MODELING THE IMPACT AND COST-EFFECTIVENESS OF INTERVENTIONS FOR RETENTION IN HIV CARE

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BACKGROUND

Universal eligibility for antiretroviral therapy (ART) in sub-Saharan Africa (SSA) has reduced HIV transmissions and deaths among people living with HIV (PLHIV). A growing proportion of transmissions and deaths now occur among PLHIV who have interrupted ART.[1,2] Several interventions have been shown to reduce ART interruption by at least 25%, but most of them cost more than standard-of-care.[3–5] Research is needed to inform the upper-bound costs at which such interventions should be implemented.

METHODS

We used three HIV models with diverse structures, assumptions, and settings: EMOD in South Africa, Optima in Malawi, and Synthesis in SSA lower-middle income countries (LMICs). Each model simulated reducing ART interruptions by 25%, 50%, and 100%, with or without targeting those most-at-risk of ART interruption (defined as interrupting ART within one year), with annual discount rates of 0%, 3%, and 6% over a 40-year time horizon. We compared infections averted, disability-adjusted life-years (DALYs) averted, and upper-bound costs at which improving ART retention could be cost-effective relative to benchmarks of alternative options for HIV spending.

ART retention interventions bring substantial population health value in countries with generalized HIV epidemics in sub-Saharan Africa. Costs of up to $180 per year per person on ART for some interventions are likely justified. Interventions targeted at those most likely to interrupt ART could justifiably cost as much as $5,919 per year.

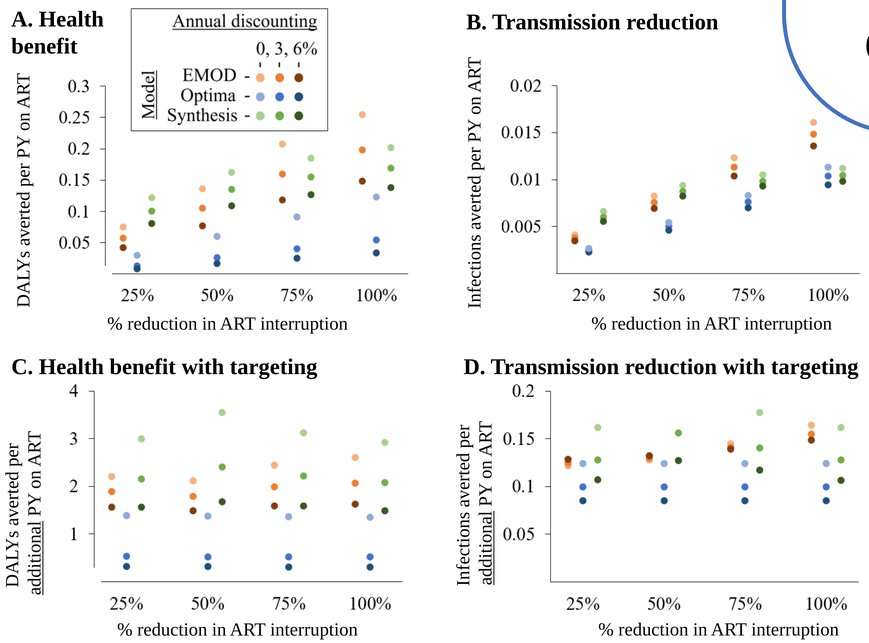


Figure 1. Health benefit and transmission reduction from reducing ART interruption.

RESULTS

The three models simulated diverse epidemic trends and estimated different impact levels and timing of the impact of retention interventions (Figure 1). Despite these differences, the models produced consistent estimates of health benefit and transmission reduction per additional person-year retained on ART. The range of estimates was 1.35 − 2.60 DALYs and 0.07 − 0.16 infections averted over 40 years per additional person-year retained on ART over this period. Upper-bound cost that could be spent to retain an additional person on ART varied by setting and intervention effectiveness (Table 1A). Improving retention by 25% among all people receiving ART, regardless of ART interruption risk, had an upper-bound cost per person-year of US$2 − $6 per person-year in Malawi (Optima), US$43 − $68 in SSA LMICs (Synthesis), and US$28 − $180 in South Africa (EMOD). A maximally targeted and effective retention intervention (Table 1B) had an upper-bound cost per person-year of US$93 − $223 in Malawi (Optima), US$871 − $1,389 in SSA LMICs (Synthesis), and US$1,013 − $6,518 in South Africa (EMOD).

Table 1. Upper-bound cost per person-year* to improve ART retention

1A. Retention interventions for all people on ART

Reduction in ART interruption	EMOD South Africa	Optima Malawi	Synthesis SSA LMICs
25%	$28 – $180	$2 – $6	$43 – $68
50%	$50 – $329	$5 – $12	$58 – $92
75%	$78 – $503	$7 – $17	$66 – $105
100%	$97 – $624	$10 – $23	$71 – $113

1B. Retention interventions for people most-at-risk of interrupting ART

Reduction in ART interruption	EMOD South Africa	Optima Malawi	Synthesis SSA LMICs
25%	$905 – $5,919	$99 – $232	$910 – $1,448
50%	$851 – $5,624	$97 – $228	$1,039 – $1,641
75%	$968 – $6,266	$95 – $225	$941 – $1,494
100%	$1,013 – $6,518	$93 – $223	$871 – $1,389

*Assumes 3% annual discounting

CONCLUSIONS

Across diverse settings and assumptions, three HIV models provided consistent estimates of the health and transmission benefits of improving ART retention in SSA. Upper-bound costs that could justifiably be spent to improve ART retention vary across SSA settings and may be increased if interventions are targeted at those most-at-risk of interrupting ART.

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REFERENCES

1. McCreesh N, Andrianakis I, Nsubuga RN, et al. *BMC Infect Dis* 2017; 17: 1–11.

2. Ousley J, Niyibizi AA, Wanjala S, et al. *Clin Infect Dis* 2018; 66: S126–31.

3. Roberts DA, Tan N, Limaye N, Irungu E, Barnabas RV *J Acquir Imm Defic Syndr* 1999 2019; 82 Suppl 3: S339–47.

4. Demena BA, Artavia-Mora L, Ouedraogo D, Thiombiano BA, Wagner N. *AIDS Patient Care STDs* 2020; 34: 59–71

5. Galárraga O, Sosa-Rubí SG. *Lan HIV* 2019; 6: e705–14.