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Microfinance, retention in care, and mortality among patients enrolled in HIV 2 Care in East Africa

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ABSTRACT

Objective: To measure associations between participation in community-based microfinance groups, retention in HIV care, and death among people living with HIV (PLHIV) in low-resource settings.

Design and methods: We prospectively analyzed data from 3,609 patients enrolled in an HIV care program in western Kenya. HIV patients who were eligible and chose to participate in a Group Integrated Savings for Health Empowerment (GISHE) microfinance group were matched 1:2 on age, sex, year of enrollment in HIV care, and location of initial HIV clinic visit to patients not participating in GISHE. Follow-up data were abstracted from medical records for January 2018 through February 2020. Logistic regression analysis examined associations between GISHE participation and two outcomes: retention in HIV care (i.e., ≥1 HIV care visits attended within 6 months prior to the end of follow up) and death. Socioeconomic factors associated with HIV outcomes were included in adjusted models.

Results: The study population was majority female (78·3%) with a median age of 37·4 years. Microfinance group participants were more likely to be retained in care relative to HIV patients not participating in a microfinance group (adjusted OR (aOR) = 1·31, 95% CI: 1·01 – 1·71; p=0.046). Participation in group microfinance was associated with a reduced odds of death during the follow-up period (aOR=0·57, 95% CI: 0·28 – 1·09; p=0.105).

Conclusions: Participation in group-based microfinance appears to be associated with better HIV treatment outcomes. A randomized trial is needed to assess whether microfinance groups can improve clinical and socioeconomic outcomes among PLHIV in similar settings.

Keywords: HIV; microfinance; retention in care; death; poverty; stigma; socioeconomic determinants of health

INTRODUCTION

Poverty shapes risk of HIV infection and drives HIV-treatment outcomes among people living with HIV (PLHIV) in sub-Saharan Africa (SSA).[1–3] PLHIV who are living in poverty face socio-economic barriers to accessing and engaging in HIV care,[2] including transport costs and long distances to health facilities, food insecurity, user fees at health facilities, and lack of community-based services.[4–6] Access barriers are heightened for rural populations living in remote locations where transportation fees are prohibitively high

relative to income.[7] Because of these barriers, economically disadvantaged PLHIV may be more vulnerable to disease progression compared to patients with greater financial resources.[2]

Microfinance services increase access to income-generating opportunities for marginalized populations who may otherwise be excluded from formal banking sectors.[8] By providing small loans and community savings to individuals in low resource settings, microfinance interventions can improve HIV treatment outcomes by addressing poverty-related risk factors that threaten care engagement. Economic strengthening via microfinance can reduce food insecurity, a by-product of poverty, which in turn increases healthcare utilization and ART adherence through nutritional and behavioural mechanisms;[9] increasing financial security can improve retention in HIV care by addressing barriers related to transportation costs and health facility fees.[10,11] Recent systematic reviews by Swan M. et al.[1] and Nadkarni S. et al.[12] show improved adherence to antiretroviral therapy (ART)[1,12], retention in care[1,12], and viral suppression[12] among PLHIV who participated in microfinance and income generating activities at the individual-level, compared to PLHIV who did not. However, most studies reviewed did not account for potential differences between patients who participated in microfinance programs through randomization or other methods.

There is also minimal evidence as to whether group- rather than individual-level microfinance can have a positive effect on HIV treatment outcomes. Offering microfinance within a group setting may be particularly beneficial for PLHIV,[12,13] who experience frequent HIV-related stigma that can limit their ability to find work or access conventional forms of capital.[14] By meeting in the community, microfinance groups offer access to savings and loans without requiring individuals to travel long and costly distances to commercial hubs. Microfinance groups can further serve as a mechanism for social support when the majority or all of group members are PLHIV.[15] Groups with a majority of HIV-positive members can reduce or remove disease-related stigma and psychological barriers that threaten ART adherence.[15,16] Despite the potential for microfinance to improve the socioeconomic determinants of access and adherence to HIV care, the impact of group-based microfinance interventions on HIV outcomes is not yet understood.

This research aims to characterize the relationship between participation in group-based microfinance and retention in care and mortality among individuals enrolled in an HIV care program in western Kenya. We hypothesize that patients who participate in group-based microfinance in the community will be more engaged in HIV care and have reduced mortality compared to patients who are not enrolled in group microfinance. To the best of our knowledge, this will be among the first studies to utilize medical record data to prospectively assess associations between microfinance group participation and HIV treatment outcomes.

METHODS

Study Setting and Design

We conducted a prospective analysis of patients enrolled in HIV care via the Academic Model Providing Access to Healthcare (AMPATH) program in western Kenya.[17] AMPATH is a partnership between Moi University, Moi Teaching and Referral Hospital, and North-American academic institutions whose mission is to improve care, train medical professionals, and advance research beyond the clinical setting to create opportunities for education and socioeconomic advancement. Since 2001, AMPATH has grown to provide care to over 165,000 active people living with HIV across 800 clinical sites in Kenya.[17] AMPATH's microfinance program, *Group Integrated Savings for Health Empowerment (GISHE)*, was established in 2012 and follows the Village-Level Savings and Loan Associations model[18] where members of community-led groups manage their own savings, provide interest-bearing loans, and contribute to a social fund for emergency or social welfare issues. At group formation, members undergo training, draft a Constitution that stipulates group operations, and designate a treasurer to act as group leader. Members meet regularly (e.g., biweekly, monthly) and borrow based on need, with a focus on furthering income-generating activities. GISHE groups are comprised of 15-30 members who are predominately female (~81% female, 19% male) AMPATH patients.[19] The AMPATH care program refers patients to GISHE based on need.

Study Population

This analysis included patients enrolled in HIV care at the Moi Teaching and Referral Hospital and other AMPATH-supported clinics in two counties: Uasin Gishu and Bungoma. Patients who were a registered member of an AMPATH GISHE group as of January 2018 were matched 1:2 on age, sex, geographic location of initial clinic visit, and year of enrollment in HIV care to AMPATH patients who were not participating in GISHE in January 2018. To match on age and enrollment year, we used non-parametric nearest-neighbor matching without replacement.[20] We used exact matching for categorical variables. [Supplementary Table 1, http://links.lww.com/QAD/C193] Data for patients who were at least 18 years old in 2012 when the GISHE program began, and who had received any HIV care in 2018 at the start of data collection for this study, were abstracted from the AMPATH Medical Records System and included in the sampling frame. [Figure 1] Each patient's geographic location was based on the site of their initial clinic visit to capture urban vs. rural locations. Follow-up data through February 6, 2020 was included in this analysis such that the maximum follow-up duration was 767 days.

Measures

The following data were captured by clinicians and recorded in AMPATH's Medical Record System at the initial clinic visit during which a patient first enrolled in HIV care: age, sex, enrollment year, WHO disease stage, geographic location of initial HIV clinic visit, educational status, availability of electricity and running water in the home, number of people in the household, and travel time to the clinic. WHO disease stage was a four level categorical variable reflecting the four clinical stages of HIV infection; location of initial HIV clinic visit was dichotomized as Moi Teaching and Referral Hospital or other AMPATH-

supported facility; educational status was dichotomized to reflect whether or not a patient ever attended school; and self-reported travel time to the clinic was a categorical variable with the following 4 levels: less than 30 minutes, 30-60 minutes, 1-2 hours, and more than 2 hours. We calculated the length of time in care as the number of years from the date of a patient's initial HIV clinic visit until database closure on February 6, 2020. Additional measures from routine clinical care were captured from AMPATH's Medical Record System including ART start dates, clinical encounter dates, and scheduled return to clinic dates. Scheduled return to clinic dates were routinely scheduled every 3 to 6 months by providers during each HIV clinic appointment.

Outcomes

The primary outcomes in this analysis were (1) retention in HIV care and (2) death. We used a binary indicator of retention in HIV care where an individual was considered to be retained in care if they attended at least 1 HIV clinical care visit within the 6 months preceding the end of the follow-up period on February 6, 2020, and not retained in care otherwise. We defined retention in care based on established AMPATH care protocols where expected return to clinic dates are 3 months for patients on ART and 6 months for patients not on ART. This definition also aligns with similar research assessing retention in care among AMPATH patients living with HIV.[21,22] For patients retained in care, death during the follow-up period was determined from the AMPATH community tracking form and medical record data.

Statistical Analysis

Pearson's chi square tests for categorical variables and analysis of variance tests for continuous variables were used to summarize and examine differences between GISHE and non-GISHE participants in terms of socio-demographic and clinical characteristics. We examined the association between GISHE participation and both primary outcomes -- retention in HIV care and death -- separately using logistic regression analysis. Factors known to be associated with HIV treatment outcomes were considered for inclusion in the adjusted analysis. The covariates included in the final model were: age, sex, initial clinic visit location, year of enrollment, educational status, availability of electricity and water in the home, travel time to the clinic, and WHO disease stage. For the continuous age variable, cut points were assigned at 30 and 45 years based on visual inspection of the age distribution in the sample. Characteristics on which GISHE participants were matched to non-GISHE participants were included as covariates in the adjusted model in order to account for any residual confounding between groups. Results of adjusted models exclusive of the matching variables and inclusive of initial care adherence are presented in Supplementary Tables 2 and 3, http://links.lww.com/QAD/C193. Analyses were conducted using StataSE 15 (College Station, Texas: Stata Press) and R statistical software.

Missing Data

Across the entire sample, there were no missing data for retention in care given that patients with missing data for this outcome were by definition not retained in care. Ascertainment of death data was complete for those patients who were considered to be retained in care during the follow-up period up until the date of death. Fewer than 7% of data were missing for each of the covariates included in the final adjusted model. Covariates driving the missing data were travel time to the clinic (6·1% missing), educational status (4·3% missing), and presence of electricity and water in the home (4·0% missing). AMPATH has robust mechanisms for increasing the accuracy of data collected via its medical record system [23] and for following-up patients who miss clinic visits.[24] Thus, the chance of human error leading to missing data is minimal.

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RESULTS

Study Population Characteristics

A total of 3,609 patients receiving HIV care were included in this analysis. [Table 1] The median age of the study population was 37·4 years (Interquartile range (IQR): 31·1 – 44·7) and approximately three-quarters (78·3%) of patients were female. Nearly 90% of the population had ever attended any formal schooling and 15·1% had electricity and running water in the home. A total of 1,203 patients who participated in GISHE as of January 2018 were matched to 2,406 patients who had not participated in GISHE. Due to matching, GISHE and non-GISHE participants were similar with respect to age at enrollment, sex, location of initial HIV care visit, and year of enrollment in care. GISHE and non-GISHE participants were also similar with respect to WHO disease stage at enrollment and educational status. Compared to non-GISHE patients, GISHE participants had a larger household size, were less likely to have electricity and piped water in the home, and were more likely to travel up to 2 hours to a health facility for care. On average, compared to non-GISHE patients, GISHE participants had more recently attended an HIV clinic appointment at the time of database closure on February 6, 2020 (2.7 months compared to 3.2 months since last HIV clinic appointment, respectively).

Retention in HIV care

In total, 3249 (90·0%) of all patients had attended at least 1 clinical HIV care visit within the 6 months preceding the end of the follow-up period. GISHE participants were more likely to be retained in care relative to patients who had not participated in GISHE (Odds Ratio (OR)

= 1·44; 95% Confidence Interval (CI): 1·13 – 1·85). [Table 2] After adjusting for relevant covariates (age, sex, WHO disease stage, initial clinic location, enrollment year, electricity and water in the home, travel time to the clinic, and educational status), the association between GISHE participation and retention in care was slightly attenuated, but still positively associated (adjusted OR (aOR) = 1·31, 95% CI: 1·01 – 1·71). Patients who had been in HIV care for longer periods of time were 41% more likely to remain engaged in care relative to patients who had been engaged in care for fewer years (aOR = 1·41, 95% CI: 1·33 – 1·49). Older patients (those 30 years and older) and female patients were also more likely to be retained in HIV care. The odds of being retained in care did not differ between patients who had their initial HIV care visit at Moi Teaching and Referral Hospital or another AMPTH-supported facility (aOR = 1·0; 95% CI: 0·66 – 1·59).

Death

Between January 2018 and February 2020, a total of 57 patients (1·6%) died, 12 of whom were GISHE participants and 45 of whom were non-GISHE patients. GISHE participants were 47% less likely to die during the follow-up period relative to non-GISHE patients (OR=0·53, 95% CI: 0·27 – 0·97). [Table 2] Adjusting for relevant covariates (age, sex, WHO disease stage, initial clinic location, enrollment year, electricity and water in the home, travel time to the clinic, and educational status), the relationship between GISHE participation and odds of death during follow up was slightly attenuated such that the association was no longer statistically significant at the $p<0.05$ level, but was still inversely related (aOR=0·57, 95% CI: 0·28 – 1·09). For matching covariates, odds of death increased for older patients (those 30 years and older), male patients, and those who had their initial HIV care visit at Moi Teaching and Referral Hospital. Odds of death was 6% lower among patients who had been in care for longer periods of time.

DISCUSSION

This analysis found that participation in group-based microfinance was associated with better HIV-related outcomes among PLHIV in western Kenya. Patients who were enrolled in HIV care and participating in community-based microfinance groups had a 1·31 times higher odds of being retained in HIV care and a 0·57 times lower odds of dying during the follow-up period, compared to patients not participating in group microfinance.

The few studies that have assessed group microfinance show improved retention in HIV care and ART adherence among group members. One community and home-based care intervention in 14 Ethiopian cities found that, among clients participating in community savings and loans groups, 99% reported >95% ART adherence with a decline in annual mortality rates from 10% to 0·7% over the 4 year follow-up period.[25] An economic strengthening program in Ethiopia found that Village Savings and Loan groups increased the odds of having at least 95% ART adherence by a factor of 5·6 among microfinance group members.[9] Colombia's IMEA Project – an intervention combining group microfinance and treatment adherence support for women with HIV/AIDS – was associated with increased

ART adherence scores among microfinance members over 23 months, with mean scores increasing from 16·5 to 52·5 ($p<0·001$).[10] Despite their encouraging findings, these studies largely relied on participants' self-report and included relatively small sample sizes. Thus, the current analysis strengthens the evidence-base supporting group microfinance for PLHIV by using objective medical record data to measure HIV outcomes among 3609 patients over two years.

In addition to poverty-reducing effects, there may be other mechanism(s) – such as social support – through which group microfinance improves outcomes.[26] Community-based social support has been significantly associated with improved retention (RR: 1.07, 95% CI 1.07 -1.08) and reduced mortality (RR: 0.85, 95% CI 0.81 - 0.89) and loss to follow up (RR: 0.75, 95% CI 0.72 - 0.78) among PLHIV in South Africa.[27] In addition to better ART adherence, microfinance group participants in the Okello et al. study [25] reported statistically significantly greater improvements in social relationships and their communal environment relative to controls. The ongoing Harambee cluster randomized trial in western Kenya[28] aims to address persistent gaps in this area by using mediation analysis to identify the complex mechanisms through which group microfinance and community-based care impact viral suppression.

In our analysis, the strongest predictors of disengagement from care were age, length of time in care, and travel time to a health facility. Younger age (i.e., age 18 to 30) is associated with attrition from HIV care due largely to the frequent mobility of this population.[29,30] Similarly, prior length of time in care forecasts the likelihood of remaining engaged in care in the medium to long term. This signifies that young adulthood is a critical period for habituating HIV management habits. Just as concerted efforts are being put towards developing interventions that address the unique needs of adolescents living with HIV,[31] targeted approaches for care engagement may need to be extended to young adulthood.

Findings from this analysis hold two important implications for public health programming. First, the UNAIDS 95-95-95 target (95% of PLHIV diagnosed, 95% of those diagnosed adhering to ART, 95% of those on ART being virally suppressed)[32] relies largely on allocating resources to rapidly scale up treatment for persons at high risk of and those currently living with HIV. Yet increasing treatment alone will likely not be enough to achieve this target; sub-Saharan Africa has the largest population of people living in extreme poverty and is projected to be home to 87% of the world's poorest by 2030.[33] This analysis and other recent work reinforces the urgency for community-level interventions that can address the socioeconomic and psychosocial drivers of vulnerability among PLHIV in order to improve access to care.[33–35] Such interventions will need to be delivered in tandem with treatment scale-up initiatives if the world's poorest poor are to be included in the 95-95-95 targets.

Second, health systems in SSA are increasingly strained by having to implement the WHO 2015 recommendations to "treat all" with ART,[36] and scale up treatment in advance of the UNAIDS 2030 target. These health systems have simultaneously had to adapt to be able to

sustain care during the novel coronavirus pandemic.[37] In the face of these health system demands, differentiated care delivery models will become even more critical for keeping PLHIV retained in care with minimal resources. Differentiated models that deliver care within the context of microfinance groups have already demonstrated positive effects on chronic disease control including reductions in blood pressure [38] and increasing chronic disease preventive screening in high risk, rural populations.[39,40] Furthermore, young adults and mobile populations may stand to benefit most from differentiated care options that can provide care and medications based on patients' temporal and spatial realities.[29] Delivering community-based health services within the context of microfinance groups has not yet been extended to HIV. Doing so will be critical to keeping PLHIV retained in care[29] and achieving global disease control targets.

The current study is not without limitations. First, viral suppression is one of most important markers of ART adherence, but was not included as an outcome in this analysis. For both groups, complete data on time-updated viral load measurements were not available and applying more advanced statistical methods to address these missing data was beyond the scope of this analysis. Second, our study was dependent on the clinical data available AMPATH's Medical Record System which limited our selection of covariates. While medical record data captured important socio-demographic factors associated with group microfinance participation (e.g., wealth proxies, household conditions), it is still possible that imbalances exist between the comparison groups in terms of unmeasured covariates such as treatment adherence[10,12], group cohesion[12,41], or spousal support[12,41]. If these unmeasured covariates are confounders, then the matching methods could potentially exacerbate bias in treatment effect estimates. Also, our death estimates are conservative because occurrences of death are likely underestimated in both treatment groups and some patients who were counted as not retained in care may have died. Lastly, patients were considered to be participating in microfinance groups if they were enrolled in GISHE at the start of the data collection period in 2018. This definition only provides a snapshot of microfinance group participation since it does not capture patients who had previously been enrolled in GISHE prior to 2018 or who enrolled in GISHE after the start of data collection. We also could not measure how long GISHE participants had been involved in group microfinance. Thus, our regression models were unable to assess whether length of time in group microfinance or prior group participation influenced outcomes.

Despite these limitations, this study is one of the first to measure associations between microfinance group participation and objectively measured HIV-treatment outcomes. Improvements in retention in care and reduced mortality among microfinance group members underscore the importance of the group effect of microfinance interventions [12] for reducing the societal vulnerabilities facing PLHIV that can contribute to poorer HIV outcomes. These findings indicate that providing microfinance at the group level in the community could be extended to address the socioeconomic determinants of health affecting people living with HIV and other chronic conditions in rural settings.

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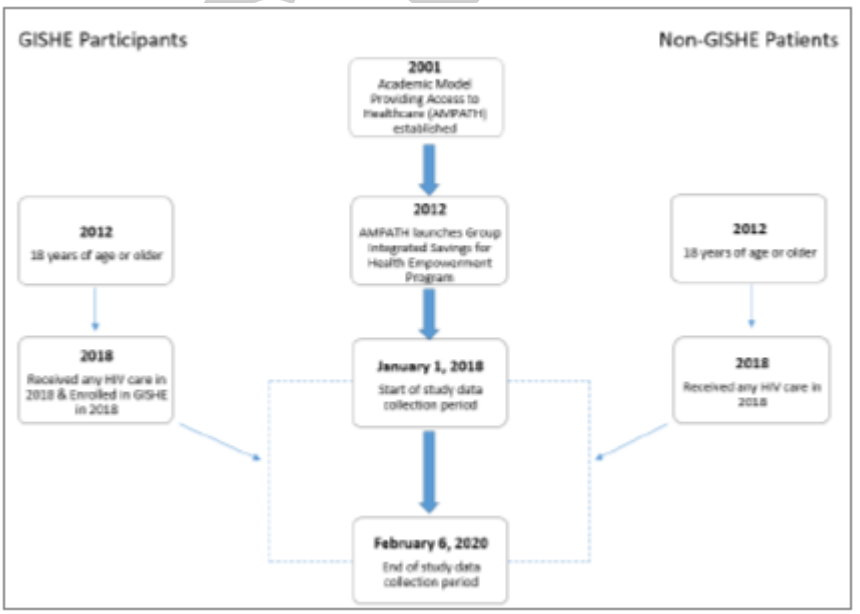
FIGURE 1. Study inclusion criteria and follow-up data collection timeline



GISHE: Group Integrated Savings for Health Empowerment
GISHE microfinance group participants were matched 1:2 on age, sex, year of enrollment in HIV care, and location of initial clinic visit to patients not participating in GISHE

TABLE 1. Characteristics of 3,609 Patients Receiving HIV Care in western Kenya, by Participation in Group-based Microfinance Program (GISHE)

	Participated in GISHE (N = 1203)	**Did not participate in GISHE (N = 2406)**	**p-value**
Sex, n (%)			
Male	258 (21·4)	526 (21·9)	0·775
Female	945 (78·6)	1880 (78·1)	
Age at enrollment, mean (SD)	38 (9·8)	38·2 (10·1)	0·117
Year of enrollment, n (%)			
Before 2010	902 (75)	1817 (75·5)	0·723
2010 onward	301 (25)	589 (24·5)	
WHO disease stage at enrollment, n (%)			
Stage 1	522 (43·4)	1007 (42)	0·549
Stage 2	312 (26)	598 (25)	
Stage 3	330 (27·5)	705 (29·4)	
Stage 4	38 (3·2)	85 (3·5)	
Initial HIV clinical care visit at MTRH, n (%)			
Yes	127 (10·6)	256 (10·6)	0·939
No	1076 (89·4)	2150 (89·4)	
Travel time to clinic, n (%)			
< 30 minutes	350 (30·9)	672 (29·7)	0·04

30 – 60 minutes	391 (34·6)	796 (35·2)	
1 – 2 hours	296 (26·2)	538 (23·8)	
> 2 hours	94 (8·3)	253 (11·2)	
Ever attended school, n (%)			
Yes	1013 (88·1)	2030 (88·1)	0·986
No	137 (11·9)	274 (11·9)	
Availability of electricity & running water in the home, n (%)			
Yes	122 (10·5)	402 (17·4)	<0·001
No	1037 (89·5)	1904 (82·6)	
Number of people in the household, mean (SD)	5·5 (2·7)	5 (2·5)	<0·001
Initiated ART, n (%)			
Yes	1202 (99·9)	2399 (99·7)	0·211
No	1 (0·1)	7 (0·3)	
Number of years on ART, mean (SD)	10·7 (2·7)	10·7 (2·9)	0·918
Years in HIV care, mean (SD)	11·6 (2·4)	11·6 (2·4)	0·71
Months since last viral load measurement, mean (SD)	7·8 (4·4)	7·5 (4·3)	0·065
Months since last HIV care visit at database closure, mean (SD)	2·7 (4·2)	3·2 (5)	0·003
Virally suppressed at first VL	1028 (88·2)	1997 (87·2)	0·401

measure taken at the start of the follow up period, n (%)			
Virally suppressed at last VL measure taken prior to the end of the follow up period, n (%)	1114 (95·6)	2190 (95·7)	0·943

GISHE: Group Integrated Savings for Health Empowerment; MTRH: Moi Teaching and Referral Hospital;

WHO: World Health Organization; ART: Antiretroviral Therapy; VL: Viral Load

The follow-up data collection period for this analysis was from January 1, 2018 through February 6, 2020.

TABLE 2. Associations Between Microfinance Group Participation (GISHE) and Retention in Care and Mortality Among Patients Enrolled in HIV Care in Western Kenya

	Retention in Care		**Death**	
	Unadjusted OR (95% CI) N= 3609	Adjusted OR (95% CI) N=3339	Unadjusted OR (95% CI) N=3609	Adjusted OR (95% CI) N=3339
Microfinance group participation (GISHE)				
No	(ref)	(ref)	(ref)	(ref)
Yes	1·44 (1·13 – 1·85)**	1·31 (1·01 – 1·71)*	0·53 (0·27 – 0·97)	0·57 (0·28 – 1·09)
Sex				
Female		(ref)		(ref)
Male		0·92 (0·69 – 1·23)		1·33 (0·69 – 2·45)
Age at enrollment				
<= 30 years		(ref)		(ref)
31 – 45 years		2·13 (1·6 – 2·84)***		2·45 (0·95 – 8·33)
>45 years		1·97 (1·39 – 2·8)***		3·49 (1·22 – 12·54)*
Initial HIV clinical care visit				

at MTRH				
No		(ref)		(ref)
Yes		1·0 (0·66 – 1·59)		1·66 (0·69 – 3·54)
Years in HIV care		1·41 (1·33 – 1·49)***		0·94 (0·83 – 1·07)
Ever attended school				
No		(ref)		(ref)
Yes		0·64 (0·42 – 0·96)*		2·54 (0·88 – 10·77)
Electricity & water in the home				
No		(ref)		(ref)
Yes		1·39 (0·96 – 2·08)		0·92 (0·38 – 1·97)
Travel time to the clinic				
< 30 minutes		(ref)		(ref)
30 – 60 minutes		0·75 (0·55 – 1·01)		3·06 (1·38 – 7·73)**
1 – 2 hours		0·62 (0·45 – 0·87)		1·52 (0·56 – 4·32)
> 2 hours		0·44 (0·29 – 0·67)***		3·75 (1·41 – 10·52)**
WHO disease stage at enrollment				
Stage 1		(ref)		(ref)
Stage 2		1·0 (0·74 – 1·36)		0·94 (0·44 – 1·94)
Stage 3		0·79 (0·6 – 1·06)		1·08 (0·54 – 2·11)
Stage 4		0·86 (0·46 – 1·78)		1·77 (0·4 – 5·42)

*p<0.05; **p<0.01; ***p<0.001

OR: Odds Ratio; CI: Confidence Interval; GISHE: Group Integrated Savings for Health Empowerment; WHO: World Health
Organization; MTRH: Moi Teaching and Referral Hospital

Odds ratios represent the results of the logistic regression analysis conducted on the matched sample.