Facility-Level Factors Associated with Mortality of Patients on ART: A Retrospective Cohort Study in K

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BACKGROUND

Between 2007 and 2012, antiretroviral therapy (ART) coverage in Kenya increased from 29% to 61%[1]. While the efficacy of ART is well proven, its true effectiveness may be limited by a variety of patient and health systems factors. Several studies have identified demographic and socioeconomic factors that affect the outcomes of ART patients, but less is known about how health facility characteristics relate to survival. Further, it is difficult to compare facilities based on traditional outcome measures such as retention because mortality rates among lost to follow-up (LTFU) patients vary by facility. Identifying top-performing programs and facility characteristics associated with better outcomes can guide practices for the broader ART delivery system. Similarly, identifying facilities with poor outcomes can draw attention to areas in need of additional focus.

OBJECTIVES

- Estimate the survival rates of patients receiving antiretroviral therapy at a large, unbiased sample of Kenyan health facilities, accounting for mortality among those lost to follow-up.
- Examine health facility characteristics associated with mortality rates for patients receiving antiretroviral therapy.

METHODS

Data collection

We surveyed 47 Kenyan facilities that provide ART, collecting comprehensive information about their resources and practices. At these facilities, we extracted initiation, visit, and outcome information from a total of 15,689 ART patient charts.

Outcomes classification

For each chart, we classified the patient as (a) alive and on ART; (b) lost to follow-up; (c) dead; or (d) transferred at 6, 12, and 24 months. Lost to follow-up was defined as not having visited the clinic for at least 6 months and not returning.

Correcting for mortality among those LTFU

Several studies have traced LTFU patients to ascertain their true outcome. Looking across studies, there is a relationship between the proportion of all patients who were LTFU, and the proportion of traced LTFU patients who were found to have died. We used this relationship to estimate the total mortality at the facility level, stratified by baseline WHO stage, using the equation

$$ln\left(\frac{M_{LTFU}}{1-M_{LTFU}}\right) = \beta_0 + \beta_1 ln\left(\frac{P_{LTFU}}{1-P_{LTFU}}\right) + \varepsilon$$

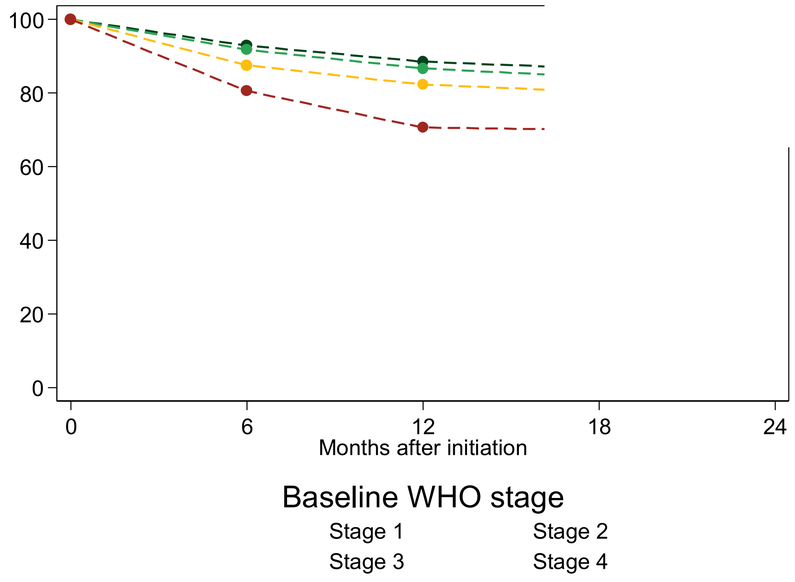
After applying this correction, all patients were classified as (a) alive or (b) dead. Transferred patients were excluded from analysis.

Regression analysis

We conducted OLS regressions at the health facility level to examine facility characteristics associated with the proportion of patients alive at 6, 12, and 24 months. All models were adjusted for the composition of patients in terms of baseline WHO stage, sex and age.

RESULTS

Figure 1: Proportion of patients alive at 6,



The mortality rate was highest in the first 6 months after initiating therapy.

By 24 months, 86% of those initiating in WHO stage 1 were alive, compared to 69% of those initiating in stage 4.

Across facilities, estimated total mortality ranged from 2% to 27% at 6 months after initiation of ART; 5% to 35% at 12 months after initiation; and 8% to 41% at 24 months after initiation.

At 24 months, mortality ranged from 9% to 41% at rural facilities, and 8% to 35% at urban facilities.

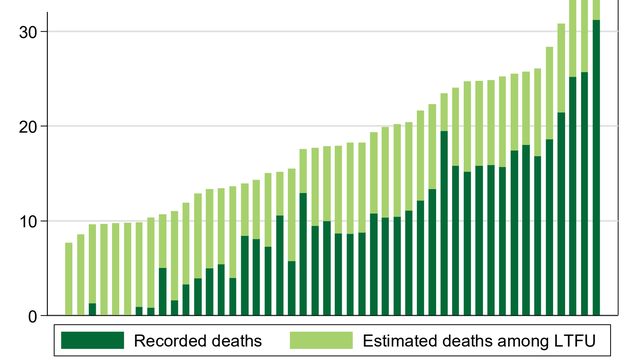


Figure 3: Facility factors associated with the proportion of patients alive at 6, 12, and 24 months

	6 months	12 months	24 months
Rural location (reference: Urban)	**-4.64***	**-5.22***	-3.34
Hospital (reference: Health Center)	-1.72	-2.27	-2.82
Government-owned (reference: Private/NGO)	-4.41	-5.65	-5.24
Had HIV training in the past year	0.39	0.51	-1.87
Has nurse-led treatment	-2.72	-2.29	-0.52
Has CD4 testing capacity on site	-0.027	-2.82	-3.80

*p<.05
Note: All models adjusted for baseline WHO stage, % female, age

IMPLICATIONS AND CONCLUSIONS

Our study finds that rural facilities are associated with worse patient outcomes, independent of determinants including baseline disease severity. Future research should examine the potential drivers of this association, including patients' socioeconomic characteristics and facility-level factors that we did not examine in our study such as management practices and outreach programs. However, even among rural facilities, there was significant variation in facility performance. The top-performing facilities should be studied in depth to understand the reasons for their success.

1. Odhiambo J, Kellogg T, Kim A, Ng'ang'a L, Mukui I, Umuro M, et al. Antiretroviral treatment scale-up among persons living with HIV in Kenya: results from a nationally representative survey. *J Acquir Immune Defic Syndr*. 2014 May 1;66.

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