Impact and Cost-Effectiveness of Hypothetical Strategies to Enhance Retention in Care within HIV Treatment Programs in East Africa

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ABSTRACT

Objectives: Attrition from care among HIV infected patients can lead to poor clinical outcomes. Our objective was to evaluate hypothetical interventions seeking to improve retention-in-care (RIC) for HIV-infected patients in East Africa, asking whether they could offer favorable value compared to earlier ART initiation. Methods: We used a micro-simulation model to analyze two RIC focused strategies within an East African HIV treatment program—“risk reduction,” defined as intervention(s) that decrease the risk of attrition from care; and “outreach,” defined as interventions that find patients and re-link them with care. We compared this to earlier ART treatment as a measure of the potential health benefits forgone (e.g., opportunity cost). Results: Reducing attrition by 40% at an average cost of $10 per person remains a less efficient use of resources compared to ensuring full access to ART (cost- effectiveness ratio $1300 vs $3700) for ART eligible patients. An outreach intervention had limited clinical benefit in our simulation. If intervention costs are <$10 per person, however, an intervention able to achieve a 40% (or greater) reduction in attrition may be a cost-effective next implementation option following implementation of earlier ART treatment. Conclusions: Our results suggest that programs should consider retention focused programs once they have already achieved high degrees of ART coverage among eligible patients. It is important that decision makers understand the epidemiology and associated outcomes of those patients who are classified as lost to follow up in their systems prior to implementation in order to achieve the highest value. Keywords: Africa, cost-effectiveness analysis, health care utilization, HIV/AIDS.

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Introduction

Attrition from HIV treatment programs in sub-Saharan Africa, estimated to be approximately 20% at 1 year after antiretroviral therapy (ART) initiation [1–3], is an enormous challenge that threatens the gains achieved as a result of the public health scale-up of HIV care and treatment [4–6]. Attrition, often referred to as “loss to follow-up,” does not provide information about an individual’s true treatment or vital status.

Patients classified as “lost to follow-up” (LTFU) may 1) have transferred their care to another facility, unbeknownst to the original treatment site (often referred to as “silent transfer” or “remains connected to care”) [7,8]; 2) be disengaged from care and no longer on treatment; or 3) be dead. Studies that have physically traced patients classified as LTFU have discovered high proportions of patients in each of these three circumstances, with deaths accounting for 20% to 60% of those who were successfully traced [9–11]. High rates of death or connection to care among LTFU patients could potentially lessen the benefits of implementing programs that aim to reduce disengagement because patients who remain connected to care or who have died will not garner any benefit from such programs. Retention/re-engagement strategies that discriminate between the possible circumstances of silent transfer, death, and true disengagement from care [10,12,13] or that can substantially reduce the rate of disengagement [14–18], however, may have the potential to improve patient outcomes. Therefore, interventions that seek to reduce disengagement or identify, trace, and re-link those patients who have become disengaged from care in sub-Saharan Africa may provide favorable value compared with other interventions designed to optimize outcomes for HIV-infected patients.

Mindful of the importance of distinguishing between patients who maintain a connection to care, those who have died, and true losses to care, we sought to evaluate the impact of alternative retention-in-care strategies in East Africa. In addition, we sought to ascertain the cost-effectiveness of the best retention-in-care

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Table 1 – Key input parameters to computer simulation.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate (range considered)</th>
<th>Reference(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of simulated cohort</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD4 count, mean ± SD</td>
<td>287 ± 242</td>
<td>AMPATH data</td>
</tr>
<tr>
<td>Age (y), mean ± SD</td>
<td>39 ± 9</td>
<td>AMPATH data</td>
</tr>
<tr>
<td>Mean ART adherence</td>
<td>70%</td>
<td>Adjusted for calibration</td>
</tr>
<tr>
<td>Loss to care probabilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability of disengagement from clinic (per month) [LTFU]</td>
<td>0.4%–2.4%</td>
<td>[3]</td>
</tr>
<tr>
<td>Relative risk of disengagement from clinic if pre-ART</td>
<td>2</td>
<td>[46–49]</td>
</tr>
<tr>
<td>Probability disengagement from care if disengaged from clinic</td>
<td>27% (16%–56%)</td>
<td>[8,13,25,40]</td>
</tr>
<tr>
<td>Probability of identification of disengagement</td>
<td>100%</td>
<td>Assumption</td>
</tr>
<tr>
<td>Relative risk of treatment failure given disengaged from care</td>
<td>3.32</td>
<td>[50–54]</td>
</tr>
<tr>
<td>Intervention characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk reduction intervention—Relative risk reduction on probability of disengagement</td>
<td>40% (10%–90%)</td>
<td>[14–18,26,27]</td>
</tr>
<tr>
<td>Cost of risk reduction intervention per person/month</td>
<td>$10 ($1–$50)</td>
<td>Assumption</td>
</tr>
<tr>
<td>Outreach intervention—Probability of tracing</td>
<td>56%</td>
<td>[7,8,55]</td>
</tr>
<tr>
<td>Outreach intervention—Probability of re-linkage following successful tracing</td>
<td>60%</td>
<td>[12,56]</td>
</tr>
<tr>
<td>Costs, 2014 (US$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-ART HIV care (annually)</td>
<td>429</td>
<td>[57]</td>
</tr>
<tr>
<td>Care while on first-line ART (annually)</td>
<td>740</td>
<td>[57]</td>
</tr>
<tr>
<td>Care while on second-line ART (annually)</td>
<td>1453</td>
<td>[57]</td>
</tr>
<tr>
<td>Mortality/inpatient hospitalization (per event)</td>
<td>220</td>
<td>[58]</td>
</tr>
</tbody>
</table>

AMPATH, Academic Model Providing Access to Healthcare; ART, antiretroviral therapy; LTFU, loss to follow-up (patient can be in one of three mutually exclusive health states—1) alive and in care elsewhere, 2) alive and disengaged from care, 3) death which has been unrecognized).

* Range reflects dependence of probability of disengagement on time spent in care (i.e., higher rate of disengagement in the first 6–12 mo of clinical follow-up/treatment).

strategies and to compare them with those of alternative resource uses for HIV-infected persons, in particular to expansion of ART access.

Methods

Overview

We expanded and recalibrated a previously developed stochastic microsimulation HIV model to account for retention-in-care dynamics [19]. We used this simulation to analyze the effectiveness and value of implementing retention-in-care strategies within a hypothetical East African HIV care and treatment program. Model parameters were informed by data from East African sources where possible (Table 1). We compared the scale-up of these interventions with that of earlier ART provision as a measure of the potential health benefits forgone (e.g., opportunity cost), which could be gained by applying resources to other simultaneously resource-constrained decisions.

HIV Disease Progression Simulation

This model has been previously validated by a demonstration of its ability to predict clinical data in several distinct clinical cohorts [19–21]. Each simulated patient is assigned a CD4 count and viral load (VL) from a relevant probability distribution reflecting an East African population in care, and the model tracks an individual’s CD4 count, VL, treatment status (on/off ART), and ART regimen (two regimens assumed to be available) over time, as well as the likelihood of experiencing an incident symptomatic HIV/AIDS-related clinical event (e.g., opportunistic infection) or dying of an HIV-related or HIV-unrelated event. ART initiation is assumed to occur at a CD4 count of less than or equal to 200 cells/mm³. Although this does not reflect the current World Health Organization (WHO) recommendation [22], it does reflect a common situation in under-resourced programs [23,24]. Results were aggregated from large numbers of patient simulations to obtain stable estimates of the outcomes.

Representation of LTFU, Disengagement, and Re-Engagement in Simulation

Patients classified as LTFU have heterogeneous outcomes and may have a wide array of root causes of attrition. To account for this, we added representation of the following clinical/treatment states to our computer simulation (Fig. 1).

A “disengaged from clinic” (LTFU) patient is one who has not returned for follow-up care and treatment as requested and whose vital status is uncertain. If a patient is disengaged from clinic, they can be in one of three mutually exclusive health states:

- “Death, unrecognized”: The patient is deceased, but the surveillance system did not detect this outcome or death was not reported to the health facility.
- “Connected to care”: The patient transferred care to another health facility or health provider, and this was either not reported or incorrectly reported to the initial treating facility; hence, the patient is incorrectly categorized as lost. It is assumed that the patient is continuing to receive all relevant medications and care.
- “Disengaged from care” (care interruption): The patient is alive and no longer receiving care or treatment.

We simulate a cohort of HIV-infected persons initially in care. Patients can remain engaged in care or can become disengaged from clinic (LTFU) following one of two pathways. An individual can suffer a mortality event, which is not ascertained by the health
facility where they receive care. As in earlier versions of this simulation, mortality is closely associated with immune and virologic status (i.e., untreated patients with high VLs and lower CD4 counts have substantially higher mortality than do patients on ART who have suppressed VLs and immune recovery). An individual can also transfer care to another health facility without this information being captured by the initial facility. Such silent transfers may be common in locales where robust health information systems such as electronic medical records or "ART passports" do not exist [8,25]. Finally, a patient may delink or disengage from care and follow-up at the health facility but remain alive. Previous work has suggested that the LTFU rate is inversely associated with time spent in care, and this was adjusted for in the state transition probabilities governing disengagement from clinic [3]. Given the heterogeneity of LTFU rates reported in the literature, the outcomes associated with patients classified as such, and the incompletely understood relationship between these, we chose to model the rates and probabilities of disengaging from clinic and the likelihood of delinking from care independently.

Patients who remain engaged in care or who are LTFU but remain connected to care experience the same likelihood of future adverse outcomes (e.g., death or disengagement from care). Patients who disengage/delink from care are assumed to be no longer compliant with ART and have similar probabilities of experiencing an adverse outcome as any other patient not on ART (controlling for immune and virologic status). We further assume that patients who are disengaged from care will relink to care on their own if they experience a symptomatic AIDS-related event (more likely to occur once their CD4 count drops below 200 cells/mm³). The methods underlying the recalibration of this simulation are described in detail in Supplemental Materials found at http://dx.doi.org/10.1016/j.jval.2015.09.2940.

Representation of Alternative Retention-in-Care Strategies

We simulated alternative strategies exploring varying relative emphases: 1) a risk reduction intervention that seeks to reduce the chances of a patient from disengaging from clinic following enrolment; 2) an outreach intervention that seeks to find/ascertain the status of patients who are disengaged from clinic and relink those who are disengaged from care. These component strategies were operationalized as follows.

Risk Reduction

The risk reduction intervention attempts to reduce the likelihood that any patient will disengage from clinic after enrolment. Many interventions have been demonstrated to have an impact on the rate of LTFU, and as such, wide uncertainty estimates
characterize this intervention. Our initial estimate for its efficacy and cost is based on a review of the literature including observational studies of interventions/strategies or cost-effectiveness analyses of interventions that had an impact on disengagement rates [14–18,26,27]. We explored wide plausible intervals for estimates of intervention effectiveness (10%–90%) and cost ($1–$50 per patient per month) within our sensitivity analyses to represent the heterogeneous nature of these programs and the resources required for implementation.

**Outreach**
The outreach component strategy consists of activities that are triggered when a patient becomes disengaged from clinic. First the patient is traced to determine his or her vital status. Then, if tracing is successful and the patient is alive, attempts are made to relink the individual to the treating health facility. Importantly, the outreach component has no impact on the rate at which loss from clinic or care is experienced [10,28–31].

**Base-Case Analyses**
We compared the effects of alternative retention-in-care strategies on HIV-positive patients enrolled in care and treatment programs. We sought to identify the relative impact and cost-effectiveness of the two interventions independently in comparison to a base case of either 1) standard of care (null) scenario in which no additional retention-focused interventions were implemented or 2) a scenario in which ART is scaled up and available for all patients with a CD4 count of 350 cells/mm³ or less. We used the model to predict several outcomes, including life expectancy, quality-adjusted life-years (QALYs), and per-patient total costs for care and treatment. We estimated the health benefits as the difference between the life expectancy and QALYs for simulations conducted under either base-case assumption or with those under the simulated implementation of a particular retention-in-care strategy. To estimate the cost-effectiveness, we calculated incremental cost-effectiveness ratios (ICERs), which represent the difference in costs divided by the difference in effectiveness of the base-case and intervention strategies. Costs are reported in 2014 US$, and both costs and QALYs are discounted at a rate of 3% annually. We evaluated the cost-effectiveness of the interventions considered from a payer perspective.

As a supplement to our opportunity-cost-based criteria, WHO guidelines were also used to define thresholds for cost-effectiveness. According to these guidelines, an ICER of less than one time the per-capita gross domestic product (GDP) (~$1000 for Kenya was used in this analysis [32]) is considered to be “very cost-effective,” while an ICER of less than three times the per-capita GDP (~$3000) is considered to be “cost-effective” [33]. Given the limitations with precision associated with any simulation, we assumed that an ICER of more than five times the per-capita GDP (~$5000) would almost certainly be considered unfavorable from a decision-making perspective, whereas an ICER between three and five times the per-capita GDP may still be favorable accounting for these limitations.

**Sensitivity Analyses**
We varied key parameters (see Table 1) in a one-way sensitivity analysis across a plausible range of values to estimate which had the strongest effect on the cost-effectiveness, including the rates associated with disengagement, the efficacy and costs of the intervention components, and the costs of ART and routine care. We then conducted multivariate sensitivity analyses using influential variables derived from the one-way sensitivity analysis to explore the conditions in which the intervention value may be enhanced or conditions in which the implementation of the intervention would be a cost-effective addition to increasing ART access (i.e., expansion of earlier ART access to all HIV-infected persons with a CD4 count of ≤ 350 cells/mm³).

**Results**

**Calibration of Simulation**
We prespecified the following three calibration criteria to evaluate whether the model’s predictions were compatible with...
Effects on Life Expectancy of Disengagement from Care

The projected mean life expectancy for an HIV-infected adult who remains fully engaged in care is 16.0 years (9.5 QALYs). When the possibility of disengagement from clinic is considered, the mean life expectancy decreases to 14.4 years (8.8 QALYs), a reduction of 1.6 years (0.7 QALYs).

Impact and Cost-Effectiveness of Retention-in-Care-Focused Interventions

The standard of care (null) scenario results in an average of 14.4 life-years, or 8.8 QALYs, with mean per-person discounted costs of $10,900. Implementing the risk reduction strategy adds a mean of 1.2 life-years, or 0.6 QALYs, at a mean incremental cost of $2,200 to yield an ICER of $3,700/QALY (compared with null scenario) (Table 2). Implementing an outreach intervention adds a mean of 0.1 life-year, or 0.1 QALY, at a mean incremental cost of $100 to yield an ICER of $1,000/QALY. Because the implementation of this intervention had minimal health impacts and its inclusion in a combined retention package had no impact on cost-effectiveness results (data not shown), this component was not included in further multivariate sensitivity analyses. In comparison, ensuring complete expansion of ART treatment to all HIV-infected persons with CD4 counts of 350 cells/mm$^3$ or less in line with previously adopted WHO guidelines (without any retention-focused interventions) results in the addition of a mean of 3.8 life-years, or 2.9 QALYs, at a mean incremental cost of $3,900 to yield an ICER of $1,300/QALY.

Cost-Effectiveness of Implementation of a Retention-in-Care-Focused Intervention

We explored the impact of key parameters in the simulation on the health benefits, cost, and value of retention-in-care intervention by varying their values across plausible ranges. When we varied parameters independently (i.e., one-way sensitivity analysis), the strongest influencers on the value of a retention-focused intervention, in order of importance, were 1) the cost of the retention-in-care intervention, 2) the risk of an HIV patient becoming disengaged from clinic (LTFU), and 3) the likelihood that a patient classified as LTFU was no longer connected to care (see Appendix Fig. 3 in Supplemental Materials found at http://dx.doi.org/10.1016/j.jval.2015.09.2940). Importantly, in the scenarios that we evaluated there were none in which the ICERS for the retention-in-care intervention were favorable (i.e., less than) than the ICERS for earlier ART treatment (at a CD4 count of <350 cells/mm$^3$). If we assume, however, that all individuals who are LTFU are truly disengaged from care (rather than a proportion remaining connected to care) and that such patients do not return to care, the cost-effectiveness of the retention-focused intervention approaches that of the ART expansion (see Appendix Fig. 4 in Supplemental Materials found at http://dx.doi.org/10.1016/j.jval.2015.09.2940).

Value of Retention-in-Care Package as Next Prioritized Intervention

Given that under the model assumptions there was no scenario in which a retention-in-care-focused intervention was more favorable than earlier ART provision from a population health or economic perspective, we explored under what conditions this intervention should be prioritized as the next best intervention (i.e., the addition of retention-focused intervention to earlier ART provision retains an ICER that is considered favorable/cost-effective). When the retention-in-care intervention costs were assumed to be $1 (or less), the ICER of the retention-in-care intervention was favorable (>$3000 or less) when the intervention’s efficacy was assumed to be only mild (10% reduction) and as long as the likelihood of disengagement from clinic was greater than or equal to initial assumptions (Fig. 3). Even at an efficacy of 90% and a high probability of disengagement from both clinic and care, the ICER of the retention-focused intervention, however, was less favorable than that of the earlier ART initiation (i.e., cost effectiveness ratio of >$1500). When the monthly costs per patient were assumed to be $40 or more, there were no scenarios in which the ICER was less than $3000. When the monthly costs per patient were between $1 and $40, the likelihood of the ICER remaining favorable was associated with an increasing probability of disengagement from clinic, an increasing probability of disengagement from care, and an increasing efficacy of the intervention.
Fig. 3 – Multivariate sensitivity analysis of critical factors influencing cost-effectiveness of a retention-in-care intervention. For each surface plot, the x-axis represents the probability of no connection to care (i.e., disengaged from care) given the patient is disengaged from clinic. The y-axis represents multiplier on initial estimate of disengagement from clinic rates. The z-axis represents incremental cost-effectiveness ratio (ICER; $/quality-adjusted life-year gained) comparing intervention to null scenario (no retention intervention). Rows of plots represent simulations in which values for effectiveness of risk reduction intervention are varied and include 10%, 40%, 70%, and 90% risk reduction of disengagement from clinic. Columns of plots represent simulations in which values for cost of intervention are varied and include $1, $10, $20, $40, and $50 per person per month. (Color version of figure available online).
Fig. 4 – Multivariate analysis of the estimated value of adding a retention-in-care intervention to earlier ART. For each 5 × 5 grid, rows represent varying assumptions on the probability of no connection to care (i.e., disengaged from care) given the patient is disengaged from clinic and columns represent varying assumptions on the multiplier on initial estimate of the rates of disengagement from clinic. Rows of 5 × 5 grids represent simulations in which values for effectiveness of risk reduction intervention are varied and include 10%, 40%, 70%, and 90% relative risk reduction of disengagement from clinic. Columns of 5 × 5 grids represent simulations in which values for cost of intervention are varied and include $1, $10, $20, $40, and $50 per person per month. Each cell is color-coded to represent whether the addition of the retention-in-care intervention to full coverage of an earlier ART policy (at a CD4 count of ≤ 350 cells/mm³) would have been favorable from an economic perspective. Cells shaded green represent an ICER of less than $3000 (≤ 3x the per-capita GDP), cells shaded orange represent an ICER of $3000 to $5000 (3–5x the per-capita GDP), and cells shaded red represent an ICER of more than $5000 (> 5x the per-capita GDP). ART, antiretroviral treatment; GDP, gross domestic product; ICER, incremental cost-effectiveness ratio; RR, risk ratio. (Color version of figure available online).
Discussion

Using a computer simulation of HIV disease progression and retention-in-care dynamics in East Africa, we found that disengagement from care had a clinically relevant effect on life expectancy—an average loss of 1.6 years (0.7 QALYs). In addition, an intervention designed to improve retention-in-care increased QALYs compared with no intervention. An outreach intervention (i.e., physical tracing and relinking) alone was associated with both minimal costs and minimal benefits under our initial assumptions. A risk reduction strategy had a more pronounced impact on clinical outcomes (greater increase in QALYs) when compared with an outreach strategy. This strategy, however, was a more expensive intervention.

We found that the factors with the strongest influence on the value of a retention-in-care intervention included the risk of disengagement from clinic (LTFU), the risk of loss of connection to care if disengaged, and the effectiveness and cost of the intervention. Under conditions in which the cost is one-tenth of initial estimates and the risk reduction intervention at least as efficacious as initially assumed, implementation of retention-in-care intervention would be a cost-effective use of resources. Furthermore, if costs exceed $40 per month per person, such an intervention is unlikely to achieve cost-effectiveness regardless of other parameter values.

Another key finding of our analysis is that where resources are limited, investing in retention-in-care-focused interventions may be less preferable when “benchmarked” to other potential HIV care and treatment options, including earlier ART initiation (at a CD4 count of ≤350 cells/mm³ instead of ≤200 cells/mm³). Our results demonstrate that the value (i.e., the health benefit for resource expended) of earlier ART treatment is greater than that of the implementation of the retention-in-care strategies we considered (and no improvement in ART access). This is likely a function of our conservative assumptions regarding the proportion of persons classified as LTFU who are truly disengaged from care (i.e., only about 25%), the likelihood of these individuals returning to care (all will return if they become symptomatic), and the assumption that the cost of the intervention is borne by all individuals whether or not they are or become lost. In scenarios in which these assumptions were substantially relaxed, the retention-focused intervention is on par in terms of value with earlier ART treatment, and in some cases (i.e., very low cost or very high efficacy) it may even provide greater health benefits on average (see Appendix Fig. 4). Similarly, relaxing these assumptions improves the overall value of a retention-in-care intervention whereby it is cost-effective (ICER ≤ $3000) across a much broader array of intervention cost and efficacy values than under the initial assumptions of our analysis. Under our initial assumptions, however, scenarios may exist in which the implementation of retention-in-care package would be a valuable next step following full implementation of earlier ART therapy for HIV-infected persons seeking care.

In our multivariate sensitivity analysis if the cost of the intervention is less than $10 per person per month, it may have favorable value under some conditions (i.e., cost-effective by compared WHO standards). Furthermore, if the cost could be brought below $1, it would likely be considered cost-effective and it would be a preferred next option following scale-up of earlier ART therapy if implemented in an environment in which LTFU rates are high and in which many of those classified as lost were actually disengaged from care. For instance, in settings in which robust electronic medical records have been implemented, or in which ART passports are commonly used, silent transfers are less common [34] and patients classified as LTFU are more likely to be either deceased or alive and disengaged from care. Strategies aimed at improving retention in this setting would provide greater health benefits and do so more efficiently than in a setting in which such information and tracking systems do not exist because, all else being equal, fewer persons would experience the health benefits of the intervention (maintenance of viral suppression as a result of robust ART compliance) as a result of the increased likelihood of misclassification. Although our simulation was not designed to evaluate how such information systems and other physical tracking systems might affect these decisions or how they might assist with prioritization of such interventions, it has brought up important questions for future study.

Our results are somewhat different from another published cost-effectiveness study that demonstrated that strategies for LTFU prevention could result in a substantial saving of life-years and be considered “very cost-effective” under many scenarios [35]. If the effectiveness of that study’s intervention (equivalent to the risk reduction strategy in our study) was at least 41%, it would be considered “cost-effective” under the cost assumptions most similar to ours, whereas implementation of this intervention in our model results in an ICER of more than three times the per-capita GDP. The other study, however, did not account for the fact that significant proportions of persons categorized as LTFU may remain connected to care and therefore dilute the health benefits observed for the resources invested in a retention-focused program.

There is a growing body of evidence that provides insight into the underlying causes and factors contributing to the poor retention-in-care experiences of many HIV care and treatment programs in the developing world [31,36-41]. Patients’ out-of-pocket expenses for opportunistic infection prophylaxis or ART and transportation costs/distance from a health center have been shown to be associated with disengagement in Africa and poorer clinical outcomes. In addition, interventions to alleviate these costs to patients have been demonstrated to improve adherence and retention in care [15,42,43]. Further research would be useful in assisting decision makers in tailoring and prioritizing strategies aimed at alleviating and ameliorating these barriers.

Limitations and Strengths

Our study included several limitations. We did not include the downstream effects of preventing patients from disengaging from care or relinking disengaged patients to treatment such as reduced HIV transmission. Including secondary infections may have made our results even more favorable to a retention-in-care portfolio of interventions because maintaining a low VL greatly reduces the risk of transmission [44,45]. We modeled only two sequential available ART regimens. It is, however, difficult to ascertain the magnitude and direction of bias this assumption has on our results. Whenever possible, we derived model inputs from East Africa data, but when local data estimates were unavailable, we used data from elsewhere in sub-Saharan Africa. Finally, we compared the clinical effectiveness and cost-effectiveness of only two broad HIV interventions (expansion of ART access and mitigation of disengagement from care), whereas broader portfolios of interventions may be under consideration. A notable strength of our analysis, however, is that it resolves a shortcoming of previous work: a person categorized as LTFU may not actually be disengaged from the health care system (i.e., may have died or may be receiving treatment elsewhere) and therefore may not derive any health benefits for the resources invested in the efforts to retain the person. Not considering this important circumstance would likely result in overestimation of the cost-effectiveness of retention-in-care-focused interventions.
Conclusions

Our results suggest that programs should scale up or optimize their retention programs if they have already achieved broad, early ART coverage among their HIV-infected population. Under conditions in which LTFU is common, disengagement from care is likely and retention programs can be scaled up relatively inexpensively and this may be a valuable next option on the implementation “menu” for policymakers and decision makers in this region.

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Supplemental Materials

Supplemental material accompanying this article can be found in the online version as a hyperlink at http://dx.doi.org/10.1016/j.jval.2015.09.2940. or, if a hard copy of article, at www.valueinhealthjournal.com/issues (select volume, issue, and article).

REFERENCES


