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Distinct forms of migration and mobility are differentially associated with HIV treatment adherence

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Abstract

Objective: We examined whether human mobility was associated with antiretroviral (ARV) treatment adherence, measured via ARV hair concentrations.

Design: This is a cross-sectional analysis of adults on ARV treatment in East Africa at baseline in an observational cohort study.

Methods: Participants reported recent mobility (overnight travel) and histories of migration (changes of residence), including reasons, frequency/duration, and locations. Hair ARV concentrations were analyzed using validated methods. We estimated associations between

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mobility and ARV concentrations via linear regression adjusted for age, sex, region, years on treatment.

Results: Among 383 participants, half were female and the median age was 40. Among men, 25% reported recent work-related mobility, 30% non-work mobility, and 11% migrated in the past year (mostly across district boundaries); among women, 6% and 57% reported work-related and non-work mobility, respectively, and 8% recently migrated (mostly within district). Those reporting work-related trips ≤2 nights had 72% higher hair ARV levels (p=0.02) than those who did not travel for work; in contrast, non-work mobility (any duration, vs. none) was associated with 24% lower levels (p=0.06). Intra-district migrations were associated with 59% lower ARV levels compared to non-migrants (p=0.003) while inter-district migrations were not (27% higher, p=0.40).

Conclusions: We found that localized/intra-district migration and non-work travel—more common among women—were associated with lower adherence, potentially reflecting care interruptions or staying with family/friends unaware of the participants' status. In contrast, short work-related trips—more common among men—were associated with higher adherence, perhaps reflecting higher income. Adherence interventions may require tailoring by sex and forms of mobility.

Keywords

HIV; Adherence; Migration; Mobility; Kenya; Uganda; Sex Differences

INTRODUCTION

Human mobility is associated with HIV incidence,[1-5] prevalence,[6-8] and is a key driver of HIV spread.[9,10] However among persons living with HIV, the impact of mobility on HIV care engagement and antiretroviral treatment (ART) adherence remains poorly understood. Adherence is essential for prevention of morbidity, mortality,[11,12] and onward transmission,[13] yet strategies to support adherence in the context of mobility are limited, in part due to insufficient data characterizing the role of mobility in adherence. Some emerging evidence suggests that mobility may present barriers to continuity of care[14-19] and ART adherence,[16,20] while other studies have not found these associations.[19] These divergent results may reflect inconsistent measurement and definitions of mobility[14] or insufficient measurement of treatment adherence.[21-24]

In sub-Saharan Africa, the forms and drivers of human mobility are complex, highly variable, and differ by sex. [7,25-29] We characterize *mobility* as temporary travel to and from one's primary residence involving overnight stays (distinguished from commuting), and *migration* as a change of residence over a defined geopolitical boundary, both national and subnational (i.e., both international and internal migration). Some of the most common motivations for both mobility and migration in sub-Saharan Africa include business or educational opportunities, to care for or receive care from family, or to escape violence or political disruptions.[7] These diverse motivations, along with distance travelled, travel frequency, and trip duration, may impact treatment adherence differentially. For example, recent qualitative research highlights challenges obtaining ART refills in a new location

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when taking time off work causes loss of wages or stigma from a new employer, particularly when wait times are long or lack of a referral letter causes delays.[18,30-32] On the other hand, some report that visiting the clinic while travelling allows them to avoid stigma at home.[31] Others report resorting to treatment sharing, resulting in suboptimal adherence in both parties.[33] Even among those who are able to maintain refills, mobility that "de-stabilizes" routines can have negative impacts on daily pill-taking.[32]

We therefore sought to examine whether, and which, forms of mobility are associated with objectively measured adherence. Our team recently developed novel multi-dimensional measures and data collection tools to quantify the forms of mobility in sub-Saharan Africa, including motivations, locations of destinations, and mobility frequency. Within a cohort study of mobile and non-mobile adults living with HIV in rural Kenya and Uganda that incorporated these metrics, we also collected objectively-measured treatment adherence. To address the potential for under-reported adherence challenges, we measured antiretroviral (ARV) concentrations in hair, which reflect medication consumption[23] and strongly predict virologic control in both women and men.[34-36] Leveraging these novel and multi-dimensional measures, we estimated associations between forms of human mobility and adherence to ART.

METHODS

Study Sample

This is a cross-sectional study of adults in Kenya and Uganda at baseline in an observational cohort study designed to examine the impacts of mobility on sexual risk behavior, risk of acquisition of HIV and sexually transmitted infections (*chlamydia trachomatis* and *neisseria gonorrhoeae*), and HIV treatment outcomes.[7,27] The cohort was sampled from the Sustainable East Africa Research in Community Health (SEARCH; NCT01864603) study, a community cluster-randomized trial designed to test the effect of universal ART ("test and treat") on HIV incidence and other health outcomes.[37] From 12 SEARCH communities (6 control, 6 intervention), 2750 adults (≥16 years of age) were selected via stratified random sampling (defined by HIV status and prior mobility) and enrolled between February and November 2016.[7] At enrollment, participants answered detailed questionnaires regarding lifetime migrations and any overnight travel in the prior 6 months. Those living with HIV (n=1119) who self-reported ART use (n=1001) were asked to donate small hair samples for analysis of antiretroviral concentrations; 927 (93%) donated hair. This analysis includes participants on efavirenz (EFV) or nevirapine (NVP), the two most common anchor medications in the cohort. Sample selection is detailed in Supplemental Figure 1, and described below under "Objective adherence measurement".

Ethical Approvals

This study was approved by Institutional Review Board at the University of California San Francisco, the Scientific and Ethics Review Unit of the Kenya Medical Research Institute, and the Makerere University School of Medicine Research and Ethics Committee in Uganda. All participants provided written informed consent prior to study participation.

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Measures of mobility

The measures of mobility and migration used in this analysis were designed in the parent study to address limitations in the metrics used to represent the complex forms of mobility emergent in sub-Saharan African settings, especially women's mobility, which has been less well-described.[25,38] The development of these multi-dimensional measures was informed by formative research in the setting[39,40] as well as theoretical advances in the demographic literature.[41,42] The measures have been described in detail previously.[7,27]

Mobility:

Participants reported all overnight travel in the past six months separately for work and non-work purposes. For each destination, we collected the reasons for travel, total number of trips, and average length of stay. We examined mobility frequency and average trip duration in the prior 6 months both continuously and categorically (i.e., 3-levels representing no mobility, or, among mobile persons, the frequency or duration dichotomized at the median).

Migration:

Participants reported all lifetime migrations including locations, age at the time, and reasons. Within-country changes of residence were distinguished as inter-district (across district [Uganda] or sub-county [Kenya] boundaries, the smallest geopolitical units in these countries) or intra-district. Reasons for migrations were classified as: "for opportunity", including for a job, education, or improved housing; "after loss", including following divorce or death of a spouse, fleeing violence, loss of employment; or "for family", including for marriage, accompanying a family member, or to care or be cared for by a family member.

Objective adherence measurement

To determine treatment regimens for analysis of hair ARV concentrations, participants were asked to bring pill bottles to the study visit; for those that did not, researchers shared pictures of pill bottles to aid recall. Self-reported anchor medication differed from clinical records in 32%. Therefore, we excluded those with disagreement between these sources to minimize misclassification error. We first analyzed hair ARV levels from all participants on EFV, the most common anchor medication. To increase our ability to detect associations with rare forms of mobility (recent migration and work-related travel), we additionally sampled participants on NVP, the second most common anchor medication. For efficiency with laboratory analyses, we sampled all participants on NVP with rare mobility events, and a random sample of those without these mobility histories.

Hair samples were collected following published methods.[43] Medications are incorporated into hair from systemic circulation as it grows, at approximately 1 centimeter per month.[44] Hair samples were cut to analyze 1.5 centimeters closest to the scalp, reflecting ~6 weeks of ARV exposure, though short hair was common with 50% of samples ≤1 centimeter. Among the 98% with sufficient historical clinical data, all were on EFV or NVP for ≥45 days. Hair concentrations of ARVs were analyzed using validated liquid chromatography/tandem mass spectrometry (LC/MS/MS)-based methods.[34,43]

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Statistical analyses

To address the concern that requiring matching regimens in clinical records and self-report could induce selection bias (e.g., over-sampling participants with a longer duration on ART), we compared baseline characteristics between those with and without agreement in clinical records, among participants who self-reported EFV or NVP use. We did not find concerning differences. (Supplemental Table 1.)

We $\log_2$ transformed hair concentrations and estimated associations with metrics of mobility using linear regression. Models included participants on either EFV or NVP with an indicator variable to adjust for medication and allowed for heterogeneous residual variance by medication. To ensure this approach was not clearly inappropriate, we first examined interactions of medication with mobility metrics in linear regression models of $\log_2$ ARV levels, and found no evidence of interaction (all $p>0.45$). To facilitate interpretation of associations between predictor variables and a log-transformed outcome, we back-transformed regression coefficients to reflect percent differences in hair levels (100*[2^(coefficient)-1]). We examined unadjusted and adjusted models.

Adjusted models included potential confounders defined *a priori*: age, sex, region (Kenya, eastern Uganda, southwestern Uganda), and years on ART. In addition, we examined occupation and household wealth as potential confounders; these covariates did not meaningfully change estimates nor improve model fit (per Akaike's information criterion[45]). We also conceptualized income as a potential mediator (on the pathway between work-related mobility and adherence), but did not have individual income data, and the household measure may have been insufficient to address this concept. Given our relatively small sample we chose to present the more parsimonious models without these additional covariates to avoid over-fitting. We also examined whether sex modified any associations with interaction terms.

We compared mobility frequency and duration modeled as categorical vs. continuous. We log-transformed the continuous measures which were highly skewed, first assigning a value of 1 to individuals with no reported travel, and included an indicator variable for any travel vs. none in analyses. After confirming that results from categorical and continuous models were qualitatively similar, we chose to report the results from the categorical variables as primary, given the more simple interpretation.

In a secondary analysis, we defined a binary outcome, "poor adherence". Thresholds that predict virologic suppression have been proposed for efavirenz (1.04 ng/mg hair) and nevirapine (33.2 ng/mg hair) in one study,[36] but have not been validated and we had insufficient viral load data to examine thresholds. Therefore, we defined the lowest quintile of the distribution for each ARV as poor. We used Poisson regression with robust standard errors to estimate associations with poor adherence in terms of relative risks.[46]

We conducted a large number of tests for statistical significance and did not adjust for multiple comparisons. Our rationale was that this is the first description, to our knowledge, of multidimensional measures of mobility in association with HIV treatment adherence. We do not consider our results conclusive or confirmatory.[47,48] Rather, we propose that these

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analyses will provide important insights for consideration in service delivery models and future research.

Analyses were conducted in Stata version 16.1 (StataCorp, College Station, TX, USA) and figures of percent change in hair levels were created in R version 4.0.2 (R Development Core Team, Vienna, Austria).[49]

Role of the funding source

The funders were in not involved in the study design, data collection, analysis, interpretation of data, writing of the report, or the decision to submit the paper for publication.

RESULTS

Among 383 participants in this analysis, 199 (52%) were female and the median age was 40 (interquartile range [IQR]: 33, 48; Table 1). Over half (53%) were from western Kenya, 17% from eastern Uganda, and 29% from southwestern Uganda. Just over half (56%) reported any overnight travel in the past 6 months: 46 (25%) men and 11 (6%) women reported work-related travel; 56 (30%) men and 114 (57%) women reported non-work travel. The most common reasons for non-work related mobility were to attend a funeral (49%) or for holidays or family visits (27%). Among men who reported mobility, the median number of work-related trips was 2 and non-work trips was 1; among women, the median number of trips was 2 for both work and non-work reasons (Figure 1). In the past year, 20 men (11%) and 15 (8%) women reported any migration; the most recent move was typically inter-district for men (70%) and intra-district (73%) for women.

The median time on ART was 2.5 years (IQR 1.9-4.6). Among 294 participants on EFV (77%), the median hair concentration overall was 4.8 ng/mg hair (IQR: 2.8-8.7, range: undetected-33.4); levels were lower in men (median 4.1 ng/mg hair, IQR: 2.4-8.5) compared to women (median 5.1, IQR: 3.2-8.9; p=0.04). Among 89 participants on NVP (23%) the median concentration was 70.6 ng/mg hair (IQR: 47.5-125.0; range: undetected-191) with lower levels in men (median 67.3 ng/mg hair, IQR 47.5-114.0) than in women (median 86.6 ng/mg hair, IQR: 45.4-131.0) although this difference was not statistically significant (p=0.44).

Forms of mobility and adherence

Adjusted analyses produced similar estimates to unadjusted (Figure 2); adjusted results are reported here. Among those reporting mobility in the past 6 months for any reason, hair ARV levels were modestly lower than among those without recent mobility, though not statistically significant (Figure 2). When we considered reasons, frequency, and duration, differences in ARV levels began to emerge.

Work-related mobility, not accounting for duration or frequency, was not associated with hair levels. However, hair levels were 53% higher among those reporting >2 trips compared to those reporting none, though with wide uncertainty (95% CI: −7, 152; p=0.09), while those reporting only 1-2 trips had similar levels to those reporting none (13% lower on average, 95% CI: −43, 35; p=0.54). In direct contrast, average hair levels in those reporting

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>2 trips were 75% higher than those reporting 1-2 (95% CI: −4, 221; p=0.07). Those reporting shorter duration trips (1-2 nights on average) had 72% higher levels (95% CI: 8, 174; *p*=0.02) compared to those who did not travel for work, while those reporting longer durations had lower levels, but with wide variability (26% lower, 95% CI: −53, 16; *p*=0.19); those reporting short duration averaged 132% higher hair levels than those reporting long duration (95% CI: 28, 322; p=0.006).

Among individuals reporting any non-work mobility in the past 6 months, hair ARV levels were 24% lower than those reporting none (95% CI: −43, 1; *p*=0.06). Consideration of trip frequency and duration did not meaningfully change these results.

Among individuals who migrated in the past year, hair levels were 30% lower on average compared to those with no recent migration, but with wide variability (95% CI: −53, 5; *p*=0.09). Considering the most recent migration within the past year (6 reported >1), those with intra-district moves had 59% lower hair levels (95% CI: −77, −26; *p*=0.003) compared to non-migrants while those with inter-district moves had 27% higher hair levels but with wide variability (95% CI: −27, 120; *p*=0.40). In direct contrast, those with recent intra-district moves averaged 67% lower hair levels (95% CI: −85, −29; *p*=0.005) than those with recent inter-district moves. Results were similar for migrations within the past 2 years (Supplemental Table 2).

The direction of associations were comparable in analyses with the binary outcome “poor adherence”, and when mobility frequency or duration were modeled continuously (Supplemental Table 2).

Associations stratified by sex

We did not observe statistically significant interactions between sex and most mobility metrics, though some estimates were modestly different (Supplemental Figure 2). We did observe a statistically significant interaction with average duration of non-work-related trips. Women reporting short duration trips (1-2 nights) averaged 48% lower hair levels (95% CI −67, −20) than women with no non-work travel, while this association was not observed in men; women reporting long duration (>2 nights) had similar levels to women with none, while men with long duration averaged lower hair levels (−37%, 95% CI −65, 16), but with wide confidence intervals (overall interaction p=0.02).

DISCUSSION

In a cohort of adults on ART in Kenya and Uganda we observed varied associations between forms of mobility and objectively-measured adherence. The novel, multidimensional measures of recent mobility in this cohort revealed patterns not seen with simple classifications of “any” mobility or migration. We found that those who recently traveled for work-related reasons, particularly those who took shorter and more frequent trips, had better adherence (higher hair ARV levels) than those who did not. In contrast, those who traveled for reasons other than labor had lower adherence. On average, recent migration was associated with lower hair ARV levels, though with considerable uncertainty. When incorporating distance of migrations, those who changed residence within the same district

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or sub-county had 59% lower hair ARV levels than non-migrants. Notably, non-work related mobility and intra-district migrations—the forms most associated with reduced adherence—were most common among women, while work-related mobility was most common among men.

One quarter of men engaged in work-related mobility in the six months prior to the interview, compared to only 5% of women. The association between work-related mobility and higher adherence, most pronounced for those who traveled frequently and for short durations, could reflect steady, predictable work and the stability that income can bring, including facilitating planning to bring adequate medication supply. Moreover, trips of a shorter duration carry a lower risk of running out of pills.[19] We could not estimate differences in these associations by sex with much precision given our relatively small sample. Still, qualitatively, the associations between work-related mobility and adherence were similar in men and women. While work-related mobility was rare among women, well over half reported travel for reasons other than work in the prior six months compared to 30% of men, and non-work mobility was negatively associated with adherence. The most common reasons for non-work mobility were to attend funerals and to visit family. These types of travel are more likely to be unplanned. Moreover, in environments with extended social connections, the potential lack of disclosure, stigma, or the need to hide pills could be de-stabilizing and negatively influence adherence.[32]

As with recent travel, the forms of migration differed by sex, with intra-district moves being most common among women. These more localized moves were strongly associated with lower hair ARV levels. HIV patients making localized changes of residence might not feel the need to request formal clinic transfers, though may face longer travel times or require new routines to maintain engagement at the same clinic. Additionally, localized moves may reflect a lack of stability, where moves across borders may require more planning and organization.

On average in the cohort, as observed in other studies, adherence was modestly higher in women than men.[50] However, mobility may introduce greater challenges to adherence for women compared to men, given the nature of women's mobility. While we did not observe major differences by sex in associations between each mobility metric and adherence, the forms of mobility that were most common among women were associated with poor adherence, while the forms most common among men were associated with higher adherence. Notably, the patterns of mobility among men observed in this and other cohorts are associated with higher income, social privilege, and formal sector work that requires more predictable travel to more distant destinations.[38] Together these factors may buffer the disruptions that mobility can bring. In prior work our team has observed that gender inequality, including women's lower income (resulting from their being more likely to be unemployed or in informal sector employment) and their greater likelihood to move due to household shocks (such as disinheritance and property loss following divorce or death of a spouse), may contribute to vulnerabilities among mobile women.[39,40,51]

Major strengths of this study are the novel, detailed measurement of forms of mobility, and the objective measurement of adherence. Until recently, most assessments of the impact

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of mobility on HIV care outcomes has relied on crude measures, e.g., ever migrated, or stayed outside the house in the recent past, regardless of reason or frequency. We leveraged data from a novel cohort study in which participants reported detailed migration histories and recent mobility patterns,[7] which allowed us to observe both positive and negative associations between forms of mobility with adherence. In addition, hair ARV concentrations provided an objective assessment of adherence, as this pharmacologic measure predicts HIV treatment success much more strongly than self-report.[34,35] These robust measures allowed us to rigorously assess the association between varied forms of mobility and treatment adherence.

This study has some limitations. First, although this sample was derived from a large population-based cohort, our sample size was limited by the somewhat frequent divergence between self-reported regimens and clinical records. Thus, the number of recent migrants or participants engaged in recent work-related mobility in our sample limited the precision of our estimates. Despite this, we observed meaningful differences in associations between forms of mobility and adherence. In addition, the observed differences in types of mobility by sex are consistent with those reported in the full parent population-based cohort.[7] Second, we were not able to examine the causal effects of mobility on adherence given the cross-sectional nature of these data. However, the associations we observed highlight the importance of addressing the multidimensional aspects of mobility in the development of adherence support strategies and provide important insight on potential pathways between mobility and adherence. Our findings warrant further investigation, both longitudinally and in other cohorts.[47,48] Indeed, while mobility his highly prevalent across the African continent, forms of mobility differ by region even within rural Kenya and Uganda.[7,27] We therefore underscore the importance of context, including the magnitude and forms of mobility within a community, in the development of targeted adherence support strategies.

In conclusion, using rigorous measures of HIV treatment adherence and mobility in a cohort of adults in rural Kenya and Uganda, we observed higher adherence among those who travelled for work, lower adherence among those who travelled for other reasons, and mixed associations with recent migration depending on distance. The forms of mobility were strongly associated with sex, and forms associated with worse adherence were most common among women. These findings highlight the need for further research to inform tailored adherence interventions for mobile groups that acknowledge sex differences, motivations, frequency, and distance travelled.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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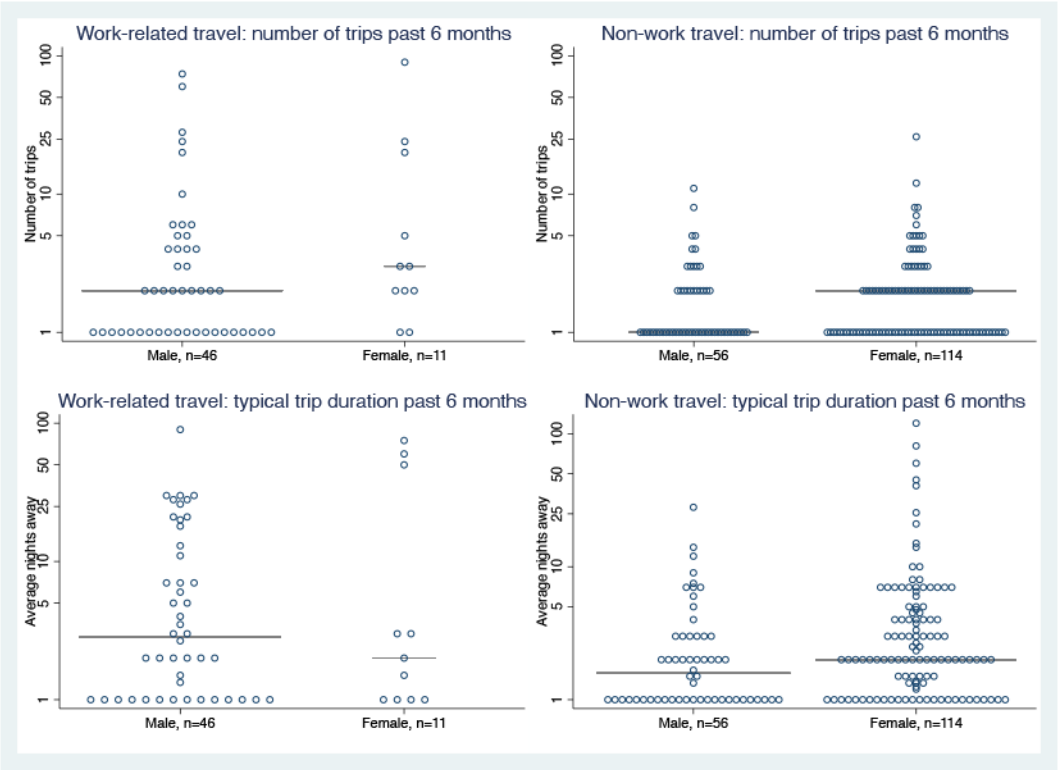

Figure 1.
Mobility frequency and duration by sex and by work versus non-work related travel

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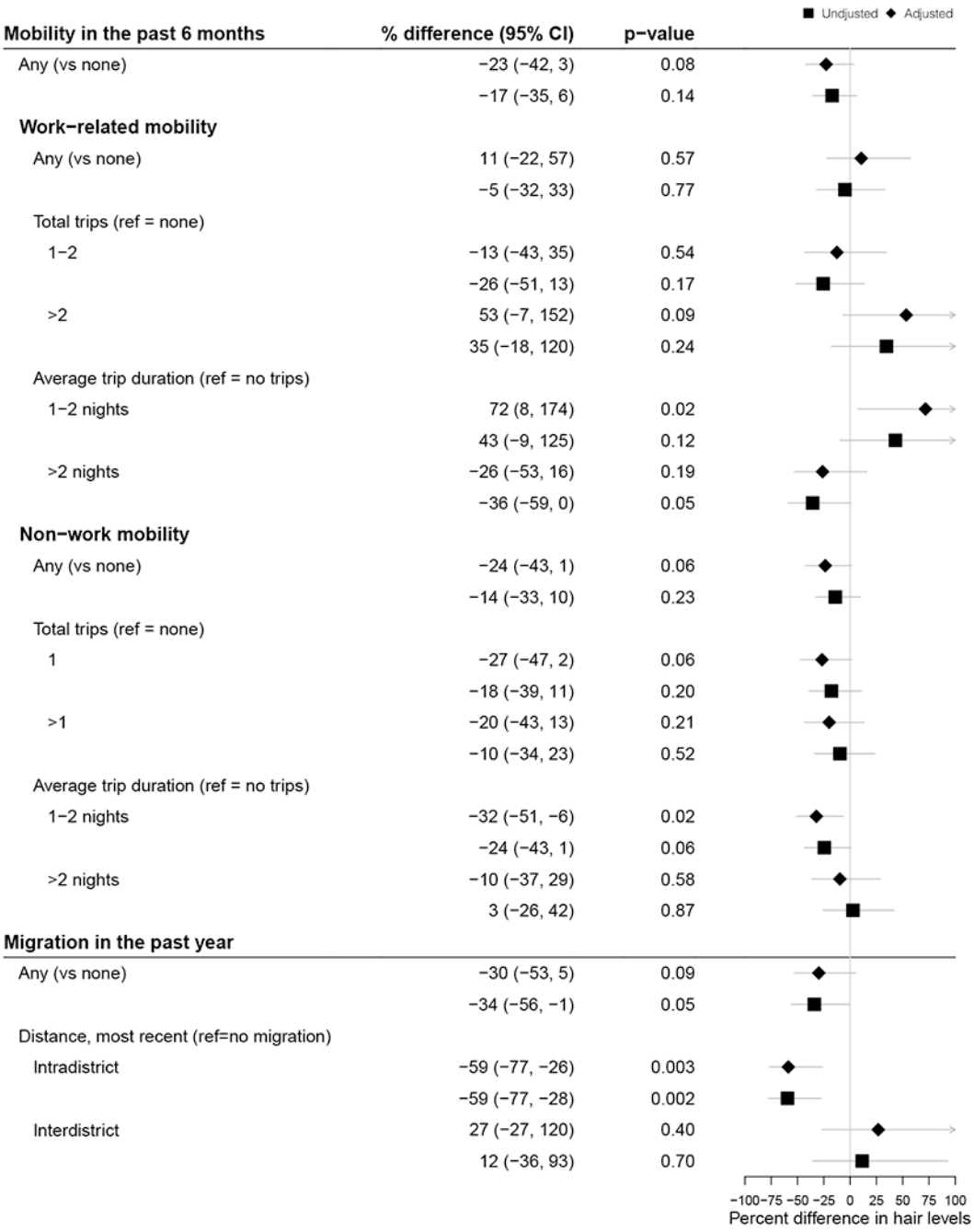

Figure 2.

Percent difference in hair antiretroviral levels associated with metrics of mobility and migration: unadjusted and adjusted (for age, sex, region and years on ART) estimates.

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Table 1.

Baseline characteristics among a cohort of adults from rural Kenya and Uganda.

	Total N=383	Male N=184	Female N=199
	n (%) or median (IQR)		
ARV analyzed			
EFV	294 (77%)	141 (77%)	153 (77%)
NVP	89 (23%)	43 (23%)	46 (23%)
Age in years	40 (33-48)	41.5 (34-49)	39 (31-46)
Region			
Kenya	204 (53%)	98 (53%)	106 (53%)
Uganda E	67 (17%)	20 (11%)	47 (24%)
Uganda SW	112 (29%)	66 (36%)	46 (23%)
Marital status			
Divorced/Separated/Widowed/Missing	82 (21%)	10 (5%)	72 (36%)
Currently married	285 (74%)	170 (92%)	115 (58%)
Single	16 (4%)	4 (2%)	12 (6%)
Education level			
No School	52 (14%)	20 (11%)	32 (17%)
Primary/Secondary	314 (84%)	156 (86%)	158 (82%)
Post-secondary	8 (2%)	5 (3%)	3 (2%)
Household wealth, poorest quintile	78 (20%)	39 (21%)	39 (20%)
Occupation risk categories*			
Informal low risk	289 (77%)	134 (74%)	155 (80%)
Formal	20 (5%)	7 (4%)	13 (7%)
Informal high risk	64 (17%)	39 (22%)	25 (13%)
Years since ART initiation	2.5 (1.9-4.6)	2.6 (1.9-4.7)	2.5 (1.9-4.5)
Ever disclosed HIV status to anyone	353 (92%)	173 (94%)	180 (90%)
Last time you took ARVs			
<24 hours ago	380 (99%)	183 (99%)	197 (99%)
24-48 hours ago	1 (0%)	0 (0%)	1 (1%)
More than a week ago	2 (1%)	1 (1%)	1 (1%)
Attend >1 HIV clinic			
Only 1 at home	375 (98%)	184 (100%)	191 (96%)
Also attend others when travelling	7 (2%)	0 (0%)	7 (4%)
Ever changed where you access HIV care?	84 (22%)	31 (17%)	53 (27%)
Mobility in the past 6 months			
Any travel (work/non-work) in past 6 months	213 (56%)	92 (50%)	121 (61%)
Work-related			
Any work-related travel, past 6 months	57 (15%)	46 (25%)	11 (6%)
Most Common travel reason - Work travel			
Market trading	12 (21%)	6 (13%)	6 (55%)

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	Total N=383	Male N=184	Female N=199
	n (%) or median (IQR)		
Artisanal labor (e.g. construction)	7 (12%)	7 (15%)	0 (0%)
Fishing	6 (11%)	4 (9%)	2 (18%)
Farming	3 (5%)	3 (7%)	0 (0%)
Looking for work	3 (5%)	1 (2%)	2 (18%)
Other	26 (46%)	25 (54%)	1 (9%)
Non-work related			
Any other travel, past 6 months	170 (44%)	56 (30%)	114 (57%)
Most Common travel reason - Non-work travel			
Funeral	84 (49%)	28 (50%)	56 (49%)
Care-giving/ Care-seeking	19 (11%)	3 (5%)	16 (14%)
Holiday/ Visiting family	46 (27%)	15 (27%)	31 (27%)
Schooling	2 (1%)	2 (4%)	0 (0%)
Other	19 (11%)	8 (14%)	11 (10%)
Migration in the past 2 years			
Past 2 years: any migration	64 (17%)	41 (22%)	23 (12%)
Most recent (2y) migration-type			
Intradistrict	24 (38%)	8 (20%)	16 (70%)
Interdistrict	37 (58%)	30 (73%)	7 (30%)
International	3 (5%)	3 (7%)	0 (0%)
Most recent (2yr) migration - reason			
For opportunity (job, school, housing)	53 (83%)	37 (90%)	16 (70%)
After loss (lost job, divorce/separated, fled violence)	6 (9%)	1 (2%)	5 (22%)
For family (marriage, to care for family/be cared for)	5 (8%)	3 (7%)	2 (9%)
Past 1 year: any migration	35 (9%)	20 (11%)	15 (8%)
Most recent (1y) migration-type			
Intradistrict	15 (43%)	4 (20%)	11 (73%)
Interdistrict	18 (51%)	14 (70%)	4 (27%)
International	2 (6%)	2 (10%)	0 (0%)
Most recent (1yr) migration - reason			
For opportunity (job, school, housing)	30 (86%)	18 (90%)	12 (80%)
After loss (lost job, divorce/separated, fled violence)	3 (9%)	0 (0%)	3 (20%)
For family (marriage, to care for family/be cared for)	2 (6%)	2 (10%)	0 (0%)

* Informal low-risk occupations include farming, market vendor, construction, household work; formal work includes government work, teacing, healthcare, factory/mining work; informal high-risk work includes fishing/fish trade, hotel/bar worker, transport/tourism.