Effect of patient satisfaction with a health care facility on HIV outcomes: A facility-level study in eastern Africa

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Abstract

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Data from Uganda and Kenya were used to investigate the relationship between patient satisfaction and the outcome measures of retention and HIV viral load suppression. First, we explore the determinants of patient satisfaction. Second, we look for an association between patient satisfaction and retention in care. Third, we investigate the relationship between patient satisfaction and viral load suppression for those currently in care. Clarity of health care providers' explanations and length of wait time were both significantly associated with patient satisfaction. Patient satisfaction was related to facility retention in HIV care, but it was not related to HIV viral load suppression for those who were currently in care. Better patient experiences in health care facilities could potentially improve HIV treatment retention in eastern sub-Saharan Africa, a key step in the HIV treatment continuum of care.

Introduction

Maintaining a patient with HIV in care and on treatment is critical to prevent treatment failure, drug resistance, and ultimately, death. One factor that has the potential to impact patient care at the facility level is patient satisfaction. While there are many individual components that may determine patient satisfaction, they can be broadly categorized into the following groups: interpersonal treatment, services provided, demographic and descriptive characteristics, time, and economics.

Interpersonal treatment is defined here as the manner in which an individual was treated by facility staff either collectively or individually. Confidentiality is one measure of interpersonal treatment. A study in Tanzania found that if patients rated confidentiality as "very good" compared to "very bad," the odds of them highly rating overall satisfaction were almost three times as large.[1] The same was true of whether the patients felt that the health care provider treated them with respect.[1] Privacy, respectfulness, and time taken by health care providers to listen to their concerns all positively influence patients' overall satisfaction.[2] To incorporate these important possible determinants of overall satisfaction, this study includes various measures of interpersonal experience.

The services provided and the way in which they are provided also impact how positively an individual views their visit to health care facilities. In particular, wait time has been shown to exert a large impact on overall satisfaction. In a study of HIV patients in Tanzania, if a patient viewed their wait time as "very good," as compared to a rating of "very bad," the odds of their overall satisfaction rating being higher increase by about 2. A similar result was found in a study of patient satisfaction at the main referral hospital in Kampala, Uganda.[3] Access to and availability of drugs is also an important component of how services provided can impact overall

patient satisfaction with the health care facility. A focus group study in Uganda found that lack of drugs impacted how a patient viewed the facility, and was also associated with how often they returned to that facility.[4] Because of these associations, this study will take into account measures of how perception of services provided is associated with overall satisfaction.

The economics of money and time spent play an important role in how people rate a health care facility. Long travel time is negatively associated with visiting a health care facility, though this impacts poorer people more than those with more money.[4] In the literature, the association between cost of care and rating of that care is mixed. One study in Uganda found that estimated expenditure was not associated with overall satisfaction.[3] However, another found cost to impose a large barrier to accessing care and to negatively influence how patients felt about the facility.[5]

An individual's demographic characteristics and the descriptive characteristics of a facility are often associated with how well a health care facility is rated. The size of a facility is an important characteristic that has been shown to impact how people view that facility. Those attending larger, as opposed to smaller, facilities have almost three times the odds of rating the facility higher.[1] In terms of an individual's demographics, the evidence is mixed. A study investigating correlates of patient satisfaction in Tanzania did not find age or sex to be significantly associated with overall satisfaction.[1] However, a meta-analysis of a similar question found that age and sex were associated with satisfaction, with older individuals and males having higher odds of rating their care higher.[6]

When evaluating the impact of patient satisfaction for patients with HIV, it is paramount to focus on outcomes of importance. Some key outcome measures include weight, opportunistic infections, and CD4 counts. The health of an HIV-positive person can be measured through their

weight gain (or loss) during treatment. This is particularly true during the early stages of treatment where even a small amount of weight loss (3-5% of starting body weight) is associated with a higher mortality risk.[7–10] Similarly, the presence of opportunistic infections can signify worsening infection and ineffective treatment.[11,12] Biometrics such as CD4 count and viral load count are also ways in which to measure patient progress or deterioration.[13,14] However, the pathway through which all of these outcomes are attained requires retention in care and treatment.

This study focuses on two different outcome measurements: retention in care and viral load suppression. Retention is a key measure of both facility and patient performance. In this study, we focus on 12-month retention from the day of antiretroviral therapy (ART) initiation. Although retention is useful, it is flawed by the fact that visits may be unrecorded or patient charts may go missing. The most accurate way to measure how well a patient is responding to ART is by measuring HIV RNA viral load. The goal of HIV treatment is to achieve an undetectable viral load in the blood.[15] A cut-off of 1,000 copies/μL has been proposed by the WHO as a marker for potential treatment failure, perhaps indicative of the need for second line ART treatment.[16] For the purpose of this study, this definition has been adopted.

A potential link between satisfaction of care and retention is that satisfaction can provide motivation for an individual to continue to seek HIV care, while dissatisfaction can produce barriers and reduce a patient's willingness to start or to continue treatment, even if they have already tested HIV-positive through services that a facility provided. Controlling for age and health status, a study in the United States found that patient satisfaction with the HIV care received from a health facility in the past year was significantly associated with both retention and adherence to treatment.[17] Additionally, there are steps that health facilities can take to

increase patients' satisfaction, thereby increasing continuity of care. These steps include building rapport between health care providers and patients, improving the communication skills of providers, and training providers to be more aware of the facilitators and barriers of adherence.[18] Positive experiences with a health care visit can motivate patients to continue therapy.[19] Particularly in the realm of adherence counseling, positive experiences during a health care visit can impact the patients' feeling of self-efficacy – that is, whether they believe their actions of taking their medication and coming in for facility visits will actually make them get better. Various studies have shown that patients' beliefs about the effectiveness of medicine impact their adherence to treatment regimens.[20–22] Though other factors have been discussed in more detail in previous research, it is worth noting that travel time and cost[23–26], sex[27–29], and type of health care facility[27,28] are related to both retention and patient satisfaction.

Though both positive and negative health care experiences influencing patient satisfaction can impact retention in care, the ultimate goal of HIV care is HIV viral load suppression. While prior research has not focused on this concept, the link between satisfaction, medication compliance, retention, and eventual viral load suppression intuitively makes sense since HIV patients not retained in care are much less likely to achieve viral load suppression. It is important to investigate potential factors associated with HIV viral load suppression for patients who have already had contact with the health care system. This is an area in which interventions can be performed in order to increase the odds of patients having undetectable viral load in their systems. This analysis will investigate the determinants of satisfaction with HIV care to better understand what patients find important in their care experience. It will further delve into the association between satisfaction and two important outcomes, retention in care

after starting ART and viral load suppression for those patients who have already come to a health care facility for HIV-related services.

This study will add to the current literature because not only does it investigate the relationship between patient satisfaction and retention, but it also explores the association between patient satisfaction and viral load suppression. It is a unique study of viral load suppression because its focus is on patients who are currently in care, a first step to expanding the available knowledge of how patient satisfaction is related to HIV outcomes. We will explore the determinants of patient satisfaction and hypothesize that there is a relationship between satisfaction and patient outcomes.

Methods

Study design

The data used in this analysis come from a broader study conducted in Uganda and Kenya from 2011 to 2013 by the Institute for Health Metrics and Evaluation at the University of Washington, called the Access, Bottlenecks, Costs and Equity study (hereafter referred to as ABCE). Other countries were involved in the ABCE study, but data from only Kenya and Uganda are included in this analysis. Though it would have been ideal to also include Zambia, the survey was modified after data collection in Zambia, which limits comparison. The Ugandan and Kenyan surveys are the most similar and lend themselves most easily to comparison. Furthermore, the two countries are both in Eastern Africa, which still has a large burden of HIV.[30]

Facilities were chosen for the ABCE study via the following steps in order to create a representative sample. First, health districts in each country were stratified by indicators such as

wealth, levels of health, and various population characteristics. At least one district from each combination was chosen. An exception was made for the capital cities, such that facilities from within Nairobi and Kampala were chosen. In each country, both hospitals and centers, each within both rural and urban areas, were sampled. Some facilities elected not to participate in the study and were replaced by similar ones from the same district. This replacement also occurred for facilities to which access was limited due to issues of safety or distance. The ABCE study also sampled a subset of the facilities that provided ART services to be included in the ART section of the study.

Exit surveys were conducted at facilities offering HIV services, asking questions about the patients' reasons for attending that facility, medications, adherence, cost of care, and many questions about their experience and satisfaction with various aspects of the facility. These exit surveys were used to explore what constituted important characteristics associated with overall satisfaction of a health care facility.

The ABCE study also collected data about facilities' revenues, costs, supplies, and personnel. Furthermore, at facilities that offered ART, information from up to 250 medical charts was extracted. Medical charts of current patients, deceased patients, and those lost to follow-up were extracted. Charts were extracted if the patient was an adult aged 18 and over at the time of extraction, and had initiated ART between 6 and 60 months prior to the date of extraction. In cases where fewer than 250 charts were available, all charts were extracted. When a facility had more than 250 medical charts, the total number of charts was divided by 250. The closest integer k to that number was used to select every kth chart until 250 charts were extracted. Information of the extraction included visit dates prior to ART initiation, ART initiation, and other facility visits. Additional data were also extracted on demographics, clinical outcomes, and

ART treatment regimen. Retention during the 12 months after ART initiation was calculated from the information on facility visits.

An additional pilot study on viral load suppression was conducted in 15 of the facilities that participated in ABCE in Uganda. This pilot study assessed HIV viral load suppression among HIV-positive patients currently enrolled in care at the health care facility. One of the main objectives of this study was to determine the suitability of using individual patients' HIV viral load count as a performance measure for ART programs at a facility level in Uganda. HIV viral load was measured by collecting patients' plasma, with up to 250 patients included at each facility. Inclusion criteria were the same as those for medical chart extraction in the general ABCE study.

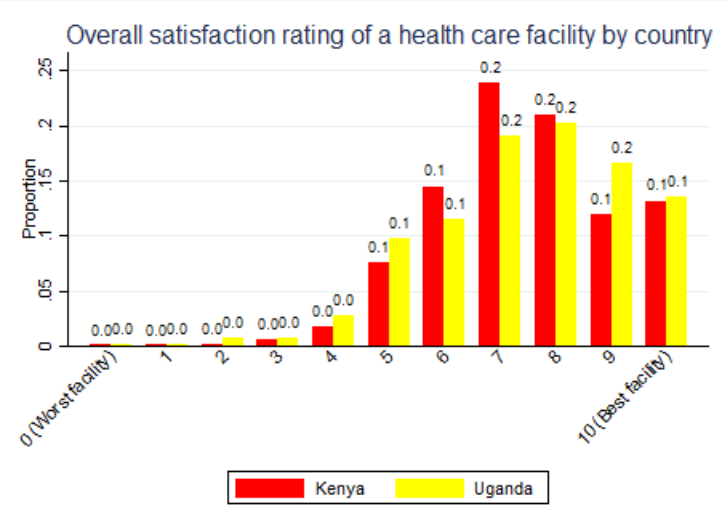
Data analysis

For all study questions involving data for both countries, the analysis was carried out separately for Uganda and for Kenya. The reasoning behind this is that for policy reasons, it does not matter how patients view Ugandan facilities versus Kenyan facilities. While some comparisons may be helpful in order to extrapolate lessons of elements that are working well in one country to another country (such as how wait-time may potentially differentially impact Kenyan and Ugandan patients' views of facilities), the magnitude of the effects can still be compared without specifying country within the regression equation. Table 1 shows the mean and standard deviation of all of the independent and dependent variables for all analyses.

Components associated with patient satisfaction

The dependent variable is overall satisfaction with a health care facility as reported by individuals upon exiting a facility after receiving care, which is treated as an ordered categorical variable. The question about overall satisfaction asked "Using any number from 0 to 10, where 0 is the worst facility possible and 10 is the best, how would you rate this facility?" This variable is positively skewed, meaning that more people rate their facility higher rather than lower (Please see Figure 1 to see a histogram of overall satisfaction by country).

Figure 1: Histogram of overall satisfaction by country



The independent variables include individuals' demographic characteristics, facility descriptive characteristics, costs, and various measures of satisfaction with the health care facility. Demographic characteristics include age and sex of the patient. The sample had a greater proportion of female participants than males (around 60%). Additionally, descriptive characteristics of the facilities include the following: size of ART clinic, whether the facility was a hospital or a health center, urbanicity of the facility (rural, semi-urban, and urban) and private/public status of the facility. However, since close to 100% of the facilities were public, this variable did not end up being useful. ART clinic size was classified as large or small

according to whether the size was greater or less than the median size of all facilities within the country. Cost of medical care was also included as an independent variable.

The variables used in measuring satisfaction were as follows: cleanliness, travel time, waiting time, privacy, clarity of explanations by providers, and whether the patient perceived that enough time was allotted to allow the health care provider to answer questions. Variables connected to perception of receipt of proper care included whether individuals received the medicines for which they came to the facility and whether the patient had seen a doctor during his/her appointment.

To assess what components are associated with overall satisfaction with a facility, linear regression modeling was used.

The specific model is as follows:

$$
\begin{aligned}
&overall\ satisfaction\ rating_i \\
&\quad = \beta_0 + \beta_1 age_i + \beta_2 female_i + \beta_3 travel\ time_i + \beta_4 travel\ time\ rating_i \\
&\quad + \beta_5 waiting\ time\ rating_i + \beta_6 if\ medications\ were\ obtained_i \\
&\quad + \beta_7 saw\ a\ doctor_i + \beta_8 privacy\ rating_i + \beta_9 explanations\ rating_i \\
&\quad + \beta_{10} questions\ ratings_i + \beta_{11} ART\ clinic\ size_f \\
&\quad + \beta_{12} \ln(total\ medical\ fees)_i + \beta_{13} private\ status_f + \beta_{14} type_f \\
&\quad + \beta_{15} rural\ status_f + \gamma_f + \varepsilon_i
\end{aligned}
$$

where *i* is a given patient, and *f* is a given facility, γ is a random effect, and ε is random error.

For the variables measuring the various satisfaction components with the health care facility, if the value was listed as "don't know," it was recoded as missing. Due to the skew of the total fees paid by patients, the natural log of the fees was used in the regression. Though it was included in the specification, the public/private status of the facility was omitted from the

results due to collinearity and lack of variation in values across the dataset. A random effect on facility was also included to capture the inherent differences between facilities where the differences are assumed to be randomly distributed.

Factors related to retention after ART initiation

Retention was defined as whether the patient was still seeking care at an HIV health care facility 12 months after initiating ART. The independent variables included average satisfaction rating of the health care facility (0-10 scale), sex, age, WHO stage of HIV at time of ART initiation, CD4 value at time of ART initiation, average of the natural log of total fees paid at the facility, average travel time to the facility, ART clinic size, health care facility type (hospital versus health clinic), and urbanicity of the facility. The rating of the health care facility, travel time, and total fees paid come from the exit survey data. The other data come from the medical chart extractions. Though they originate from different patients, each type of data are cross-sectional. CD4 counts were split into four categories: 0-50, 51-200, 201-350 and 351 and higher. There was a fairly high level of 12-month retention after ART initiation; almost 70% in Kenya, and just above 80% in Uganda.

The method used to investigate whether patient satisfaction is related to retention after ART initiation was a logistic regression with a random effect on facility. This analysis used logistic regression because the outcome variable can only take on the values of 0 or 1 (not retained, or retained).

The model specification is as follows:

$$logit(P_{retention_i})$$

$$= \beta_0 + \beta_1 female_i + \beta_2 age_i + \beta_3 WHO\ stage\ at\ ART\ initiation_i$$

$$+ \beta_4 CD4\ count\ at\ ART\ initiation_i + \beta_5 average\ fees\ paid_f$$

$$+ \beta_6 average\ travel\ time_f + \beta_7 ART\ clinic\ size_f + \beta_8 private\ status_f$$

$$+ \beta_9 type_f + \beta_{10} rural\ status_f + \beta_{11} average\ overall\ satisfaction_f + \gamma_f$$

where *retention* is the 12-month retention after ART initiation (0 or 1), i is a given patient, and f is a given facility, and γ is a random effect.

WHO stage and CD4 count at initiation, facility type, ART clinic size, and rural status were considered categorical variables. The natural log of total fees paid was used because of the skew of the variable. Sex and age were also included in the analysis. Overall satisfaction rating of the facility was the independent variable of interest. Because different individuals answered the exit survey about their view of the facility than had had their medical charts extracted, average overall satisfaction score by facility was used. Due to the correlation between CD4 count and WHO stage at initiation, two regressions were run for this analysis, one with and one without CD4 count at ART initiation. Though the correlation between CD4 count and WHO stage at ART initiation was small at -0.05, it was statistically significant at the 0.01 level.

Relationship between patient satisfaction and viral load suppression

The dependent variable is the proportion of patients at each facility who are virally suppressed, with viral load suppression defined as < 1,000 RNA copies per milligram. The independent variables are sex, age of the patients, CD4 count at ART initiation, WHO stage at ART initiation, ART clinic size, rural/urban status of the facility, whether the facility was a hospital, and average overall rating of the facility. Similar to the prior analysis, CD4 count at

ART initiation was divided into four categories. Travel time and cost were not included in this analysis because they were not associated with retention, and it would be through retention that these variables could impact viral load. A majority of patients who were currently in care were virally suppressed (almost 90%). It is significant that these were patients who had consented to having their blood drawn at the time of their facility visit as they were actively seeking HIV services. Because of this, retention could not be used as a covariate in this part of the analysis.

A logistic regression with a random effect on facility was used to investigate this association. Logistic regression was chosen because the dependent variable is bounded by 0 and 1, as a proportion that are virally suppressed at the facility level.

The specific model is as follows:

$$logit\left(P_{suppression_i}\right) = \beta_0 + \beta_1 female_i + \beta_2 age_i + \beta_3 WHO\ stage\ at\ ART\ initiation_i + \beta_4 CD4\ count\ at\ ART\ initiation_i + \beta_5 ART\ clinic\ size_f + \beta_6 private\ status_f + \beta_7 type_f + \beta_8 rural\ status_f + \beta_9 average\ overall\ satisfaction_f + \gamma_f$$

where *suppression* is viral suppression status (0 or 1) of patients who are currently in care , *i* is a given patient, and *f* is a given facility, and γ is a random effect.

All variables but age and average overall satisfaction with the facility were analyzed as categorical variables. Average satisfaction score of the facility had to be used because the patients who had their viral load measured were not given the exit survey. Two regressions were run for this analysis, one with and one without CD4 count at ART initiation, based on the same reasoning as for the previous analysis. Retention cannot be used as a covariate because all

patients whose viral load was measured were current patients, and thus were all retained in care at the present time.

Results

Components associated with patient satisfaction

For both Kenyan and Ugandan patients responding to an exit survey after having received HIV care at a health care facility, a few commonalities become evident about what influences how these patients viewed and then rated the health care facility (see Table 2). Age and sex are associated with how people rate a health care facility. Older individuals have slightly higher odds of rating a facility highly; however, age only trends toward statistical significance in this relationship. Females similarly have larger odds to highly rate a health care facility, with an OR of about 1.2 in both countries as compared to males (95% CI 1.09-1.41 in Kenya; 1.01-1.45 in Uganda).

The length of time spent waiting to be seen by a provider is significantly associated with how satisfied patients are after receiving HIV services. This is a dose-response relationship, whereby the shorter the wait time, the higher the facility is rated. For example, in Kenya, a wait time that is considered "long" as compared to "very long" carries an OR of 1.3 for rating the facility higher (95% CI 1.01-1.58 in Kenya; 1.03-1.70 in Uganda). A wait time of "very short" as compared to "very long" has an OR of about 1.8 in Kenya (95% CI 1.35-2.30). In Uganda, but not Kenya, cleanliness is significantly associated with overall satisfaction rating: a cleanliness rating of "very good" as compared to "very bad" has 13.8 times the odds of being rated a more satisfactory facility (95% CI 2.07-91.39). Both clarity of explanations and having adequate time to ask questions were significantly associated with higher ratings of the facility.

The odds ratio of "very good" clarity of explanations to "very bad" was 7.6 in Kenya and 4.1 in Uganda (95% CI 1.15-50.79 in Kenya; 1.50-11.37 in Uganda). However, the direction of the relationship between adequacy of time to ask questions and overall satisfaction rating is not what would be expected; as adequacy of time increases, overall rating decreases. Obtaining all medicines as compared to none was associated with about twice the odds of having higher overall satisfaction ratings in Kenya. Travel time, satisfaction with travel time, seeing a doctor during a visit, and perceptions of privacy were not associated with overall satisfaction rating.

In terms of facility-level covariates, none were significantly associated with overall satisfaction rating of a health care facility. The covariates analyzed included size of ART clinic, total medical fees paid, type of facility, and location of facility from an urban center.

Factors related to retention after ART initiation

To determine what factors were associated with retention after ART initiation, various demographic, health information, and facility characteristics were investigated (see Table 3). In Kenya only, older patients had slightly higher odds of retention than younger patients, with an odds ratio of 1.1 (95% CI 1.04-1.17). As expected, patients with more advanced disease, measured by being Stage III or IV and having lower CD4 counts, had lower odds of retention in care 12 months after ART initiation. For example, in Kenya, the OR was 0.29 when comparing Stage IV at ART initiation to Stage I at initiation (95% CI 0.22-0.39). Additionally, initiating ART with a CD4 count between 201 and 350 showed almost twice the odds of being in care a year later than initiating with a CD4 count of 0-50 (95% CI 1.55-2.40 in Kenya; 1.15-2.11 in Uganda). The only facility-level characteristic that was associated with patient retention in HIV care after beginning ART was location of the facility. In Kenya, patients attending urban

facilities had higher odds of retention than those in rural areas. Interestingly, the opposite was true in Uganda, though this association was only trending towards statistical significance.

The main predictor of interest in this analysis, overall satisfaction rating, proved a significant predictor of 12-month retention in care after ART initiation. In Kenya, if the average overall satisfaction rating for a facility was higher, the odds of being "retained" were around two-thirds higher for each increase of one point on the overall satisfaction rating scale (95% CI 1.31-2.09 in Kenya; 0.619-1.03 in Uganda).

None of the results changed substantively when CD4 count at ART initiation was not included in the analysis. Results for this sub-analysis are also found in Table 3.

Relationship between patient satisfaction and viral load suppression

The next step after exploring the association of patient satisfaction and patient retention in care after ART initiation was to investigate how satisfaction was related to HIV viral load suppression (see Table 4). The data used in this analysis are only from Uganda, for reasons discussed above. Older age was associated with increased odds of being virally suppressed (OR 1.03, 95% CI 1.025-1.034). Females had greater odds of viral suppression than males, with an odds ratio of 1.12 (95% CI 1.03-1.22). Generally, if an individual had a higher CD4 count at initiation, they had higher odds of becoming virally suppressed, but this was the case only for a CD4 count between 201-350 compared to a count of 0-50 at ART initiation. Furthermore, WHO stage of disease at ART initiation had a dose-response relationship with viral suppression. Those who initiated while they were at Stage IV had odds of viral suppression much lower than those who initiated at Stage I; the OR was around 0.6 (95% CI 0.54-0.77).

Characteristics of the facility were not associated with HIV viral load suppression, though some were at the 0.10 level. Compared to health centers, hospitals were trending towards higher odds of having patients who were virally suppressed (95% CI 0.91-2.88). Facilities in semi-urban areas showed lower odds of having patients with viral suppression than facilities in rural areas (95% CI 0.31-1.02). ART clinic size was not associated with odds of viral load suppression.

Higher average facility satisfaction rating was not associated with a decreased odds of patients being virally suppressed (OR 95% CI 0.49-1.14). The interpretation of these results did not change when CD4 count at initiation of ART was not included as an independent variable in the analysis.

Discussion

Our study found that some facility characteristics were associated with overall satisfaction rating, though many were not. Although previous work had shown clinic size to be associated with satisfaction, this study did not support that finding. The difference is possibly due to this study's use of ART clinic size instead of the full clinic size. Also, neither cost of medical care nor travel-time was related to the overall rating. However, as discussed above, the current literature is not in total agreement about these determinants, so perhaps this lends itself to the idea that such determinants might be more locally than generally associated with patient satisfaction.

It was expected that seeing a doctor during a HIV-related health care visit would be positively associated with overall satisfaction rating, but this was found not to be the case. It could be that the sicker patients were the ones who saw doctors, and perhaps sicker patients view

their visit less positively. This matter could not be investigated because there was no outcome or health-related information for the individuals answering the exit survey. A second possibility is that because only a small proportion of patients actually saw a doctor, the true effect is masked. In both countries, around 20-30% saw a doctor during their visit for HIV-related services. In any case, it is clear that more effort needs to be focused on better understanding the role of physicians in the satisfaction of care within health care facilities.

Shorter wait time and better clarity of explanations by health care providers were each associated with overall patient satisfaction of the facility. These are actionable items upon which providers and health systems can improve in order to upgrade their patients' experiences at their facilities. Exploring ways to train health care providers on how to more clearly explain treatment and advantages of treatment would be extremely beneficial to increasing patient satisfaction. Furthermore, facility-level infrastructure and personnel changes to decrease wait time would similarly increase patient satisfaction.

An important finding is that overall satisfaction with a health care facility was associated with patient retention in HIV treatment after a patient had initiated ART. Since patient satisfaction is controllable and something on which facilities could intervene and improve, this finding is significant. In particular, further steps could include evaluating interventions to improve upon the two main aspects of satisfaction that were associated with overall satisfaction of the facility. These could be measurable operational metrics within health care facilities to assess their performance.

It is worth noting that on average, patients started ART at WHO Stage II and with a CD4 count of between 201 and 350. Both WHO stage and CD4 count at ART initiation were associated with retention in care after initiation of antiretroviral treatment; those who had lower

CD4 counts or higher stages had lower odds of being in care. These results highlight the need to increase the reach and frequency of HIV testing campaigns, especially in light of the fact that those who are sicker are less likely to be able to come to the facility for check-ups and medicine, and thus more likely to die.

Viral load suppression varied by health care facility type, with hospitals having higher odds of virally suppressed patients than health clinics. Similarly, urban facilities in Kenya had higher odds of retaining patients in care than rural facilities. Both of these findings could indicate that places equipped with more resources achieve better outcomes. Additional research is needed to see why there were differences between different types of facilities, and how those differences can be mitigated.

Though overall satisfaction rating was not associated with viral load suppression for individuals currently in care, this lack of connection could be due because overall satisfaction impacts viral load through the pathway of retention, and in the case of viral load, we were only able to include patients who were presenting for care. If patients previously lost to follow-up were also included in this analysis, it is possible that there could actually be an effect we are not currently appreciating due to our sample selection. This would be an interesting area in which to pursue additional research.

Though there are many strength of this analysis, certain limitations must be addressed. To analyze the determinants associated with overall satisfaction, an alternative model that could have been used is ordered logit model. However, because of the sparseness in some categories, there was an issue of convergence, and so this model could not be used. The main issue of concern was that very few patients rated the facility with an overall satisfaction score of less than

5 on the 0 to 10 scale. A further issue in using ordinary least squares regression, as was done, is that we cannot bound the prediction by the limits of the variable.

When interpreting these results, a caveat to keep in mind is that the patients who rated the facility on all of the satisfaction measurements were individuals currently seeking HIV care. Furthermore, the patients who rated their health care facility were *not* the same patients for whom the study measured retention and viral load outcome data. The patients for whom viral load was collected were also currently in care. The implication is that this analysis can only be applied to patients who are already seeking HIV-related services.

Additionally, the viral load study within the larger ABCE study included only 15 facilities. Thus, these results have reduced generalizability and may not apply outside of Uganda. This portion of the study did not recruit HIV-positive individuals who were not seeking care. Thus, a vulnerable portion of the population of interest was not studied, and retention in care could not be used as a covariate in the analysis of determinants associated with viral load suppression. The viral load data are not truly nationally representative because the ART facilities were selected by convenience from the larger ABCE study, which was nationally representative. Though efforts were made to extract information from all types of patients' charts (currently in care, lost to follow up, and deceased), it is possible that the charts from deceased or lost-to-follow-up patients may have been disposed of. If this is the case, it would introduce bias into the study.

Ecological issues must also be kept in mind. Average satisfaction ratings were used to investigate the relationships between overall satisfaction with both retention and viral load suppression. Individuals for whom outcome data were collected were not surveyed about their experiences with the health care system. Future studies should use satisfaction with a health care

facility and HIV outcome data from the same individuals. There also continues to be the need to screen and coordinate the care of HIV patients to encourage participation in treatment programs so that individuals come to the health care facilities in the first place, and continue to do so after starting treatment.

Conclusion

This study examined the components important in determining patients' overall satisfaction with a health care facility providing care for HIV patients. Wait time and clarity of explanations had key associations with this satisfaction variable. The study additionally found that patient satisfaction is associated with retention in care after initiating ART. This finding, as well as the finding that there was no significant relationship between satisfaction and viral load suppression for patients that are currently in care, indicates areas for future research. Study of these areas could enable researchers to see at what other stages of care patient satisfaction is related to retention and whether satisfaction is associated with viral load suppression for all patients both in and out of care.

In a perfect world, health care providers would screen all potentially HIV-infected individuals, have all patients in treatment, and further reduce risk factors of transmission. This study, like others, has reported that this does not occur. The examination of the factors that may result in positive outcomes for those infected with HIV in two east African countries has shown the dynamics of care to be complex. Though this study has limitations as previously described, the strengths of this study include that it explores many potential determinants of overall patient satisfaction and investigates the relationship between that satisfaction and patient outcomes.

These dynamics of care can become more understandable and successful through steps such as better facility management and coordination, and enhanced patient-provider communication.

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Tables

Table 1: mean and standard deviation of variables

	Kenya			Uganda		
	Mean	St. dev.	% missing	Mean	St. dev.	% missing
Exit survey data						
Age (years)	34.81	-11.67	0.00	34.57	-12.28	0.00
Female (proportion)	0.61	-0.49	0.00	0.6	-0.49	0.00
Cleanliness rating (1-5)	4.03	-0.69	5.10	4.03	-0.82	3.07
Clarity of explanations rating (1-5)	4.17	-0.61	5.55	4.14	-0.63	4.06
Time for questions rating (1-5)	4.09	-0.69	5.87	4.03	-0.75	5.16
Privacy rating (1-5)	3.99	-1	5.10	3.98	-1.25	3.07
Travel time rating (1-5)	3.34	-1.22	0.00	3.15	-1.5	0.00
Wait time rating (1-5)	3.14	-1.22	5.64	2.88	-1.32	3.30
Medicines obtained (1-3)	2.74	-0.5	27.63	2.82	-0.41	17.48
None (1)	2.58%			1.28%		
Some (2)	21.18%			15.10%		
All (3)	76.23%			83.62%		
Travel time (hours)	1.82	-0.96	0.26	2.26	-1.11	0.36
Saw a doctor (proportion)	0.18	-0.39	5.10	0.28	-0.45	3.07
Overall rating (0-10)	7.48	-1.61	5.50	7.48	-1.8	4.49
Hospital (proportion)	0.52	-0.5	0.00	0.5	-0.5	0.00
Large ART clinic (proportion)	0.66	-0.47	34.60	0.62	-0.48	51.32
Private facility (proportion)	0.04	-0.2	0.00	0	0	0.00
Urbanicity (1-3)	2	-0.78	0.00	2.1	-0.87	0.00
Rural (1)	30.46%			33.64%		
Semi-urban (2)	38.65%			22.47%		
Urban (3)	30.89%			43.89%		
Total fee (natural log)	5.1	-1.36	49.45	8.97	-1.43	74.82
Chart data						
Age (years)	35.16	-2.6	0.00	35.6	-3.14	0.00
Female (proportion)	0.64	-0.48	0.79	0.61	-0.49	1.57
CD4 value at ART initiation (1-4)	3.01	-1.05	0.00	2.77	-1.05	0.00
0-50 (1)	10.04%			13.20%		
51-200 (2)	24.23%			29.14%		
201-350 (3)	20.48%			25.02%		
>350	45.25%			32.65%		
WHO stage at ART initiation (1-4)	2.23	-0.85	6.85	2.28	-0.89	9.78
Stage I (1)	23.01%			22.04%		
Stage II (2)	35.15%			35.76%		

Stage III (3)	37.49%			34.70%		
Stage IV (4)	4.35%			7.50%		
Large ART clinic (proportion)	0.72	-0.45	4.13	0.67	-0.47	20.98
12-month retention (proportion	0.69	-0.46	18.10	0.84	-0.37	15.63
Viral load data						
Age (years)				38.4	-10.86	16.21
Female (proportion)				0.67	-0.47	35.05
CD4 value at ART initiation (1-4)				2.88	-0.99	0.00
0-50 (1)				8.89%		
51-200 (2)				28.62%		
201-350 (3)				28.15%		
>350				34.35%		
WHO stage at ART initiation (1-4)				2.15	-0.85	0.00
Stage I (1)				24.57%		
Stage II (2)				41.86%		
Stage III (3)				28.03%		
Stage IV (4)				5.54%		
Virally suppressed (proportion)				0.89	-0.31	0.00

Table 2: Determinants associated with overall rating of facility
Significance levels: * = .1; ** = .05; *** = .01

		Kenya	**Uganda**
Question	**value**	**OR (95% CI)**	**OR (95% CI)**
Age of patient (years)		1.010***	1.009**
		(1.004-1.016)	(1.002-1.017)
Sex *Female is baseline*			
	Female	1.236***	1.212**
		(1.087-1.405)	(1.014-1.449)
Travel time (hours)		1.094**	1.057
		(1.004-1.193)	(0.949-1.178)
How would you rate your travel time to the facility?	Very long		
	Long	1.068	1.01
		(0.806-1.416)	(0.768-1.329)
	Neither short nor long	0.953	1.215
		(0.708-1.282)	(0.866-1.704)
	Short	1.027	1.24
		(0.753-1.400)	(0.906-1.697)
	Very short	1.131	1.028
		(0.806-1.588)	(0.728-1.450)
How would you rate your wait time at the facility?	Very long		
	Long	1.265**	1.325**
		(1.012-1.582)	(1.033-1.700)
	Neither short nor long	1.206	1.657***
		(0.963-1.510)	(1.234-2.223)
	Short	1.355***	1.704***
		(1.080-1.700)	(1.304-2.226)
	Very short	1.760***	1.323

		(1.347-2.299)	(0.918-1.906)
Did you obtain the medicine that you needed?	None		
	Some	1.494	0.819
		(0.825-2.705)	(0.217-3.089)
	All	2.037**	1.663
		(1.140-3.640)	(0.449-6.165)
Did you see a doctor during your visit?			
	Yes	1.043	0.987
		(0.846-1.285)	(0.805-1.211)
How would you rate the cleanliness of the facility?	Very bad		
	Bad	3.582	5.323
		(0.189-67.736)	(0.688-41.202)
	Moderate	3.768	5.908*
		(0.206-68.960)	(0.897-38.930)
	Good	6.126	9.387**
		(0.335-111.866)	(1.437-61.339)
	Very good	8.197	13.753***
		(0.448-150.088)	(2.070-91.388)
How would you rate the privacy you experienced?	Very bad		
	Bad	1.088	2.455
		(0.237-4.994)	(0.240-25.162)
	Moderate	1.211	2.255
		(0.273-5.376)	(0.241-21.090)
	Good	1.497	2.552
		(0.340-6.593)	(0.280-23.293)

	Very good	1.481	2.079
		(0.332-6.602)	(0.225-19.241)
How would you rate the clarity of explanations given by providers?	Very bad		
	Bad		
	Bad	2.352	
		(0.348-15.898)	
	Moderate	4.357	2.700**
		(0.656-28.928)	(1.001-7.284)
	Good	5.440*	2.683**
		(0.828-35.731)	(1.023-7.041)
	Very good	7.628**	4.123***
		(1.146-50.786)	(1.496-11.367)
How would you rate the time spent getting to ask your questions?	Very bad		
	Bad	0.397	0.107***
		(0.116-1.353)	(0.032-0.365)
	Moderate	0.482	0.138***
		(0.141-1.643)	(0.042-0.453)
	Good	0.593	0.210***
		(0.175-2.002)	(0.065-0.677)
	Very good	0.651	0.186***
		(0.189-2.247)	(0.055-0.627)
Large ART clinic			
	Yes	1.042	1.431
		(0.761-1.427)	(0.700-2.926)
Total medical fee paid by patient (logged)		0.986	1.039
		(0.907-1.071)	(0.925-1.166)
Private facility	(Omitted due to collinearity)		

Hospital			
	Yes	1.014	0.979
		(0.741-1.386)	(0.566-1.693)
Urbanicity of facility *Rural is baseline*			
	Semi-urban	1.224	1.2
		(0.882-1.699)	(0.604-2.385)
	Urban	1.335	0.82
		(0.924-1.930)	(0.383-1.755)

Table 3: Factors associated with 12-month retention in HIV care
Significance levels: * = .1; ** = .05; *** = .01

		Kenya	Uganda	Kenya	Uganda
Question	**value**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Individual characteristics					
Sex *Female is baseline*					
	Female	1.047	1.058	1.06	1.064
		(0.929-1.180)	(0.882-1.269)	(0.941-1.194)	(0.888-1.275)
Average age of patients at facility (years)		1.100***	1.004	1.096***	1.006
		(1.036-1.167)	(0.937-1.076)	(1.034-1.162)	(0.935-1.082)
WHO stage at ART initiation *Stage I is baseline*					
	Stage II	0.903	1.167	0.878	1.147
		(0.763-1.069)	(0.883-1.543)	(0.742-1.039)	(0.868-1.514)
	Stage III	0.571***	0.784*	0.539***	0.728**
		(0.484-0.673)	(0.595-1.032)	(0.458-0.633)	(0.556-0.955)
	Stage IV	0.292***	0.410***	0.262***	0.367***
		(0.220-0.389)	(0.293-0.575)	(0.198-0.348)	(0.264-0.511)
CD4 count at ART initiation *0-50 is baseline*					
	51-200	1.399***	1.272*		
		(1.142-1.713)	(0.971-		

			1.667)		
	201-350	1.930***	1.556***		
		(1.550-2.401)	(1.145-2.114)		
	>351	1.587***	0.96		
		(1.307-1.926)	(0.736-1.253)		
Facility characteristics					
Average total medical fee paid by patients (logged)		0.852	1.126	0.855	1.142
		(0.698-1.040)	(0.845-1.500)	(0.702-1.041)	(0.854-1.526)
Average travel time (hours)		0.874	0.868	0.892	0.848
		(0.578-1.319)	(0.409-1.841)	(0.594-1.338)	(0.396-1.813)
Large ART clinic					
	Yes	0.851	1.406	0.861	1.447
		(0.583-1.244)	(0.791-2.500)	(0.592-1.252)	(0.809-2.589)
Private facility	(Omitted due to collinearity)				
Hospital					
	Yes	0.823	0.781	0.822	0.785
		(0.555-1.220)	(0.472-1.293)	(0.557-1.213)	(0.472-1.306)
Urbanicity of facility *Rural is baseline*					
	Semi-urban	1.628**	0.902	1.587**	0.936
		(1.082-2.450)	(0.490-1.659)	(1.061-2.374)	(0.505-1.735)
	Urban	1.735**	0.556*	1.656**	0.561*
		(1.074-2.803)	(0.295-1.047)	(1.032-2.655)	(0.295-1.064)

Satisfaction					
Average overall satisfaction rating of facility		1.656***	0.796*	1.649***	0.793*
		(1.311-2.093)	(0.619-1.025)	(1.309-2.078)	(0.615-1.024)

Table 4: Factors associated with viral load suppression
Significance levels: * = .1; ** = .05; *** = .01

		Uganda	**Uganda**
Question	**value**	**OR (95% CI)**	**OR (95% CI)**
Individual characteristics			
Sex *Female is baseline*			
	Female	1.124***	1.134***
		(1.031-1.224)	(1.041-1.235)
Age of patient (years)		1.030***	1.030***
		(1.025-1.034)	(1.026-1.035)
WHO stage at ART initiation *Stage I is baseline*			
	Stage II	0.825***	0.809***
		(0.734-0.928)	(0.721-0.909)
	Stage III	0.714***	0.680***
		(0.631-0.808)	(0.602-0.767)
	Stage IV	0.643***	0.607***
		(0.536-0.770)	(0.508-0.725)
CD4 count at ART initiation *0-50 is baseline*			
	51-200	1.097	
		(0.956-1.259)	
	201-350	1.264***	
		(1.093-	

		1.460)	
	>351	0.986	
		(0.858-1.132)	
Facility Characteristics			
Large ART clinic			
	Yes	1.772	1.786
		(0.823-3.816)	(0.831-3.841)
Urbanicity of facility *Rural is baseline*			
	Semi-urban	0.558*	0.541**
		(0.305-1.020)	(0.297-0.988)
	Urban	0.49	0.504
		(0.172-1.397)	(0.177-1.433)
Hospital			
	Yes	1.622*	1.620*
		(0.914-2.880)	(0.913-2.873)
Private facility	(Omitted due to collinearity)		
Satisfaction			
Average overall satisfaction rating of facility		0.749	0.764
		(0.493-1.139)	(0.503-1.161)

REFERENCES

1. Miller JS, Mhalu A, Chalamilla G, et al. Patient satisfaction with HIV/AIDS care at private clinics in Dar es Salaam, Tanzania. *AIDS Care*. 2014;26(9):1150-1154. doi:10.1080/09540121.2014.882487.

2. Chimbindi N, Bärnighausen T, Newell M-L. Patient satisfaction with HIV and TB treatment in a public programme in rural KwaZulu-Natal: evidence from patient-exit interviews. *BMC Health Serv Res*. 2014;14:32. doi:10.1186/1472-6963-14-32.

3. Nabbuye-Sekandi J, Makumbi FE, Kasangaki A, et al. Patient satisfaction with services in outpatient clinics at Mulago hospital, Uganda. *Int J Qual Health Care*. 2011;23(5):516-523. doi:10.1093/intqhc/mzr040.

4. Kiguli J, Ekirapa-Kiracho E, Okui O, Mutebi A, MacGregor H, Pariyo GW. Increasing access to quality health care for the poor: Community perceptions on quality care in Uganda. *Patient Prefer Adherence*. 2009;3:77-85.

5. Hardon AP, Akurut D, Comoro C, et al. Hunger, waiting time and transport costs: Time to confront challenges to ART adherence in Africa. *AIDS Care*. 2007;19(5):658-665. doi:10.1080/09540120701244943.

6. Hall JA, Dornan MC. Patient sociodemographic characteristics as predictors of satisfaction with medical care: A meta-analysis. *Social Science & Medicine*. 1990;30(7):811-818. doi:10.1016/0277-9536(90)90205-7.

7. Guenter P, Muurahainen N, Simons G, et al. Relationships among nutritional status, disease progression, and survival in HIV infection. *Journal of Acquired Immune Deficiency Syndromes*. 1993;6(10):1130-1138.

8. Mangili A, Murman DH, Zampini AM, Wanke CA, Mayer KH. Nutrition and HIV Infection: Review of Weight Loss and Wasting in the Era of Highly Active Antiretroviral Therapy from the Nutrition for Healthy Living Cohort. *Clin Infect Dis*. 2006;42(6):836-842. doi:10.1086/500398.

9. Tang AM, Forrester J, Spiegelman D, Knox TA, Tchetgen E, Gorbach SL. Weight loss and survival in HIV-positive patients in the era of highly active antiretroviral therapy. *Journal of Acquired Immune Deficiency Syndromes*. 2002;31(2):230-236. doi:10.1097/00126334-200210010-00014.

10. Wheeler DA, Gibert CL, Launer CA, et al. Weight loss as a predictor of survival and disease progression in HIV infection. *Journal of Acquired Immune Deficiency Syndromes & Human Retrovirology*. 1998;18(1):80-85.

11. Kaplan JE, Benson C, Holmes KK, Brooks JT, Pau A, Masur H. *Guidelines for Prevention and Treatment of Opportunistic Infections in HIV-Infected Adults and Adolescents: Recommendations from CDC, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America*. Atlanta, Georgia: Centers for Disease Control and Prevention; 2009:198. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5804a1.htm. Accessed August 14, 2014.

12. AIDS.org. AIDS Information, Education, Action, Awareness: Opportunistic Infection. 2014. Available at: http://www.aids.org/topics/aids-factsheets/aids-background-information/what-is-aids/hiv-testing/cd4-t-cell-tests/opportunistic-infections/. Accessed August 15, 2014.

13. US Department of Health and Human Resources, Health Resources and Services Administration. *CD4 and Viral Load Monitoring*. US Department of Health and Human Resources, Health Resources and Services Administration; 2011. Available at: http://hab.hrsa.gov/deliverhivaidscare/clinicalguide11/cg-206_cd4_monitoring.html. Accessed July 9, 2014.

14. World Health Organization. *Antiretroviral Therapy for HIV Infection in Adults and Adolescents: Recommendations for a Public Health Approach, 2010 Version*. Geneva, Switzerland: World Health Organization; 2010. Available at: http://www.who.int/hiv/pub/arv/adult2010/en/. Accessed July 9, 2014.

15. AIDS.gov. Understand your test results: viral load. *HIV/AIDS Basics*. 2009. Available at: http://www.aids.gov/hiv-aids-basics/just-diagnosed-with-hiv-aids/understand-your-test-results/viral-load/. Accessed August 19, 2014.

16. World Health Organization. *ARV Guidelines: Monitoring Response to ART and the Diagnosis of Treatment Failure*. Geneva, Switzerland: World Health Organization; 2013. Available at: http://www.who.int/hiv/pub/guidelines/arv2013/art/artmonitoring/en/index3.html. Accessed August 19, 2014.

17. Dang BN, Westbrook RA, Black WC, Rodriguez-Barradas MC, Giordano TP. Examining the Link between Patient Satisfaction and Adherence to HIV Care: A Structural Equation Model. *PLoS ONE*. 2013;8(1):e54729. doi:10.1371/journal.pone.0054729.

18. Roberts KJ. Physician-Patient Relationships, Patient Satisfaction, and Antiretroviral Medication Adherence Among HIV-Infected Adults Attending a Public Health Clinic. *AIDS Patient Care and STDs*. 2002;16(1):43-50. doi:10.1089/108729102753429398.

19. UNAIDS. *Access to Antiretroviral Therapy in Africa: Status Report on Progress towards the 2015 Targets*. Geneva, Switzerland: UNAIDS; 2012:12. Available at: http://www.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2013/20131219_AccessARTAfricaStatusReportProgresstowards2015Targets_en.pdf. Accessed June 21, 2014.

20. Beach MC, Keruly J, Moore RD. Is the Quality of the Patient-Provider Relationship Associated with Better Adherence and Health Outcomes for Patients with HIV? *Journal of General Internal Medicine*. 2006;21(6):661-665. doi:10.1111/j.1525-1497.2006.00399.x.

21. Johnson MO, Chesney MA, Goldstein RB, et al. Positive Provider Interactions, Adherence Self-Efficacy, and Adherence to Antiretroviral Medications Among HIV-Infected Adults: A Mediation Model. *AIDS Patient Care and STDs*. 2006;20(4):258-268. doi:10.1089/apc.2006.20.258.

22. Schneider J, Kaplan SH, Greenfield S, Li W, Wilson IB. Better Physician-Patient Relationships Are Associated with Higher Reported Adherence to Antiretroviral Therapy in Patients with HIV Infection. *Journal of General Internal Medicine*. 2004;19(11):1096-1103. doi:10.1111/j.1525-1497.2004.30418.x.

23. Conley NJ, Pavlinac PB, Guthrie BL, et al. Distance from home to study clinic and risk of follow-up interruption in a cohort of HIV-1-discordant couples in Nairobi, Kenya. *PLoS ONE*. 2012;7(8):e43138. doi:10.1371/journal.pone.0043138.

24. Hassan AS, Fielding KL, Thuo NM, Nabwera HM, Sanders EJ, Berkley JA. Early loss to follow-up of recently diagnosed HIV-infected adults from routine pre-ART care in a rural district hospital in Kenya: a cohort study. *Trop Med Int Health*. 2012;17(1):82-93. doi:10.1111/j.1365-3156.2011.02889.x.

25. Siedner MJ, Lankowski A, Tsai AC, et al. GPS-measured distance to clinic, but not self-reported transportation factors, are associated with missed HIV clinic visits in rural Uganda. *AIDS*. 2013;27(9):1503-1508. doi:10.1097/QAD.0b013e32835fd873.

26. Ware NC, Wyatt MA, Geng EH, et al. Toward an understanding of disengagement from HIV treatment and care in sub-Saharan Africa: a qualitative study. *PLoS Med*. 2013;10(1):e1001369; discussion e1001369. doi:10.1371/journal.pmed.1001369.

27. Mutasa-Apollo T, Shiraishi RW, Takarinda KC, et al. Patient retention, clinical outcomes and attrition-associated factors of HIV-infected patients enrolled in Zimbabwe's National Antiretroviral Therapy Programme, 2007-2010. *PLoS ONE*. 2014;9(1):e86305. doi:10.1371/journal.pone.0086305.

28. Odafe S, Torpey K, Khamofu H, et al. The pattern of attrition from an antiretroviral treatment program in Nigeria. *PLoS ONE*. 2012;7(12):e51254. doi:10.1371/journal.pone.0051254.

29. Somi G, Keogh SC, Todd J, et al. Low mortality risk but high loss to follow-up among patients in the Tanzanian national HIV care and treatment programme. *Trop Med Int Health*. 2012;17(4):497-506. doi:10.1111/j.1365-3156.2011.02952.x.

30. Institute for Health Metrics and Evaluation, University of Washington. GBD Compare: Results from the Global Burden of Disease Study 2010. *GBD Compare: Results from the Global Burden of Disease Study 2010*. 2013. Available at: http://viz.healthmetricsandevaluation.org/gbd-compare/. Accessed July 29, 2014.