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Authors

Lee, Joi K

Gutin, Sarah A

Getahun, Monica

et al.

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Condom, modern contraceptive, and dual method use are associated with HIV status and relationship concurrency in a context of high mobility: A cross-sectional study of women of reproductive age in rural Kenya and Uganda, 2016

Joi K. Lee^{a,*}, Sarah A. Gutin^b, Monica Getahun^a, Jaffer Okiring^c, Torsten B. Neilands^b, Adam Akullian^d, Sarah Ssali^{c,f}, Craig R. Cohen^a, Irene Maeri^g, Patrick Eyul^c, Moses R. Kanya^{c,e}, Elizabeth A. Bukusi^{a,g}, Edwin D. Charlebois^b, Carol S. Camlin^{a,b}

^(a)Department of Obstetrics, Gynecology & Reproductive Sciences, University of California, San Francisco, San Francisco, CA, USA

^(b)Division of Prevention Science, Department of Medicine, University of California, San Francisco, USA

^(c)Infectious Diseases Research Collaboration (IDRC), Kampala, Uganda

^(d)Institute for Disease Modeling (IDM), Seattle, Washington, USA

^(e)School of Medicine, Makerere University College of Health Sciences, Kampala, Uganda

^(f)School of Women and Gender Studies, Makerere University College of Health Sciences, Kampala, Uganda

^(g)Centre for Microbiology Research, Kenya Medical Research Institute (KEMRI), Nairobi, Kenya

Abstract

Objectives: Mobility (international/internal migration, and localized mobility) is a key driver of the HIV epidemic. While mobility is associated with higher-risk sexual behavior in women, a possible association with condom, modern contraceptive, and dual method use among women living with HIV (WLHIV), is unknown. In addition, HIV status and sexual behaviors such as relationship concurrency may also affect condom, modern contraceptive, and dual method use.

Study design: We surveyed sexually active women (N=1067) aged 15–49 in 12 communities in Kenya and Uganda participating in a test-and-treat trial in 2015–16. Generalized (unordered) multinomial logistic regression models accounting for community clustering examined associations between mobility (overnight travel away from home in past 6 months and any migration within past two years) and condom, modern contraceptive (i.e.: oral contraceptive pills, injectables, intrauterine devices, implants, vasectomy, tubal ligation; excluding male/female

*Corresponding author: Joi Lee, J13915b@american.edu, Advancing New Standards in Reproductive Health (ANSIRH) Program, Department of Obstetrics, Gynecology & Reproductive Sciences, University of California, San Francisco (UCSF), 1330 Broadway, Suite 1100, Oakland, CA 94612.

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condoms), and dual method use within past 6 months, adjusting for key covariates such as HIV status and relationship concurrency.

Results: WLHIV relative to HIV-negative women (RRR=3.76, 95%CI: 2.40–5.89), and women in concurrent relative to monogamous relationships (RRR=4.03, 95%CI: 1.9–8.50) had higher odds of condom use alone. In contraceptive use models, WLHIV relative to HIV-negative women were less likely to use modern contraceptive methods alone (RRR=0.51, 95%CI: 0.36–0.73). Relationship concurrency (RRR=4.51, 95%CI 2.10–9.67) and HIV status (RRR=3.97, 95%CI 2.43–6.50) were associated with higher odds of dual method use while mobility was marginally associated with higher odds of dual method use (RRR=1.65, 95%CI 0.99–2.77, $p=0.057$).

Conclusion: Mobility had a potential impact on dual method use in Kenya and Uganda. In addition, our findings highlight that WLHIV were using condoms and dual methods more, but modern contraceptives less, than HIV-negative women. Those in concurrent relationships were also more likely to use condoms or dual methods. These findings suggest that in a context of high mobility, women may be appropriately assessing risks and taking measures to protect themselves and their partners from unintended pregnancies and acquisition and transmission of HIV.

Implications: Our findings point to a need to strengthen accessibility of sexual and reproductive health services for both mobile and residentially stable women in settings of high mobility and high HIV prevalence.

Keywords

Condom use; contraceptive use; HIV; mobility; Kenya; Uganda

1. Introduction

With 20.6 million people living with human immunodeficiency virus (HIV), sub-Saharan Africa has the highest number of people living with HIV in the world [1], the highest rate of unintended pregnancies (91 per 1000 women) [2,3], and high levels of population mobility (including migration and short term travel) both within and from the region [4,5]. Despite high rates of HIV transmission in sub-Saharan Africa [3], condom use is declining [6]. A Kenyan study found widespread HIV awareness and efficacy in condom use for HIV prevention, yet less than half of Kenyan women with multiple sex partners (40%) reported condom use during their last sexual intercourse [7,8]. Nonetheless, condoms use for the prevention of sexually transmitted infections (STIs) and unintended pregnancies serves an important reproductive health need [7].

Contraceptive method options have expanded greatly, yet the distribution and use of these advancements remain inconsistent and disproportionately low in sub-Saharan Africa compared to other world regions, with lower utilization of modern contraceptive methods (i.e. male and female condoms, oral contraceptive pills, injectables, intrauterine devices (IUDs), implants, vasectomy, and tubal ligation) (25.0%) and higher unmet need for family planning (17.1%) [9–11].

Dual method use (the use of condoms to protect against STIs including HIV, together with another effective modern contraceptive to prevent pregnancy) can prevent both HIV

transmission and unintended pregnancy, yet dual method use is low in many settings of high HIV prevalence [12,13]. Studies to date have not examined dual method use in the context of high HIV prevalence and high population mobility.

There is a need to better understand the factors currently influencing condom, modern contraceptive, and dual method use among reproductive age women in sub-Saharan Africa in a context of declining condom usage [6] and low modern contraceptive uptake [9]. Studies have not examined the relationship between condom, modern contraceptive, and dual method use and mobility or HIV status in sub-Saharan Africa despite findings that mobile populations have higher unmet reproductive service needs that are compounded by higher sexual risk behaviors in mobile groups in rural sub-Saharan Africa [14–16]. Therefore, in this analysis we examine factors associated with condom, modern contraceptive (excluding male and female condoms), and dual methods use among a cohort of reproductive age women in rural Kenya and Uganda in the context of high population mobility and high HIV prevalence.

2. Methods

2.1. Study setting and sample

Data are from the baseline year of a longitudinal cohort study of population mobility embedded within the Sustainable East Africa Research in Community Health (SEARCH) trial (NCT# 01864603) [17]. As described elsewhere [16], the Mobility in SEARCH study (R01MH104132) was conducted in 12 SEARCH communities. We enrolled 2750 adults aged 15+ (consent rate of 98.3%), of whom 1440 were sexually active women (reporting any sexual partnerships in past six months) between 15–49 years. We used a multilevel stratified random sampling design (region, HIV status, mobility status, gender) to select individuals from the census-enumerated adult population of each of the communities. The 12 communities were composed of three communities each from two regions of Uganda, along with three inland, and three Lake Victoria shoreline communities in Kenya. For sampling purposes, we defined categories of baseline mobility status on the basis of SEARCH trial data on household presence in the past 12 months (mobile = “away from household 6 months or more in past 12 months”, and/or “fewer than half of nights spent in household in past 4 months”). Persons living with HIV and mobile individuals were oversampled to achieve the desired sample size in each stratum.

2.2. Data collection

We collected detailed mobility, sexual risk behavior, and condom and contraceptive use survey data at baseline between February - November 2016. Research assistants conducted data collection in participants’ preferred local language in households, or another preferred location. Research teams were gender-matched to participants to maximize rapport and reduce social desirability bias. We collected survey data using programmed tablets and these took about 90 minutes to complete. Survey topics included demographics, migration histories, work and non-work-related travel in the past six months, condom and contraceptive use, and sexual risk behaviors.

2.3. Measures

2.3.1. Socio-demographic factors and health characteristics—We collected data on socio-demographic factors and health characteristics including age (grouped as 15–24, 25–34, and 35–49 years), educational attainment (no education, Primary/Secondary education, Post-secondary education), marital status (single, married, divorced/separated/widowed), household wealth (poorest quartile, all others), occupational risk for HIV acquisition/transmission (informal low-HIV risk work, formal low HIV-risk work, informal high-HIV risk work), HIV status (living with HIV, not living with HIV), and STI results (active *Neisseria gonorrhoeae* and/or *Chlamydia trachomatis* (NG/CT), no active NG/CT).

2.3.2. Condom, contraceptive, and dual method use—We collected data on both condom and modern contraceptive use in the past six months. The condom use variable captured self-reports of male or female condom use (response options: Always, most of the time, sometimes, rarely, and never) for each month over the past six months with any partner. We chose this measure of condom use because it has been associated with pregnancy and STI incidence and is therefore a good proxy for sexual risk behavior [18]. We later dichotomized this variable to capture those who reported any condom use in the previous six months with any partner versus none. The contraceptive use variable captured self-reports of modern contraceptive use (i.e. oral contraceptive pills, injectables, IUDs, implants, vasectomy, tubal ligation, spermicides, diaphragm, and emergency contraception; excluding male or female condom use and vaginal rings and patches (which were not locally available) [19] in the past six months with any partner and was later dichotomized into any modern contraceptive use versus none. We captured dual method use by noting any months in which the reported use of a modern contraceptive method overlapped with reported condom use. If there was any dual method use within the past six months, the participant was considered a dual method user.

2.3.3. Mobility—We used high-resolution measures of mobility that have been described elsewhere [16]. These measures differentiated between migration events (i.e. changes of residence) and mobility that did not require a change of residence but that required overnight stays away from home, for labor-related or other purposes. The baseline mobility survey captured participants' histories of migrations over their lifetime. Migration was defined as a movement of people across a specified geopolitical boundary (nation, district, and sub-county) for the purpose of establishing a new permanent residence. Migration between countries was classified as international, and migration within countries as internal migration. We differentiated between shorter and longer-distance internal migration by classifying whether moves to change residence were within or across counties (Kenya) and districts (Uganda). We classified migration events into those that took place within the past five years, two years, and one-year.

We also asked participants about any mobility in the past six months including labor and non-labor-related mobility. We defined mobility as travel involving time away from primary places of residence, without any intention to change residence (locations and movements between multiple homes that are considered to be main residences are also recorded). This excluded commuting, as mobility is recorded only if the travel involved sleeping one or

more nights away from primary residence(s). We defined labor-related mobility as travel “for business/to earn money”, including travel to look for a job, and for farming/food production and non-labor-related mobility as travel for all other purposes, including caregiving/care-seeking, funerals and weddings, visiting family members, and other reasons. We collected data on the number of trips taken, and number of nights spent on each trip, by location, for the previous six months before the visit date, and tallied the total number of nights over time periods by travel purpose. For these analyses, we developed an indicator of any mobility that captures any reports of labor and non-labor-related mobility in the past six months and any migration within the past two years.

2.3.4. Sexual risk behaviors—We used a detailed calendar-based data collection tool to collect sexual and behavioral histories for sexual partnerships since January 2011 [15,16]. This tool which has been described previously [16] has been shown to reduce social desirability bias and improve the reporting of sexual relationships and behavior [20]. The survey records information in monthly intervals rather than years because many relationships last for less than one year; we measured changes in relationship dimensions and behaviors over the course of each sexual relationship in the preceding five years from the time of the survey (i.e. since January 2011).

We collected data on higher-risk partnerships and partnership concurrency within the past six months. We defined higher-risk sexual partnerships as relationships that were casual, commercial sex worker/client, “one night stand”, stranger, or inheritor/inherited partner. Inherited partner refers to the traditional Luo practice of widow “inheritance” in which a widow is retained in the family of her deceased husband, and children remain in the lineage; cultural practices include sexual contact with an inheritor [21]. We defined sexual partnership concurrency within the past six months as having two or more sexual partnerships within any one month over a given time period. The calendar survey enabled us to clearly identify sexual partner concurrency and its overlap with mobility over time and collect month-by-month data on partnerships including relationship type and mobility of partners.

2.4. Data Analysis

For basic characterization of both predictor and outcome variables, we conducted descriptive statistical analyses, including one-way frequency tables for all variables and measures of central tendency (means) and variability (standard deviations) for continuous variables. Bivariate comparisons that characterized the relationship between the main dependent variable (any use of condoms, modern contraceptives, or dual methods in the past six months) and the key independent variable of interest (mobility) while adjusting for age were estimated using a generalized (unordered) multilevel multinomial logit model with a random intercept term to account for community clustering.

We fit a generalized (unordered) multinomial logistic regression model with a random intercept term for community (to address clustering at the community level) to examine associations between any condom use, modern contraceptive use (excluding condoms), or dual method use in the past six months with recent mobility (work and non-work-

related mobility and migration within the past 2 years) controlling for age, education [22], relationship concurrency [23,24], and HIV status, which prior research suggests are important to condom [22,25], modern contraceptive use [26,27], and dual method use [28,29]. We also fit an ordinal multinomial logistic regression model but model fit statistics, including the LR test and the BIC, indicated that the ordinal multinomial logistic regression model produced poorer fit. We therefore present the results of the generalized (unordered) multinomial logistic regression model. For this model we report the ratios of relative risks (RRRs), their 95% confidence intervals, and p-values. Data were analyzed using Stata 16 (Stata Corporation, College Station, TX, USA).

2.5. Ethical approvals

We received ethical approvals from the University of California San Francisco Committee on Human Research (14–15058), Ethical Review Committee of the Kenya Medical Research Institute (KEMRI/SERU/CMR/3052), Makerere University School of Medicine Research and Ethics Committee (2015–040), and Uganda National Council for Science and Technology (HS 1834). All study participants gave written informed consent before taking part in the study.

3. Results

3.1. Sample demographics by region and mobility status

The sample consisted of 1093 sexually active women between 15–49 years with the majority aged 25–49 (n=855, 78.2%) (Table 1). Most women had completed primary education or higher (n=976, 91.5%) with more mobile than non-mobile women completing primary education ($p<0.001$). Marital status varied by mobility patterns with more mobile (n=107, 17.2%) than non-mobile women (n=56, 11.9%) being divorced, separated, or widowed ($p=0.051$). About 15% (n=167) of the sample was in the poorest household wealth quartile and almost 10% (n=108) reported informal high HIV-risk occupations (e.g. fishing/fish trade, hotel/restaurant/bar worker, transport/tourism) with more mobile compared to non-mobile women (n=81, 13.0% vs. n=27, 5.7%) reporting these occupations ($p<0.001$).

There were some notable differences in socio-demographic characteristics by region. For example, participants from south-western Uganda were older than those in other regions (49.6% aged 35–49 years compared to 38.3% and 37.6% aged 35–49 years in western Kenya and eastern Uganda, $p<0.001$). In addition, more Kenyan women (77.8%) had completed primary level education compared to eastern and south-western Uganda (62.5% and 59.4%, respectively, $p<0.001$). More Ugandan women reported being in the poorest wealth quartile (17.9% in eastern Uganda and 21.5% in south-western Uganda) compared to Kenyan women (10.9%), $p<0.001$. Finally, more Kenyan women reported informal high HIV-risk occupations (17.7%) compared to women in Uganda (1.1% in eastern Uganda and 3.0% in south-western Uganda, $p<0.001$).

3.2. Sexual health characteristics and risk behaviors by region and mobility status

Overall, 42.3% (n=462) of the sample was living with HIV, with mobile women (n=281, 45.2%) demonstrating higher rates of HIV than non-mobile women (n=181, 38.4%)

($p=0.03$). STI rates were low overall ($n=46$, 4.4%). Only 7.8% of women ($n=85$) reported a higher-risk partnership within the past six months, with mobile women ($n=69$, 11.8%) reporting more such partnerships than non-mobile women ($n=13$, 2.8%) ($p<0.001$). An even smaller proportion reported any partnership concurrency within the past six months ($n=63$, 5.8%), with more mobile (8.4%, $n=52$) compared to non-mobile women (2.3%, $n=11$) reporting concurrency ($p<0.001$).

3.3. Condom use by region and mobility status over the past six months

Condom use within the past six months was low. The majority of women ($n=591$, 65.9%) reported never using a condom with their most recent sexual partner within the past six months. Alternatively, 11.4% ($n=102$) of women reported always using a condom with their most recent sexual partner. Overall, Kenyan women had higher rates of condom use compared to Ugandan women; women in eastern Uganda (81.0%) most commonly reported never using a condom with their most recent sexual partner (81.0%, $n=145$ vs. 61.3% in western Kenya ($n=306$) and 63.9% in south-western Uganda ($n=140$) ($p<0.001$). In addition, mobile women more commonly reported never using a condom with their most recent partner compared to non-mobile women (61.5%, $n=335$ vs. 72.7%, $n=256$) ($p<0.05$). Reports of condom use were similarly low with any sexual partner; only 12.5% of women ($n=105$) always used a condom while 70.5% never used a condom with any of their sexual partners within the past six months. Mobile compared to non-mobile women more commonly reported never using a condom with any sexual partner within the past six months (64.5%, $n=331$ vs. 79.7%, $n=263$) ($p<0.001$).

3.4. Modern contraceptive use by region and mobility status over the past six months

Overall, 39.7% ($n=381$) of women reported any use of a modern contraceptive method within the past six months. Of those, the majority reported use of injectables ($n=198$, 22.15%), and smaller proportions reported use of implants, oral contraceptive pills, and other modern methods. Rates of contraceptive use varied by region and mobility status; women residing in western Kenya ($n=252$, 47.6%,) had higher rates of any contraceptive use compared to eastern Uganda ($n=45$, 23.8%) and south-western Uganda ($n=84$, 34.9%) ($p<0.001$). In addition, mobile women ($n=257$, 44.1%) had higher rates of any contraceptive use compared to non-mobile women ($n=124$, 33.0%) ($p=0.001$).

3.5. Dual method use by region and mobility status over the past six months

12% of women ($n=113$) reported dual method use at any time within the past six months. Women from western Kenya ($n=82$, 15.5%,) had higher rates of dual method use compared to eastern Uganda ($n=12$, 6.4%) and south-western Uganda ($n=19$, 7.9%) ($p<0.001$). Also, mobile women ($n=85$, 14.6%) had higher rates of dual method use compared to non-mobile women ($n=28$, 7.5%) ($p=0.001$).

3.6. Bivariate associations between mobility and condom, modern contraceptive, and dual method, stratified by HIV serostatus

Bivariate associations between condom, modern contraceptive, and dual method use and mobility, stratified by HIV serostatus, are presented in Table 2. Mobility was positively

associated with dual method use among HIV-negative women (RRR=2.87, 95%CI: 1.17–7.02). Mobility was not significantly associated with condom or modern contraceptive use among WLHIV or HIV-negative women (see Table 2).

3.7. Multinomial associations between mobility and condom, modern contraceptive use, and dual method use

3.7.1. Factors associated with condom use—In multinomial logistic regression models, sexual relationship concurrency and living with HIV were significantly associated with condom use while mobility was not associated with condom use (Table 3). Relative to women who reported no condom or contraceptive use, women who reported exclusive condom use in the past six months had higher odds of reporting sexual relationship concurrency (RRR=4.03, 95%CI 1.91–8.50). Furthermore, WLHIV had over three times the odds of exclusive condom use compared to HIV-negative women (RRR=3.76, 95%CI 2.40–5.89).

3.5.2. Factors associated with modern contraceptive use—In multinomial models, age, and HIV status were associated with exclusive modern contraceptive use while mobility was not associated with modern contraceptive use (Table 3). Relative to women aged 15–24, women aged 25–34 had three times the odds of contraceptive use (RRR=3.01, 95%CI 1.97–4.62). In addition, WLHIV had reduced odds of modern contraceptive use compared to HIV-negative women (RRR=0.51, 95%CI 0.36–0.73).

3.5.3. Factors associated with dual method use—In multinomial models, relationship concurrency and HIV status were associated with dual method use while mobility was marginally associated with dual method use (Table 3). Compared to women who reported no condom or contraceptive use, women who reported dual method use in the past six months had over four times higher odds of reporting sexual relationship concurrency (RRR=4.51, 95%CI 2.10–9.67). WLHIV had almost four times the odds of dual method use compared to HIV-negative women (RRR=3.97, 95%CI 2.43–6.50). Mobility also appears to potentially be associated with dual method use (RRR=1.65, 95%CI 0.99–2.77, $p=0.057$).

We also collapsed across HIV status and conducted a sensitivity analysis to see if stratified analyses were limiting our ability to detect potential associations between mobility and condom, modern contraceptive, and dual method use. In those analyses, our findings did not support the hypothesis that mobility was associated with condom or modern contraceptive use alone, but the marginal relationship between mobility and dual method use became stronger and statistically significant (RRR=1.72, 95% CI: 1.04–2.86, $p=0.04$, results not shown).

4. Discussion

In this analysis of condom, modern contraceptive, and dual method use among reproductive age women living in rural Kenya and Uganda, our findings did not support the hypothesis that mobility was associated with condom use or contraceptive use alone. However, relationship concurrency and HIV status were associated with dual method use, and mobility was marginally associated with dual method use. In addition, HIV status and

relationship concurrency were associated with condom, contraceptive, and dual method use. In multivariate analyses, relationship concurrency and HIV status both significantly increased the odds of condom use with any sexual partner within the past six months. Age had a statistically significant effect on modern contraceptive use while women living with HIV had reduced odds of contraceptive use compared to HIV-negative women. These findings highlight the impact of HIV-status and concurrency on condom and contraceptive use, and the potential impact of mobility on dual method use, in high HIV prevalence settings in rural Kenya and Uganda.

While studies have found that condom use is low among mobile men and women [16,30], to our knowledge, none have explored the factors associated with condom use among mobile women in rural settings. In this study, WLHIV had higher odds of condom use compared to women who were HIV-negative and those reporting relationship concurrency had higher odds of condom use compared to those not reporting concurrency. We previously found that sexual risk behavior such as relationship concurrency is particularly pronounced among mobile WLHIV [16], suggesting that women are appropriately assessing risks and using condoms to protect themselves and their partners. Therefore, condom use in this study population may be associated with perceived risks of HIV that are well-founded.

This study also examines factors related to modern contraceptive use among women in a setting of high mobility. Our findings indicate that WLHIV have reduced odds of using only modern contraceptive methods. It appears that WLHIV are choosing to use either condoms alone or dual methods to protect themselves and their partners from pregnancy and STIs. This suggests again that WLHIV may be correctly assessing their risks for HIV transmission and unintended pregnancies. Similar findings were found among Ethiopian WLHIV who reported higher rates of consistent condom use (48.5%) alone as compared to dual method use (15.7%) in the last 3 months [13]. Additionally, when assessing the distribution of contraceptive methods among Ghanian WLHIV, 77% of women reported condom use as their mode of contraception followed by smaller reports of modern contraceptive uptake [12].

Finally, relationship concurrency and HIV status were associated with dual method use and mobility was marginally associated with dual method use. Since mobility has been associated with an increased likelihood of partnership concurrency [16], mobile women may be more concerned with pregnancy outside of marriage and contracting STIs and may be more motivated to use dual methods. Moreover, mobile women's greater dual method use could reflect their higher income or agency to negotiate for condoms with sexual partners and use a modern contraceptive method. Prior research has suggested that migration or mobility can empower women, as it can expand opportunities for livelihoods and may permit more control over life choices [31,32]. Mobile women, who may be more socially progressive or have aspirations for modernity [33], may also have more control over their income and be ready to put their money into securing condoms and contraceptives. Overall, it appears that mobile women, who have well-documented high risks of HIV acquisition and onward transmission, may be taking steps to protect themselves and their partners through dual method use.

This study is not without limitations. The cross-sectional design limits the ability to draw conclusions about causal relationships between variables. However, since condom and contraceptive use is understudied in Eastern African communities among women classified by their mobility status, the results are useful for the development of future longitudinal studies and interventions. The study was conducted in rural communities, thus limiting the generalizability of the results to urban locations. The study results are also not generalizable to mobile men. While we acknowledged that condom and contraceptive decisions are often made at the couple-level [34,35], and that male partners have a strong impact on fertility and contraceptive decisions, we excluded men from these analyses because far more women access HIV care and sexual and reproductive health services in this context. Use of condoms, modern contraceptives, and dual method use was self-reported. It is possible that reports of use of these methods could be subject to recall bias, but, to keep recall bias at a minimum, we only ascertained a participant's condom and contraceptive history for the past six months. In addition, we defined condom and modern contraceptive use as those who reported any condom use in the previous six months with any partner versus none. These dichotomized variables do not capture variations in the degree of use or the consistency of use and may over-estimate condom and modern contraceptive use. Additionally, statistical power for testing hypotheses was limited in stratified analyses, so our findings cannot definitively rule out potential associations between mobility and condom use and contraceptive use, especially among women living with HIV due to our sample having fewer women living with HIV than not living with HIV. This warrants further exploration. Finally, in recent years, international funding for condom procurement has decreased in sub-Saharan Africa, domestic funding has not increased, and condom promotion and demand creation has stalled [6]. This may account for some of the low condom use noted in this study.

While condom, modern contraceptive, and dual method use were low overall in rural Kenyan and Ugandan communities, use was higher among WLHIV and those in concurrent relationships. In addition, while it is not possible to say definitively, mobility may be associated with dual method use, findings support a need to strengthen accessibility of sexual and reproductive health services among both mobile and residentially stable women, to meet the needs of rural sub-Saharan African women in HIV endemic regions.

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Table 1:

Socio-demographic, health, mobility and sexual risk characteristics by region and mobility status among sexually active reproductive age women aged 15–49 in study communities in rural Kenya and Uganda in 2016

Characteristic	Total	Region			p-val	Mobility status		p-val
		Western Kenya n (%)	Eastern Uganda n (%)	South Western Uganda n (%)		Mobile n (%)	Non – mobile n (%)	
Total	N=1093	n=549	n=274	n=270		n=622	n=471	
Cohort demographics								
<i>Age group</i>								
15–24	238 (21.8%)	121 (22.0%)	78 (28.5%)	39 (14.4%)	<0.001	122 (19.6%)	116 (24.6%)	0.14
25–34	408 (37.3%)	218 (39.7%)	93 (33.9%)	97 (35.9%)		237 (38.1%)	171 (36.3%)	
35–49	447 (40.9%)	210 (38.3%)	103 (37.6%)	134 (49.6%)		263 (42.3%)	184 (39.1%)	
<i>Educational attainment</i>								
No schooling	91 (8.5%)	11 (2.1%)	39 (14.8%)	41 (15.4%)	<0.001	28 (4.6%)	63 (13.7%)	<0.001
Primary school completed	741 (69.4%)	418 (77.8%)	165 (62.5%)	158 (59.4%)		441 (73.5%)	300 (64.8%)	
Secondary school completed	197 (18.5%)	94 (17.5%)	52 (19.7%)	51 (19.2%)		114 (18.8%)	83 (18.0%)	
Post-secondary school completed	38 (3.6%)	14 (2.6%)	8 (3.0%)	16 (6.1%)		24 (4.0%)	14 (3.0%)	
<i>Marital status</i>								
Single	114 (10.4%)	54 (9.8%)	26 (9.5%)	34 (12.6%)	0.03	63 (10.1%)	51 (10.8%)	0.05
Currently married	816 (74.7%)	420 (76.5%)	214 (78.1%)	182 (67.4%)		452 (72.7%)	364 (77.3%)	
Divorced, separated, widowed	163 (14.9%)	75 (13.6%)	34 (12.4%)	54 (20.0%)		107 (17.2%)	56 (11.9%)	
<i>Household wealth</i>								
Poorest quartile	167 (15.3%)	60 (10.9%)	49 (17.9%)	58 (21.5%)	<0.001	91 (14.6%)	76 (16.1%)	0.49
All others	926 (84.7%)	489 (89.1%)	225 (82.1%)	212 (78.5%)		531 (85.4%)	395 (83.9%)	
<i>Occupational risk[®]</i>								
Informal low risk	842 (77.0%)	386 (70.3%)	250 (91.2%)	206 (76.3%)	<0.001	451 (72.5%)	391 (83.0%)	<0.001
Formal low risk	65 (5.9%)	26 (4.7%)	10 (3.7%)	29 (10.7%)		40 (6.4%)	25 (5.3%)	
Informal high risk	108 (9.9%)	97 (17.7%)	3 (1.1%)	8 (3.0%)		81 (13.0%)	27 (5.7%)	
Health characteristics								
<i>HIV status</i>								
Positive	462 (42.3%)	244 (44.4%)	100 (36.5%)	118 (43.7%)	0.08	281 (45.2%)	181 (38.4%)	0.03
Negative	631 (57.7%)	305 (55.6%)	174 (63.5%)	152 (56.3%)		341 (54.8%)	290 (61.6%)	
<i>STI results</i>								
Positive	46 (4.4%)	27 (5.1%)	7 (2.9%)	12 (4.6%)	0.38	29 (4.8%)	17 (3.9%)	0.46
Negative	992 (95.6)	503 (94.9%)	236 (97.1%)	251 (95.4%)		570 (95.2%)	420 (96.1%)	
Condom and contraceptive use								

Characteristic	Total	Region			p-val	Mobility status		p-val
		Western Kenya n (%)	Eastern Uganda n (%)	South Western Uganda n (%)		Mobile n (%)	Non – mobile n (%)	
Total	N=1093	n=549	n=274	n=270		n=622	n=471	
<i>Condom use with most recent partner</i>								
No sex	89 (10.0%)	35(7.0%)	10 (5.6%)	44 (20.1%)		54 (9.9%)	35 (9.9%)	0.002
Always	102 (11.4%)	74 (14.8%)	9 (5.1%)	19 (8.7%)	<0.001	71 (13.0%)	31 (8.8%)	
Most of the time	16 (1.8%)	7 (1.4%)	5 (2.8%)	4 (1.8%)		9 (1.7%)	7 (2.0%)	
Sometimes	91 (10.1%)	75 (15.0%)	6 (3.4%)	10 (4.6%)		71 (13.0%)	20 (5.7%)	
Very rarely	8 (0.9%)	2 (0.4%)	4 (2.2%)	2 (0.9%)		5 (0.92%)	3 (0.85%)	
Never	591 (65.9%)	306 (61.3%)	145 (81.0%)	140 (63.9%)		335 (61.5%)	256 (72.7%)	
<i>Condom use with any partner within past 6 mo.</i>								
Never	594 (70.5%)	304 (63.7%)	145 (85.8%)	145 (73.6%)	<0.001	331 (64.5%)	263 (79.7%)	<0.001
Sometimes	144 (17.0%)	102 (21.4%)	15 (8.9%)	27 (13.7%)		111 (21.6%)	33 (10.0%)	
Always	105 (12.5%)	71 (14.9%)	9 (5.3%)	25 (12.7%)		71 (13.8%)	34 (10.3%)	
<i>Modern contraceptive use within past 6 mo.</i>								
Yes	381 (39.7%)	252 (47.6%)	45 (23.8%)	84 (34.9%)	<0.001	257 (44.1%)	124 (33.0%)	0.001
No	578 (60.3%)	277 (52.4%)	144 (76.2%)	157 (65.2%)		326 (55.9%)	252 (67.0%)	
<i>Modern Contraceptive methods</i>								
Oral contraceptives	28 (3.1%)	11 (2.2%)	7 (3.9%)	10 (5.6%)	<0.001	16 (3.0%)	12 (3.4%)	<0.001
Male condom	44 (4.9%)	29 (5.8%)	2 (1.1%)	13 (5.9%)		33 (6.1%)	11 (3.1%)	
Female condom	5 (0.6%)	0 (0.0%)	5 (2.8%)	0 (0.0%)		0 (0.0%)	5 (1.4%)	
Injectables	198 (22.1%)	137 (27.7%)	23 (12.8%)	38 (17.3%)		138 (25.5%)	60 (17.1%)	
Intrauterine device	8 (0.9%)	2 (0.4%)	1 (0.6%)	5 (2.3%)		3 (0.6%)	5 (1.4%)	
Implants	103 (11.5%)	87 (17.6%)	7 (3.9%)	9 (4.1%)		73 (13.5%)	30 (8.5%)	
Vasectomy	2 (0.2%)	1 (0.2%)	0 (0.0%)	1 (0.5%)		2 (.37%)	0 (0.0%)	
Tubal ligation	16 (1.8%)	4 (0.8%)	5 (2.8%)	7 (3.2%)		8 (1.5%)	8 (2.3%)	
Diaphragm	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		0 (0.0%)	0 (0.0%)	
Spermicides	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		0 (0.0%)	0 (0.0%)	
Emergency contraception	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		0 (0.0%)	0 (0.0%)	
<i>Dual method use</i>								
Yes	113 (11.8%)	82 (15.5%)	12 (6.4%)	19 (7.9%)	<0.001	85 (14.6%)	28 (7.5%)	0.001
No	846 (88.2%)	447 (84.5%)	177 (93.7%)	222 (92.1%)		498 (85.4%)	348 (92.6%)	
<i>Contraceptive use - exclusive categories</i>								
None	576 (52.7%)	206 (37.5%)	217 (79.2%)	153 (56.7%)	<0.001	268 (43.1%)	308 (65.4%)	<0.001
Condom use only	136 (12.4%)	91 (16.6%)	12 (4.4%)	33 (12.2%)		97 (15.6%)	39 (8.3%)	
Modern method	268 (24.5%)	170 (31.0%)	33(12.0%)	65 (24.1%)		172 (27.7%)	96 (20.4%)	
Dual methods	113 (10.3%)	82 (14.9%)	12 (4.4%)	19 (7.0%)		85 (13.7%)	28 (5.9%)	

Characteristic	Total	Region			p-val	Mobility status		p-val
		Western Kenya n (%)	Eastern Uganda n (%)	South Western Uganda n (%)		Mobile n (%)	Non – mobile n (%)	
Total	N=1093	n=549	n=274	n=270		n=622	n=471	
Sexual risk behaviors								
<i>High-risk partnerships* within the past 6 months</i>								
Yes	85 (7.8%)	61 (11.1%)	1 (0.4%)	23 (8.5%)	<0.001	69 (11.8%)	13 (2.8%)	<0.001
No	1008 (92.2%)	488 (88.9%)	273 (99.6%)	247 (91.5%)		515 (88.2%)	458 (97.2%)	
<i>Any partnership concurrency** within the past 6 months</i>								
Yes	63 (5.8%)	46 (8.4%)	1 (0.36%)	16 (6.0%)	<0.001	52 (8.4%)	11 (2.3%)	<0.001
No	1030 (94.2%)	503 (91.6%)	273 (99.6%)	254 (94.1%)		570 (91.6%)	460 (97.7%)	

Note: Percentages are column percentages

*“High risk partner” = a casual partner, commercial sex worker or client, one-night stand, or inherited partner/inheritor within the past 1–6 months.

**“Concurrency” = two or more sexual partnerships at the same time within the last 6 months. Condom use with most recent partner within the last 6 months

“mobility status” = any mobility and migration: permanent changes of residence over geopolitical boundaries[®] occupational risk - Informal high HIV-risk occupations: fishing/fish trade, hotel/ restaurant/ bar worker, transport/tourism; Formal low HIV-risk occupations: government/ military/ teacher/ healthcare, factory worker/mining Informal low risk. 78 responses missing.

Table 2:

Age-adjusted associations between mobility status and condom, modern contraceptive, and dual method use in past 6 months, stratified by HIV status, among sexually active women aged 15–49 years in study communities in rural Kenya and Uganda in 2016

Outcome level	Characteristic	HIV-negative women		HIV-positive women		
		RRR	95% CI	RRR	95% CI	
No condom or modern contraceptive use		-	-	-	-	
Condom use only	Mobility in past 6 months	Ref: No mobility in past 6 months	-	-	-	-
		Any mobility in past 6 months	1.57	0.76–3.22	1.76	0.95–3.28
Modern Method use (excluding condom use)	Mobility in past 6 months	Ref: No mobility in past 6 months	-	-	-	-
		Any mobility in past 6 months	1.42	0.92–2.20	1.05	0.55–2.01
Dual method use	Mobility in past 6 months	Ref: No mobility in past 6 months	-	-	-	-
		Any mobility in past 6 months	2.87	1.17–7.02	1.79	0.94–3.44

Results shown for generalized (unordered) multinomial logit model testing associations between mobility and condom, modern contraceptive, and dual method use in past 6 months, stratified by HIV status, and adjusted for age and clustering by community, among sexually active reproductive age women (15–49 years)

Table 3:

Characteristics associated with condom, modern contraceptive, and dual method use in the past 6 months with any partner among sexually active women aged 15 – 49 (n=1067) in study communities in rural Kenya and Uganda in 2016

Outcome level	Characteristic		RRR	95% CI	
No condom or modern contraceptive use					
Condom use only	Age group	Ref: 15–24 years	-	-	
		25–34 years	1.33	0.73–2.42	
		35–49 years	0.83	0.45–1.51	
	Education level	Ref: No education	-	-	
		Primary/secondary	1.18	0.52–2.68	
		Post-secondary	1.39	0.38–5.06	
	Relationship concurrency in past 6 months	Ref: No concurrent sexual relationships	-	-	
		Reported concurrent sexual relationships in any of the past 6 months	4.03	1.91–8.50	
	Mobility in past 6 months	Ref: No mobility in past 6 months	-	-	
		Any mobility in past 6 months	1.41	0.88–2.26	
	HIV serostatus	Ref: HIV – negative	-	-	
		HIV – positive	3.76	2.40–5.89	
	Modern Method use (excluding condom use)				
	Modern Method use (excluding condom use)	Age group	Ref: 15–24 years	-	-
25–34 years			3.01	1.97–4.62	
35–49 years			1.21	0.76–1.90	
Education level		Ref: No education	-	-	
		Primary/secondary	1.45	0.73–2.89	
		Post-secondary	0.79	0.27–2.35	
Relationship concurrency in past 6 months		Ref: No concurrent sexual relationships	-	-	
		Reported concurrent sexual relationships in any of the past 6 months	0.85	0.36–2.02	
Mobility in past 6 months		Ref: No mobility in past 6 months	-	-	
		Any mobility in past 6 months	1.17	0.81–1.69	
HIV serostatus		Ref: HIV – negative	-	-	
		HIV – positive	0.51	0.36–0.73	
Dual method use					
Dual method use		Age group	Ref: 15–24 years	-	-
	25–34 years		1.46	0.74–2.89	
	35–49 years		1.06	0.55–2.09	
	Education level	Ref: No education	-	-	
		Primary/secondary	1.14	0.48–2.72	
		Post-secondary	0.65	0.12–3.61	
	Relationship concurrency in past 6 months	Ref: No concurrent sexual relationships	-	-	
		Reported concurrent sexual relationships in any of the past 6 months	4.51	2.10–9.67	
	Mobility in past 6 months	Ref: No mobility in past 6 months	-	-	
		Any mobility in past 6 months	1.65	0.99–2.77	

Outcome level	Characteristic	RRR	95% CI
	HIV serostatus		
	Ref: HIV – negative	-	-
	HIV – positive	3.97	2.43–6.50

Results for generalized (unordered) multinomial logistic regression model with a random intercept term for community (to address clustering at the community level) testing associations between condom use, modern contraceptive use (excluding condoms), or dual method use in the past six months with any partner among sexually active reproductive age women (15 – 49 years).

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