if clinically indicated.

** GeneXpert TB tests were only reported in second study period.

CCLAD: Community client-led ART delivery. CCDP: Community drug distribution points.
FBIM: Facility based individual management. FBG: Facility based groups. FDR: Fast drug refill.

Costs and Outcomes of DSD Models in Lesotho and Zimbabwe: Economic Evaluations of Two Cluster Randomized Trials

Brooke Nichols

September 2020

Background

- Two cluster-randomized trials of DSD models in Lesotho and Zimbabwe conducted by EQUIP.
- Each trial included three arms: standard of care, 3-month dispensing, and 6-month dispensing, with different approaches to service delivery by arm
- Primary outcome was non-inferiority of retention in care at 12 months; cost to the health system and cost to the patient were secondary outcomes
- Health system costs included ARVs, viral load tests, health facility visits, and DSD interactions
- Patient costs (from questionnaires) included cost of transport to facility and DSD interactions; opportunity costs were assumed to be daily minimum wage by country (1 day for facility visit, 0.25 for DSD interaction).
- More information https://pubmed.ncbi.nlm.nih.gov/32665460/ and https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7172979/

Methods: Trial arms

Arm	Zimbabwe	Lesotho
Arm 1	Standard of care (3 month refills at the facility) N=1,919	Standard of care (3 month refills at the facility) N=1,898
Arm 2	ART delivered 3-monthly in Community ART Refill Groups (CARGs) N=1,335	ART delivered 3-monthly in Community Adherence Groups (CAGs) N=1,558
Arm 3	ART delivered 6-monthly in Community ART Refill Groups (CARGs) N=1,546	ART delivered 6-monthly through community-based distribution points N=1,880

Fatti et al., JAIDS 2020; Tukei et al., JAIDS 2020

Model characteristics

Model	Location of care	Model type	HCW-led vs peer-led	Clinic visits/year	Other visits/year	Total interactions/ year
Both						
Conventional care	Facility	Individual	HCW	4	0	4
Zimbabwe						
3-month CARG	Community	Group	Peer	1-2	4 (CARG meetings)	5-6
6-month CARG	Community	Group	Peer	1-2	2 (CARG meetings)	3-4
Lesotho						
3-month CAG	Community	Group	Peer	1	3 (CAG meetings)	4
6-month community dispensing	Community	Individual	HCW	1	1 (community-based visit)	2

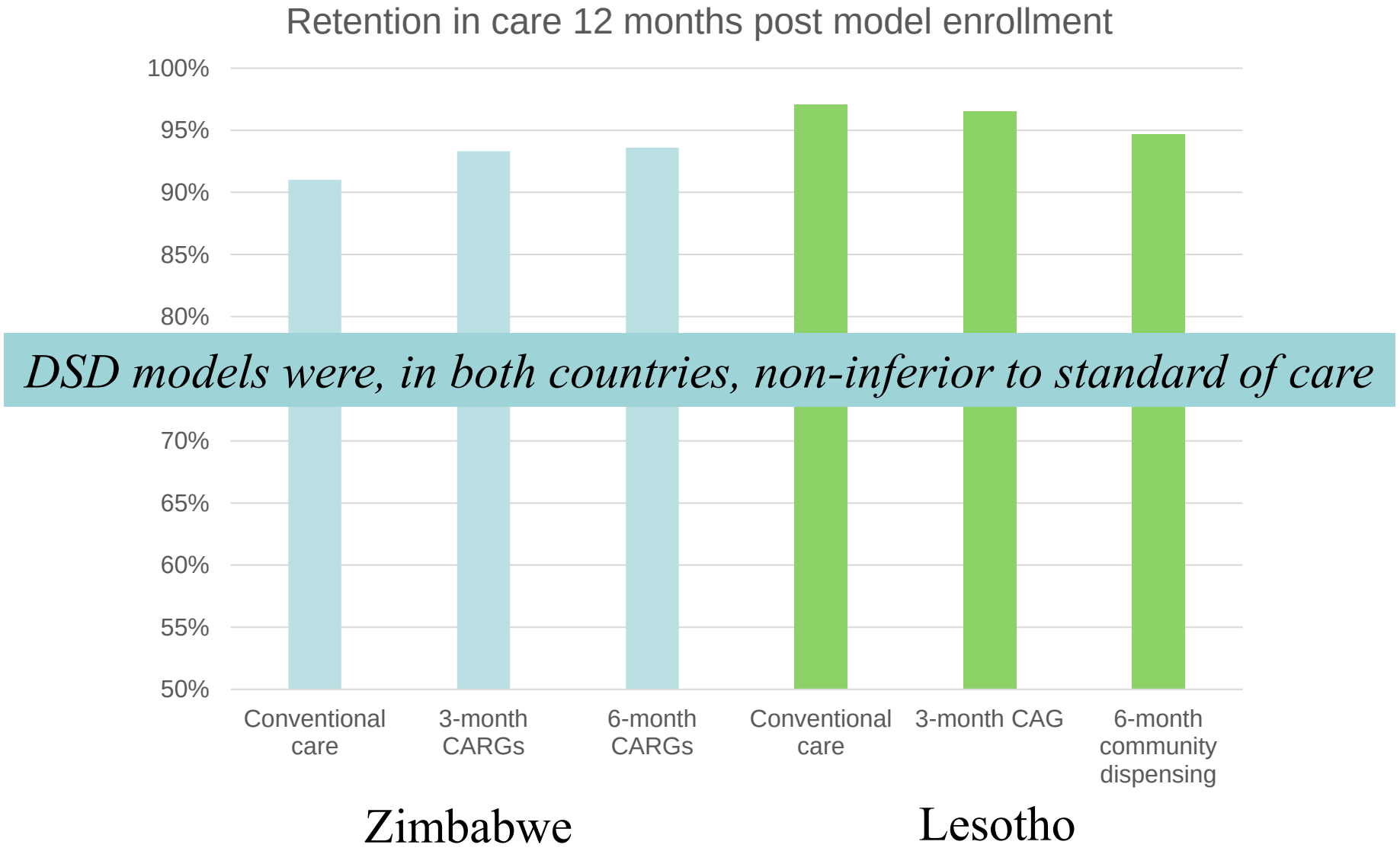
Results: Unit costs

Cost categories	Zimbabwe	Lesotho
Facility visit	$4.62*	$5.58
CAG/CARG interaction	$1.88*	$2.77
Community distribution visit	-	$5.78
Viral load test	$14.42**	$22.64
Monthly cost of first-line ART	$13.81**	$7.38

*Based on unit costs from Lesotho and Zambia
**Mavhu et al. Lancet Global Health 2020

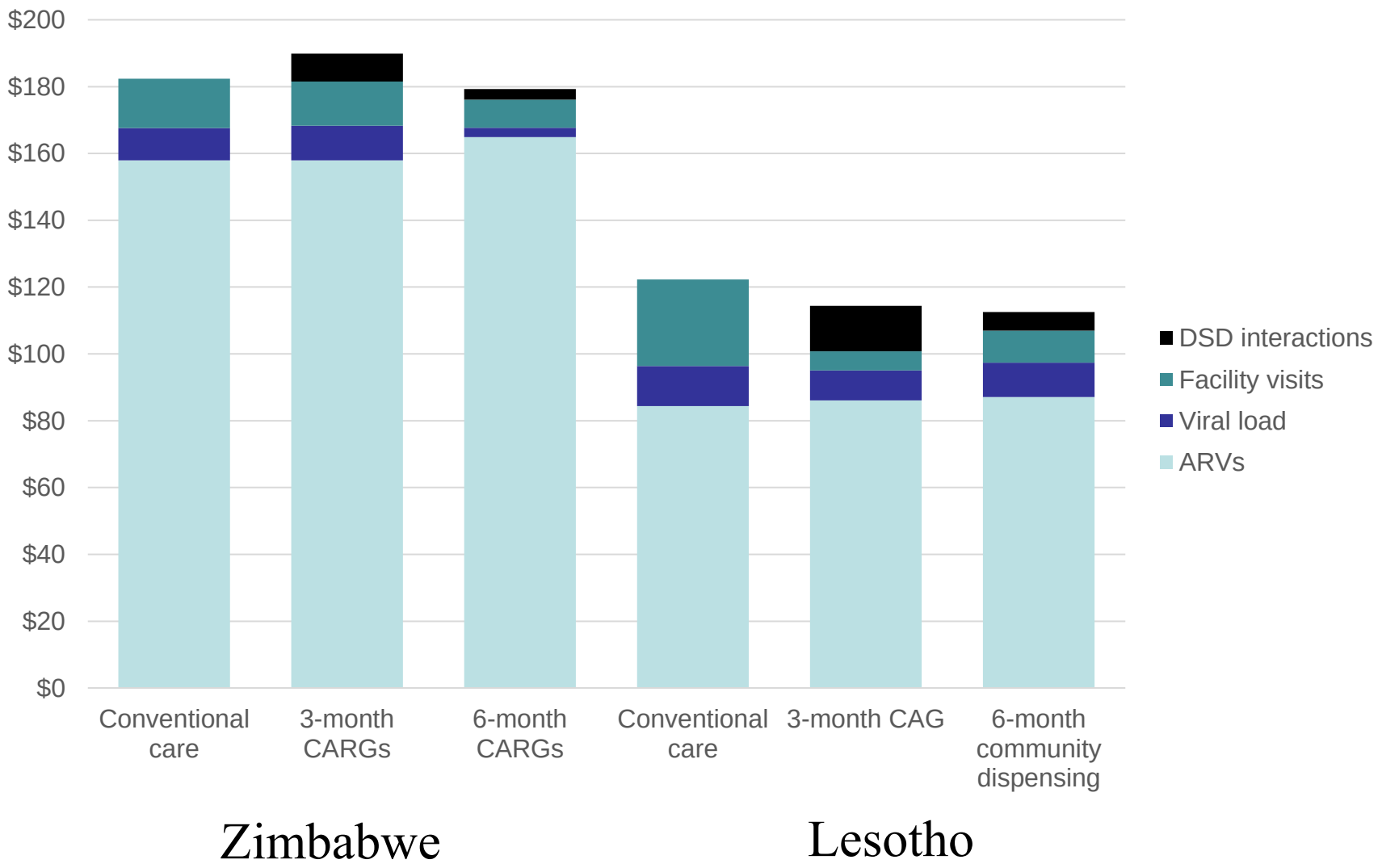
Fatti et al., JAIDS 2020; Tukei et al., JAIDS 2020

Results: primary outcomes



DSD models were, in both countries, non-inferior to standard of care

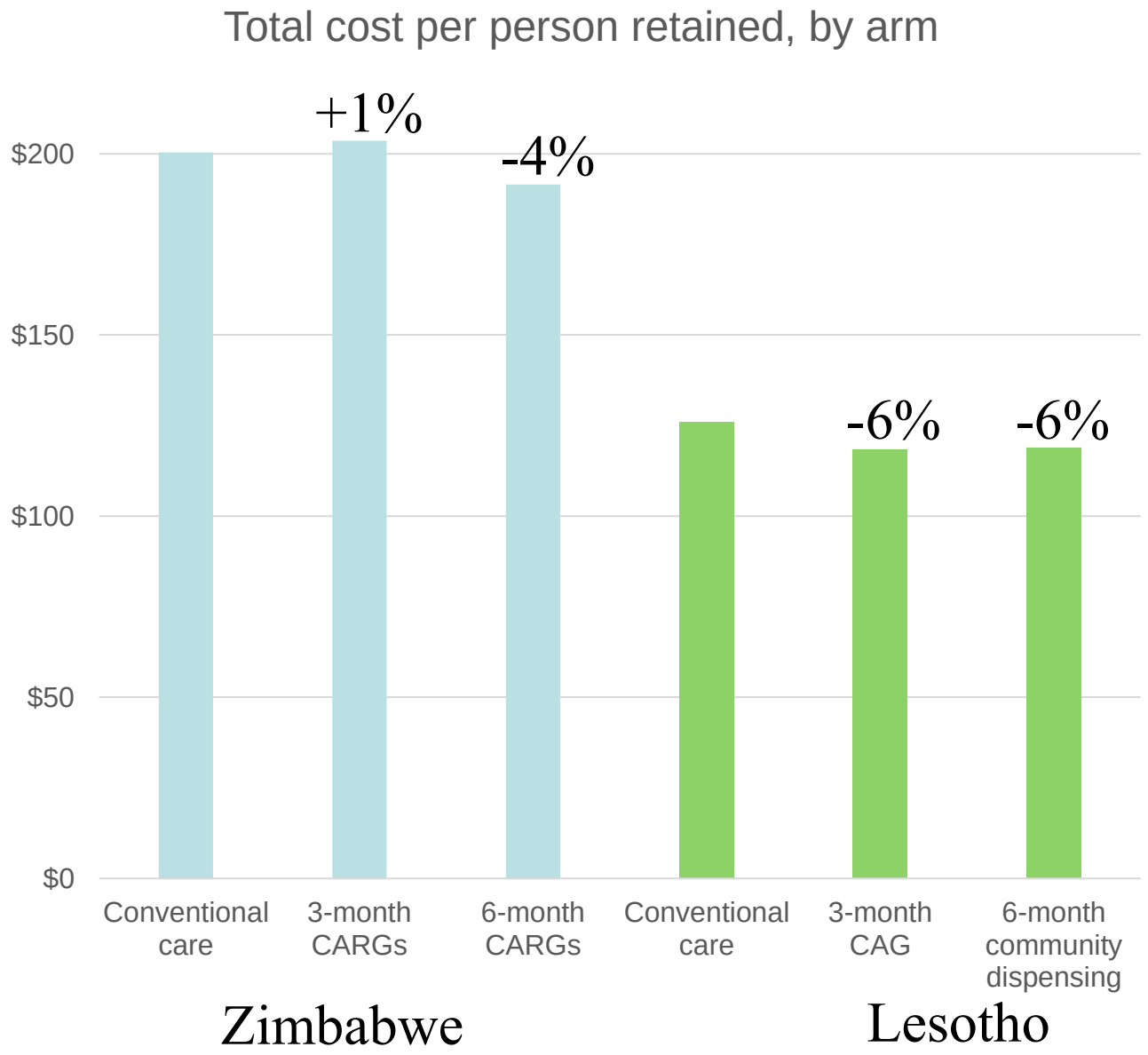
Results: health systems cost *per person per year*



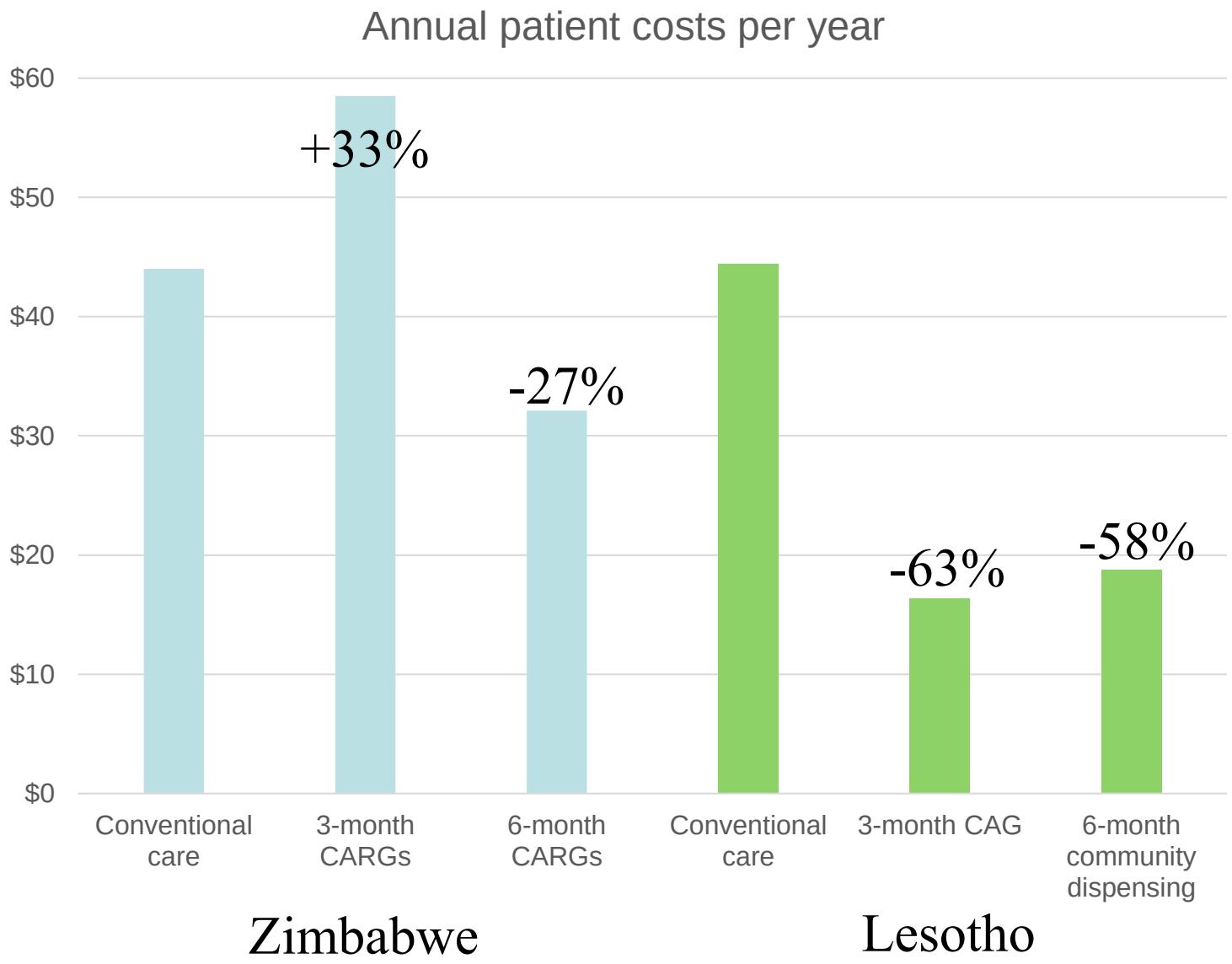
Resource utilization: intended vs. actual

Model	Total intended interactions/year	Total actual interactions/year
Zimbabwe		
Conventional care	4	3.3
3-month CARG	5-6	7.4
6-month CARG	3-4	3.5
Lesotho		
Conventional care	4	4.7
3-month CAG	4	5.7
6-month community dispensing	2	2.7

Results: total cost and cost per person retained/arm



Results: total patient costs by arm



Conclusions

- In Zimbabwe, the models of care evaluated in these studies cost the health system roughly the same as, or only very slightly less than, standard of care.
- In Lesotho, the models of care evaluated cost the health system about 6% less than standard of care.
- Making assumptions about resource “savings” is treacherous.
  - In Zimbabwe and Lesotho, patients averaged more healthcare system interactions per year than expected.
  - If there are savings, this may enable a greater number of ART patients able to be seen.
- Reductions in patient costs can be substantial; depends on the number of interactions the patient has with the healthcare system and where that interaction occurs.

Acknowledgements

With thanks to:

- Patients and implementing partners who participated in the evaluations
- Ministries of Health, Zimbabwe and Lesotho
- EQUIP Project
- Khet'Impilo
- Right to Care
- EGPAF
- HE^{2}RO (Wits University)
- USAID
- PEPFAR

Costs of multi-month dispensing of six months of antiretroviral therapy in Malawi and Zambia:
The INTERVAL Trial

Risa M. Hoffman, Crispin Moyo, Kelvin T. Balakasi, Zumbe Siwale, Julie Hubbard, Ashley Bardon, Matthew P. Fox, Gift Kakwesa, Thokozani Kalua, Mwiza Nyasa-Haambokoma, Kathryn Dovel, Paula M. Campbell, Chi-Hong Tseng, Pedro T. Pisa, Refiloe Cele, Sundeep Gupta, Mariet Benade, Lawrence Long, Thembi Xulu, Ian Sanne, and Sydney Rosen

Background

- Multi-month dispensing of ART may be a successful strategy for improving HIV treatment
- For stable patients, many countries now allow 6-month dispensing intervals
- Does 6-month dispensing cost less for health systems?
- INTERVAL compared differences in clinical outcomes and provider and patient costs between the standard of care, 3-month dispensing, and 6-month dispensing in Zambia and Malawi
- Further information about INTERVAL at https://pubmed.ncbi.nlm.nih.gov/31764076/ and https://pubmed.ncbi.nlm.nih.gov/29029644/

Methods

- Cluster-randomized, non-inferiority trial at 30 health facilities in Malawi and Zambia comparing*
  - Standard of care dispensing (SOC)
  - Three-month dispensing (3MD)
  - Six-month dispensing (6MD)
  - No other changes were made to conventional care (only dispensing duration)
- Participants were virologically suppressed adults on first-line ART and not pregnant or breastfeeding
- The primary outcome was retention in care at one year, with secondary outcomes of health system cost/participant retained and patient costs

Methods

- Health system cost-effectiveness was assessed as the average cost of producing the outcome (retention) in each arm
- Excluded participants whose visit dates were unclear
- Used micro-costing methods with resource utilization drawn from participants' records and local unit costs
- We included the following costs to the health system:
  - ART dispensed
  - Clinic visits (staff time)
  - Fixed costs of ART care (equipment, other space, utilities, training)
- Excluded costs of laboratory tests, for which we did not have participant data
- Questionnaire data to estimate patient costs for visits (transport + time)

Outcomes

Outcome N (%)	Standard of care (n=3012)	Three-month ART (n=2726)	Six-month ART (n=2981)
Retained	2478 (82.3%)	2356 (86.4%)	2729 (91.6%)
Lost to follow-up	463 (15.3%)	296 (10.9%)	186 (6.2%)
Transferred	60 (2.0%)	66 (2.4%)	58 (1.9%)
Died	11 (0.4%)	8 (0.3%)	8 (0.3%)

Result: Six-month dispensing was associated with a 9.1% (95% CI 0.9%, 17.2%) absolute increase in retention in care at 12 months after model entry.

Unit Costs and Resource Utilization

Value	Malawi			Zambia		
	SOC	3MD	6MD	SOC	3MD	6MD
Resource utilization per patient achieving the primary outcome (12 months)						
N	1,328	1,224	1,465	1,101	1,056	1,241
Clinic visits (mean, 95% CI)	5.4 (3.4-7.4)	4.9 (2.9-6.9)	2.9 (0.9- 4.9)	4.6 (2.6-6.6)	4.7 (2.7-6.7)	2.8 (0.8-4.8)
Days of ART dispensed (mean, 95% CI)	364 (362-366)	365 (363-367)	368 (360-366)	368 (366-370)	358 (356-360)	367 (366-370)
Unit costs for main resources						
First line ART medication per month		$6.30			$9.00	
Clinic visit for ART refill		$1.96			$6.95	

Malawi: Cost Per Patient in USD

Values (mean (95% CI))	SOC	3MD	6MD
N	1,328	1,224	1,465
Provider cost per patient by outcome*			
Achieved primary outcome	$89.05 (87.90; 91.90)	$88.40 (86.44; 90.36)	$85.92 (83.97; 87.89)
Did not achieve primary outcome	$63.40 (61.42; 65.37)	$62.30 (60.35; 64.30)	$66.10 (64.12; 68.09)
All patients	**$86.50** (84.50; 88.42)	**$86.00** (83.99; 87.91)	**$84.60** (82.62; 86.54)
Production cost (total cost of cohort/number achieving primary outcome)			
Proportion of patients achieving the primary outcome	89.9%	90.6%	93.2%
Production cost per patient achieving the primary outcome	$96.15	$94.87	$90.76
Cost breakdown by category			
Medications	$77.54 (87%)	$77.65 (88%)	$78.18 (91%)
Clinic visits	$8.19 (9%)	$7.43 (8%)	$4.42 (5%)
Fixed costs†	$3.32 (4%)	$3.32 (4%)	$3.32 (4%)

*Includes ARV medications, clinic visits, and infrastructure/fixed costs. Excludes laboratory tests. Increase cost/patient by ≈$19 for one viral load test/year.

†Infrastructure costs assigned 50% to visits and 50% to months in care of those retained.

Zambia: Cost Per Patient in USD

Values (mean (95% CI))	SOC	3MD	6MD
N	1,101	1,056	1,241
Provider cost per patient by outcome*			
Achieved primary outcome	$143.60 (141.68; 145.60)	$141.60 (139.64; 143.56)	$131.13 (129.20; 133.12)
Did not achieve primary outcome	$99.00 (97.04; 100.98)	$99.00 (96.98; 100.92)	$96.90 (94.96; 98.91)
All patients	$132.00 (130.43; 134.35)	$134.00 (132.09; 136.02)	$128.00 (125.64; 129.57)
Production cost (total cost of cohort/number achieving primary outcome)			
Proportion of patients achieving the primary outcome	74.8%	82.3%	89.6%
Production cost per patient achieving the primary outcome	$177.00	$162.87	$142.41
Cost breakdown by category			
Medications	$109.65 (76%)	$106.71 (75%)	$109.45 (83%)
Clinic visits	$31.75 (22%)	$32.69 (23%)	$19.48 (15%)
Fixed costs†	$2.20 (2%)	$2.20 (2%)	$2.20 (2%)

*Includes ARV medications, clinic visits, and infrastructure/fixed costs. Excludes laboratory tests. Increase cost/patient by ≈$19 for one viral load test/year.

†Infrastructure costs assigned 50% to visits and 50% to months in care of those retained.

Malawi: Patient costs of obtaining ART

Values (median (IQR))	SOC	3MD	6MD
Time costs			
Total time/year (hours)	20.0 (12.5; 28.3)	25.0 (17.5; 35.0)	13.0 (8.5; 18.0)
Work value lost/year (USD)	$5.30 (3.31; 6.63)	$6.63 (3.31; 6.63)	$3.98 (1.99; 3.98)
Travel costs			
Proportion of patients incurring travel costs >0	23%	22%	46%
Travel cost/year (USD) for patients incurring >0 cost	$6.89 (3.31; 11.00)	$6.89 (4.13; 11.00)	$4.96 (2,76; 8.27)

*Work value lost/year = median hours spent year x average national minimum wage of $1.33/day

Zambia: Patient costs of obtaining ART

Values (median (IQR))	SOC	3MD	6MD
Time costs			
Total time/year (hours)	16.5 (8.3; 25.0)	19.2 (13.3; 26.3)	11.0 (7.0; 15.5)
Work value lost/year (USD)*	$15.00 (9.98; 20.00)	$20.00 (12.50; 25.00)	$9.98 (7.49; 15.00)
Travel costs			
Proportion of patients incurring travel costs >0	38.40%	38.10%	38.50%
Travel cost/year (USD) for patients incurring >0 cost	$4.36 (3.11; 9.34)	$4.15 (3.11; 7.26)	$3.11 (1.87; 5.60)

*Work value lost/year = median hours spent year x average national minimum wage of $4.99/day

Conclusions

- In the INTERVAL trial in Zambia and Malawi, 6-month dispensing for stable ART patients cost the health system (providers) roughly the same as standard of care (and a little less than 3-month dispensing).
- 6MD generated substantial savings for patients compared to SOC and 3MD.
- Because outcomes for 6MD were better, 6MD is likely to be cost-effective for stable, adult ART patients in these settings and with this intervention.
  - Important to bear in mind that this result is context-specific; there may be conditions under which SOC should still be preferred.
- Future evaluations should look at longer follow-up (> 1 year) and multi-month dispensing for patients who do not meet the definition of stable.

Acknowledgements

- Study participants and facility staff who supported the INTERVAL study
- INTERVAL study team and PI Dr. Risa Hoffman
- EQUIP Project
- Ministry of Health Zambia
- Ministry of Health Malawi
- Partners in Hope, Lilongwe, Malawi
- Right to Care-Zambia, Lusaka, Zambia
- Right to Care
- U.S Agency for International Development
- U.S. President’s Emergency Plan for AIDS Relief (PEPFAR)

What do we know?

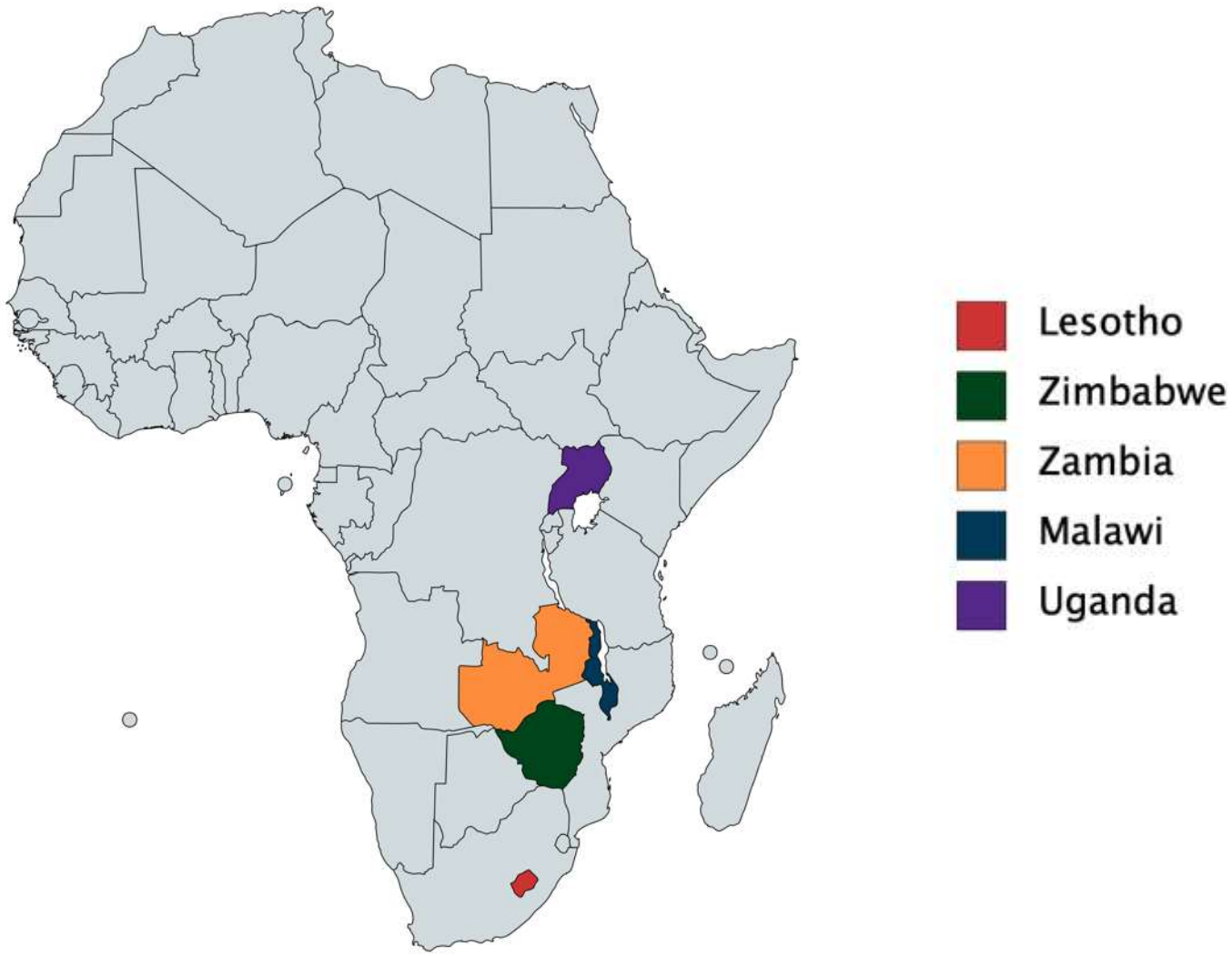
Lawrence Long
AMBIT and EQUIP Projects
Boston University and HE^{2}RO

What is the scope of these “case studies”?

5 countries

22 models

20,710 patients



What is the scope of these “case studies”?

FACILITY BASED, INDIVIDUAL MODELS

- Conventional (2xZam, Zim, Ls, Ml)
- Facility Based Individual (Ug)
- Fast Track Drug Refill (Ug)
- 3m Dispensing (Zam, Ml)
- 6m Dispensing (Zam, Ml)

HEALTH CARE WORKER LED GROUPS

- Urban Adherence Groups (Zam)
- Facility Based Group (Ug)
- 6m Community Dispensing (Ls)

OUT OF FACILITY, INDIVIDUAL MODELS

- Mobile ART (Zam)
- Home ART (Zam)
- Community Drug Distribution Point (Ug)

CLIENT LED GROUPS

- Community Adherence Group (Zam)
- Community Client Led ART Delivery (Ug)
- 3m Community ART Refill (Zim)
- 6m Community ART Refill (Zim)
- 3m Community ART Group (Ls)

KEY: Ls: Lesotho; **Ml**: Malawi; **Ug**: Uganda; **Zam**: Zambia; **Zim**: Zimbabwe

Which met the criteria of an economic evaluation?

		Country	Cost	Outcome	Comparator	Economic Evaluation
ROUTINE	Case Study 1	Zambia	Provider	Retention	Matched	Partial
ROUTINE	Case Study 2	Uganda	Provider	Viral load suppression	None	Partial
TRIAL	Case Study 3	Zimbabwe	Provider	Retention	Conventional	Full
TRIAL	Case Study 3	Lesotho	Provider	Retention	Conventional	Full
TRIAL	Case Study 4	Zambia	Provider	Retention	Conventional	Full
TRIAL	Case Study 4	Malawi	Provider	Retention	Conventional	Full

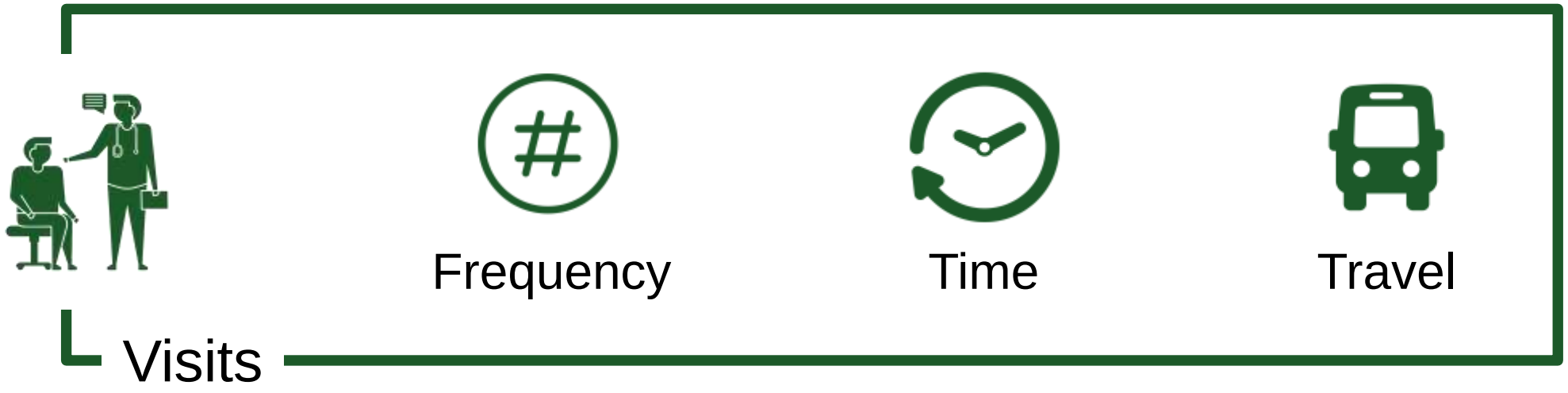
What can we say about the provider costs?

UNIT COST

UNITS USED

- Major inputs for DSD models are drugs, labs and visits
- Unit costs and units used are “fixed” for drugs and labs (in care)
- Cost variation in DSD comes from number of and unit cost of visit
- Visit unit costs vary by DSD models; can be > than conventional model
- Actual visit numbers also vary; sometimes actual is > planned
- Overall, most likely seems equivalent costs

What can we say about the patient costs?



- 3 mo dispensing across modalities and countries showed equivalent or higher costs; one exception CAG in Lesotho
- 6 mo dispensing across all modalities and countries showed lower costs
- If one of our DSD goals is to make them more patient centric then careful consideration should be given to visit design

What can we say about the effectiveness?

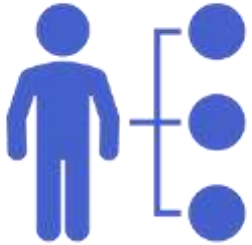
- Population matters (stable vs new initiates; rural vs urban)
- By design models are patient centric; different populations
- Comparison of effectiveness using routine data problematic

- "Clinical trial" designs give us our strongest effectiveness data
- Case 3 suggested non inferiority; Case 4 suggested improvement
- Already stable patients, therefore improvement is a high bar

Are we using the correct measure?

Our current metrics reflect clinical outcomes as the ultimate goal of DSD, but what about improving access or freeing of limited resources?

Can we say anything about cost effectiveness?



- Only if the DSD models are true alternatives
- When we limit population to stable patients it is difficult to improve effectiveness; comparison is really on cost
- Case 4 showed the strongest evidence of CE

- Cost effectiveness is a single factor in decision making
- Certain models improve access to hard to reach, underserved populations improving equity
- Expand perspective – cost to the patient was excluded

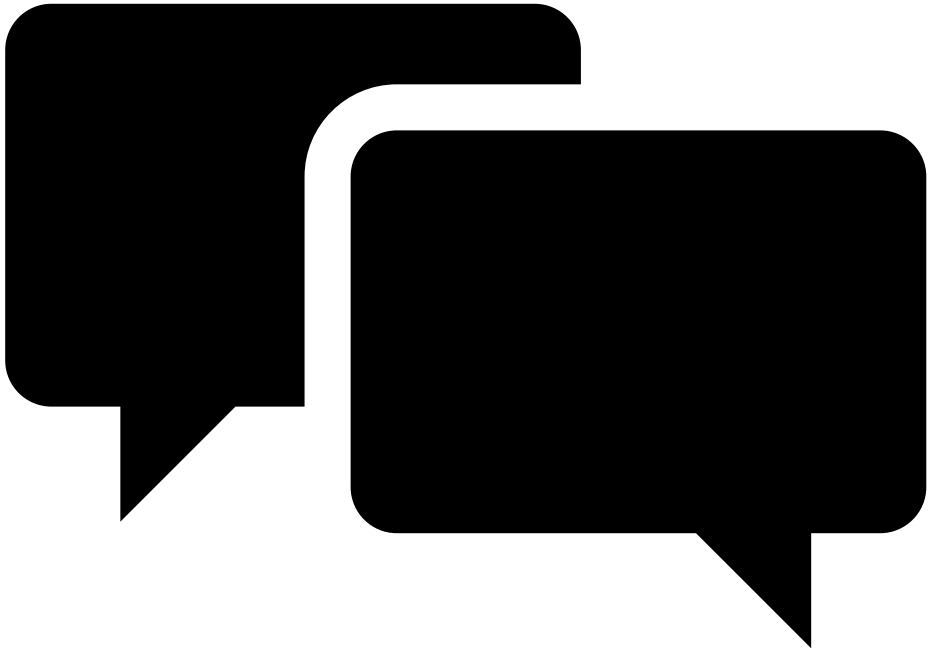
Based on this, what are considerations for the future?

Routine data systems need to be strengthened to correctly capture DSD enrolment, visits outside facilities and facility metrics showing potential reallocation of resources.

If the cost differences of DSD models are driven by visits then the shift to **multi month dispensing at facilities has squeezed out our ability to lower costs** through DSD models if we still require semi/annual clinical visits to the facility.

Even for stable patients there seems benefit to DSD models which lower the visit burden, we should **consider expanding DSD models to patients that are new and / or struggling** as the potential for improvement is greater than stable patients.

Q&A



Audience Poll #2

- If less-intensive DSD models cost the health system the same or more than standard ART models, are they still worth it?

- Si les modèles PSD moins intensifs coûtent au système de santé le même prix ou plus que les modèles d'ART standard, en valent-ils toujours la peine?

Panelists/ Panélistes

Catherine Ngugi
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Ministry of Health, Kenya

Josen Kiggundu
Senior Programme Officer, DSD
Ministry of Health, Uganda

Eula Mothibi
Executive Director
Right to Care, EQUIP

Anna Grimsrud
Lead Technical Advisor
International AIDS Society

Next Steps and Useful Links

Slides and recordings from today's session will be posted on the CQUIN website:
https://cquin.icap.columbia.edu/

Next CQUIN webinar – October 5, 7am EST/11am Abidjan/1pm Pretoria/2pm Nairobi- *Integrating for Impact: DSD for People with HIV and Non-Communicable Diseases* (in partnership with Resolve to Save Lives)