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Transportation cost as a barrier to contraceptive use among women initiating treatment for HIV in Tanzania

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Abstract

Transportation cost is a barrier to HIV treatment, yet no studies have examined its association with contraceptive use among women living with HIV. We analyzed cross-sectional data from women attending three public healthcare facilities in Shinyanga, Tanzania where they initiated antiretroviral therapy for HIV infection in the previous 90 days; all facilities offered free contraception. Women self-reported current contraceptive use and the round-trip cost of transportation to the facility. Among 421 women aged 18–49, 86 (20.4%) were using any modern contraceptive method, of which half were using modern methods other than condoms. Women who paid more than 2,000 Tanzanian shillings for transportation had a significantly lower prevalence of any modern method use than women who paid nothing (9.1% vs. 21.3%; adjusted difference: –12.9; 95% confidence interval: –21.3, –4.4). A similar difference was observed for non-condom modern method use. We conclude that high transportation cost may impede contraceptive use even among women accessing HIV treatment.

Keywords

contraception; HIV; food insecurity; transportation; PMTCT

Introduction

Unintended pregnancy has serious consequences for maternal and child health. In Tanzania, where almost one third of pregnancies are mistimed or unwanted, maternal mortality claims the lives of 1 in 33 women (Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) et al., 2016). Women living with HIV are at a higher risk of maternal mortality (Calvert & Ronsmans, 2013), and vertical transmission accounts for 18% of new HIV infections countrywide (Tanzania Commission for AIDS (TACAIDS) et al., 2014). Thus, reducing unintended pregnancy among women living with HIV is

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a key strategy for the prevention of maternal mortality and the elimination of mother-to-child HIV transmission (World Health Organization (WHO) HIV/AIDS Department, 2010). Additionally, delaying conception until after the initiation of antiretroviral therapy (ART) may decrease the risk of maternal mortality and vertical HIV transmission (Li et al., 2014; Mandelbrot et al., 2015; Matthews et al., 2013; Townsend et al., 2014).

However, women in sub-Saharan Africa face economic barriers to utilizing family planning services (Creanga, Gillespie, Karklins & Tsui, 2011). The cost of transportation to one's healthcare provider has been identified as a barrier to obstetric care (Fiander, Ndahani, Mmuya & Vanneste, 2013), HIV treatment (Etiaba, Onwujekwe, Torpey, Uzochukwu & Chiegil, 2016; Hardon et al., 2007; Schwitters et al., 2015; Sowah et al., 2014), and prevention of mother-to-child transmission services (Hlarlathie, Grede, de Pee & Bloem, 2014), but there is little research on the relationship between transportation cost and contraceptive use (Yao, Murray & Agadjanian, 2013; Agadjanian, Hayford, Luz & Yao, 2015). Thus far, no studies have examined this relationship among women living with HIV, despite the heightened public health importance of access to contraception in this population.

In the present study, we examine whether transportation cost is associated with modern contraceptive method use in a population of women initiating ART at public healthcare facilities in Shinyanga, Tanzania. In Shinyanga, 8% of women of reproductive age are living with HIV, and there is a high unmet need for contraception (MoHCDGEC et al., 2016; TACAIDS et al., 2013). This combination of risk factors makes Shinyanga an important setting in which to examine barriers to contraceptive use.

Methods

Study design and participants

To examine the association between transportation cost and contraceptive use, we used cross-sectional baseline data from a randomized controlled trial that evaluated the effectiveness of conditional cash and food assistance for recent ART initiates accessing care in the Shinyanga Region. The trial's design and results have been previously described (McCoy, Njau et al., 2015; McCoy et al., 2017). We describe the present study and its findings in accordance with the STROBE Statement checklist for cross-sectional studies (von Elm et al., 2007).

Participants were recruited from HIV clinics at three public healthcare facilities between December 2013 and July 2015. Patients were eligible to participate if they were 18 years, living with HIV, initiated ART within 90 days of enrollment, were food insecure (defined as score of 2 on the Household Hunger Scale) (Ballard, Coates, Swindale & Deitchler, 2011), and were able to provide written informed consent. Patients were ineligible if they had a body mass index of $<16 \text{ kg/m}^2$.

During recruitment, 921 patients were assessed for eligibility, of which 90% met the trial's inclusion criteria of food insecurity. The baseline sample included 800 men and women (Supplementary Figure 1). In the present study, we additionally excluded men ($N=291$),

women aged 50 or above (N=47), pregnant women (N=21), and women missing data on the exposure or outcome (N=20). Our final sample includes 421 participants, 53% of the original study sample.

The study was approved by the University of California, Berkeley Committee for Protection of Human Subjects and the Tanzanian National Institute for Medical Research.

Independent variable

The primary exposure is the round-trip cost of transportation to the healthcare facility where participants were receiving HIV primary care, assessed before randomization during the baseline in-person interview completed at the healthcare facility. Participants were asked, “How much does it cost round trip to travel here? (bus fare, gasoline, etc.)” This variable was recorded in Tanzanian shillings (TZS).

Responses were left skewed and clustered around specific values (i.e., 0 TZS, 1,000 TZS, or 2,000 TZS). Thus, we recoded transportation cost categorically using natural cut points in the distribution of responses: women who paid 0 TZS, women who paid 1 to 1,000 TZS, women who paid 1,001 to 2,000 TZS, and women who paid more than 2,000 TZS. We also conducted sensitivity analyses of this categorization (described below).

Dependent variables

The primary outcome is self-reported use of a modern contraceptive method during the month of the baseline survey. Women were asked, “*This month*, are you or your partner using any contraceptive method (modern or traditional/natural) to prevent or avoid pregnancy?” Women could report using more than one method. Women were coded as using a modern method if they indicated that they were using condoms, oral contraception, injectable contraception, the implant, the IUD, or female sterilization. Women were coded as not using a modern method if they said “no” to the question about any method use, if they did not specify a method, or if they only indicated the use of traditional methods.

Because condoms were distributed freely directly at the HIV clinics, we also created a variable to explore the use of non-condom modern methods. These methods are provided in other clinics at the same healthcare facilities and thus may require a separate visit to the facility to obtain. Women were coded as using a non-condom modern method if they reported that they were using a hormonal method and/or another modern method other than condoms. Women who were not using a modern method or who reported only using condoms were coded as non-users.

Covariates

Covariates included in multivariable regression models were selected *a priori* using a directed acyclic graph (Greenland, Pearl & Robins, 1999). These factors included healthcare facility, age, language, religion, partnership status, pregnancy intentions, education level, work status, and perceived HIV stigma. Consistent with other studies (Rutstein & Johnson, 2004; Vyas & Kumaranayake, 2006), we used principal components analysis to create a household asset index as a proxy for economic wealth. The first component was categorized

into quartiles and included in adjusted models. Finally, to assess the association between transportation cost and contraceptive use independently of transportation time, we included the round-trip transportation time to the facility in models. We recoded transportation time as a three-level categorical variable due to clustering of responses around specific values; however, our findings did not change when including time in models as a continuous variable.

Statistical analyses

We constructed bivariate and multivariable logistic regression models followed by the “margins” command in STATA/IC 14.1 to calculate marginal effects, which we interpreted as unadjusted and adjusted prevalence differences (StataCorp, 2015).

To determine the sensitivity of our findings to the coding of transportation cost, we re-ran models with transportation cost coded as a continuous variable, coded as linear splines, and subdivided into an eight-level categorical variable. We obtained similar results across analyses; we did not find evidence that contraceptive use differed between subgroups of the original four categories or that there was a linear relationship between cost and contraceptive use. Therefore, we present our findings using only the four-level categorization of transportation cost.

To estimate the association between transportation cost and contraceptive use in the subset of women for whom access to contraception may be especially critical to prevent unintended pregnancy, we ran subgroup analyses excluding women who were trying to become pregnant, reported no sex partners in the past year, and/or were sterilized (after exclusions, N=325). Our findings did not change; thus, we present the results for the full sample.

Results

Of the 421 women in the sample, more than one third had not completed primary education and half were currently working (Table 1). Almost half of women were currently married (30%) or partnered (15%), and most women (85%) had at least one child. Among women who had a steady sexual partner, 27% reported that they could not ask their partner to use a condom. No participants' households owned a motor vehicle, and only 1.9% of households owned a motorcycle.

When asked about eleven barriers to accessing medical care (Table 2), the barrier which women were most likely to identify as a problem was the cost of transportation to the healthcare facility, reported by 40% of women. Additionally, 21% of women stated that the cost of transportation was the *most* problematic out of all eleven barriers. In contrast, transportation time was reported as a problem by less than one quarter of women, and only 7% of women classified transportation time as the *most* problematic barrier to medical care.

Transportation cost

The mean round-trip transportation cost was 1,457 TZS (\$0.65 United States dollars), and costs ranged from 0 to 12,000 TZS. 45% of women reported paying nothing for transportation to the facility (N=188), 79% of whom walked (N=149). Aside from walking,

the most commonly-reported methods of transportation were bicycling, which may include bicycle taxis, and other forms of public transportation (e.g., minibus or motorcycle taxi). The median transportation cost among women who did not walk was 2,000 TZS.

Contraceptive use

During the month of the survey, 86 (20%) women were using a modern method of contraception (Table 1), of whom 43 (50%) reported using a non-condom modern method. Women using a modern method primarily reported using condoms (N=53) and injectable contraception (N=28), although several women were using the implant (N=9), oral contraception (N=4), or sterilization (N=2). Ten women were dual method users who reported using condoms alongside another modern method. No women reported using female condoms or having an IUD.

Relationship between transportation cost and contraceptive use

In both unadjusted and adjusted models (Table 3), women who paid between 1 and 1,000 TZS and women who paid between 1,001 and 2,000 TZS to reach the healthcare facility reported using modern contraceptives at the same frequency as women who paid nothing. However, women who paid more than 2,000 TZS had a significantly reduced prevalence of modern contraceptive use relative to women who paid nothing (9.1% vs. 21.3%; adjusted prevalence difference [aPD]: -12.9; 95% confidence interval [CI]: -21.3, -4.4). When modern contraceptive use was redefined to only include those who used non-condom methods, we observed a similar difference (aPD: -11.6; 95% CI: -16.6, -6.5).

Discussion

In this sample of women initiating treatment for HIV in Shinyanga, Tanzania, women who reported the highest cost of transportation to their healthcare facility had a significantly lower prevalence of modern contraceptive use than women with lower transportation costs. Our findings suggest that high transportation costs may deter contraceptive use *even* among women who are actively engaged in HIV treatment.

Although this study is the first to document transportation cost as an impediment to contraceptive use among women receiving care for HIV, our findings are consistent with existing research suggesting that transportation cost acts as a barrier to healthcare utilization in both HIV-infected and uninfected populations (Etiaba et al., 2016; Fiander et al., 2013; Hardon et al., 2007; Hlarlathie et al., 2014; Odeny et al., 2012; Schwitters et al., 2015; Sowah et al., 2014). Previous studies have also found that that increased *distance* to a healthcare provider is associated with reductions in contraceptive use among African women (Agadjanian et al., 2015; Asiimewe, Ndugga, Mushomi & Manyenye Ntozi, 2014; Eliason et al., 2014; Ettarh & Kyobutungi, 2012; Kaona et al., 1996; Okech, Wawire & Mburu, 2011; Orji & Onwudiegwu, 2002; Yao, Murray, Agadjanian & Hayford, 2012; Yao et al., 2013), but the pathway through which residential distance from healthcare may impede contraceptive use has been largely unexplored. Distance may deter contraceptive use due to the increased transportation cost or transportation time required to access healthcare providers. Alternatively, or in addition, rural women may be unaware of available

contraceptive methods, may have different cultural norms and values surrounding pregnancy and contraceptive use, or may experience higher stigma regarding their sexual behavior that discourages healthcare utilization.

In the present study, we attempted to address these competing explanations. Our sample was limited to a fairly homogeneous population of women initiating ART in clinics that promote contraceptive use, and it is therefore unlikely that differences in knowledge about the availability of contraceptive methods explain the association between transportation cost and contraceptive use. Moreover, this association persisted in models adjusting for cultural and sociodemographic factors that may account for differences in contraceptive use between women living closer to or further from a facility. Controlling for transportation time also did little to change the association between transportation cost and contraceptive use.

It is also possible that transportation cost may in part be a function of what women are able to afford, rather than representing the lowest possible cost of transportation to and from women's homes. For example, women of greater economic means may elect to spend additional money on a more comfortable or efficient method of transportation than women of fewer means. However, this phenomenon may be unlikely in the present sample as all women were food insecure and presumably had little expendable income. Additionally, women in the lowest quantiles of the household assets index paid *more* for transportation than women in the highest quantiles, potentially as a result of increased residential distance from the facility among women with fewer assets. Controlling for markers of socioeconomic status also did not significantly change the association between transportation cost and contraceptive use.

Thus, we hypothesize that economic barriers are the primary explanation for the low contraceptive use observed among women paying high transportation costs. Our finding that transportation cost, rather than transportation time, may impede access to modern contraception is consistent with the participants' self-reported barriers to healthcare access; transportation cost was the most frequently cited problem, while transportation time was perceived as less problematic. Although our ability to draw causal conclusions is limited by the cross-sectional nature of the analysis, this analysis informs future research by identifying one potential pathway through which distance is associated with contraceptive use.

Future studies may address several of the key limitations of the present study. First, contraceptive use was self-reported, creating potential for information bias. For example, HIV-infected women may falsely report condom use when interviewed at an HIV clinic, because they have been instructed to use condoms by providers. However, the 20% prevalence of modern method use observed in our sample was similar to the regional estimate of a 21% prevalence of use among married women of reproductive age (MoHCDGEC et al., 2016), and the inverse association between transportation cost and contraceptive use persisted when we reclassified contraceptive use to include only non-condom methods. Second, women who were using contraception were not asked about the source of their methods. All women in the sample were patients at three public healthcare facilities which provide contraception, including condoms, at no cost to women in care for HIV, but it is possible that women obtained methods outside of the facilities (e.g., at drug

shops), potentially altering the association between transportation cost to the facility and contraceptive use. However, HIV clinic staff indicated that the healthcare facilities were the primary source of contraception for female patients and referred patients to other clinics within the facility to access methods such as injectable contraception and the implant. Finally, further research is necessary to assess the magnitude of the association in a more diverse sample that has not already engaged with healthcare.

Implications and future directions

As Tanzania moves toward a model of “Treat All” for HIV infection (WHO, 2017), thousands more women will be initiating treatment. Enhanced integration of family planning care with HIV treatment may improve women’s access to contraception (Cohen et al., 2017; Lopez, Grey, Chen, Denison & Stuart, 2016). Injectable contraception, the non-condom method most commonly used by women in the present study, requires regular visits to obtain, yet injectable contraception was not offered directly in the HIV clinics. Thus, women may have to make a separate trip to the same facility to receive non-condom methods from another clinic. The reduced accessibility of non-condom methods may be especially worrisome in this sample of women living with HIV, as nearly one third of partnered women reported being unable to ask their partner to use condoms. Additionally, although nearly 70% of participants desired no additional children, very few women reported using long-acting contraceptive methods (i.e., the implant, IUD, or sterilization). Improving family planning integration and/or coordination between clinics, providing additional training for providers, and offering education about long-acting contraceptive methods in HIV clinics may further reduce the transportation-related burdens associated with contraceptive use among women receiving treatment for HIV.

Conclusions

Having a high cost of transportation to the healthcare facility was associated with a significantly lower prevalence of modern contraceptive method use in a sample of women initiating HIV treatment in Shinyanga. Understanding transportation-related barriers to contraceptive use in this population can inform programs and interventions with greater potential to prevent unintended pregnancy, maternal and child mortality, and vertical HIV transmission.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

- Agadjanian V, Hayford SR, Luz L.& Yao J.(2015). Bridging user and provider perspectives: family planning access and utilization in rural Mozambique. *Int J Gynaecol Obstet*, 130 *Suppl* 3(E47), 51. doi:10.1016/j.ijgo.2015.03.019.
- Amuri M, Mitchell S, Cockcroft A.& Andersson N.(2011). Socio-economic status and HIV/AIDS stigma in Tanzania. *AIDS Care*, 23(3), 378–82. doi:10.1080/09540121.2010.507739. [PubMed: 21347901]
- Asiimewe JB, Ndugga P, Mushomi J.& Manyenye Ntozi JP (2014). Factors associated with modern contraceptive use among young and older women in Uganda; a comparative analysis. *BMC Public Health*, 14, 926. doi:10.1186/1471-2458-14-926. [PubMed: 25195645]
- Ballard T, Coates J, Swindale A.& Deitchler M.(2011). Household Hunger Scale: Indicator Definition and Measurement Guide. (Anonymous Trans.). Washington, D.C.: Food and Nutrition Technical Assistance II Project, FHI 360.
- Calvert C.& Ronsmans C.(2013). The contribution of HIV to pregnancy-related mortality: a systematic review and meta-analysis. *AIDS*, 27(10), 1631–9. [PubMed: 23435296]
- Campbell AA, de Pee S, Sun K, Kraemer K, Thorne-Lyman A, Moench-Pfanner R...Semba RD (2009). Relationship of household food insecurity to neonatal, infant, and under-five child mortality among families in rural Indonesia. *Food Nutr Bull*, 30(2), 112–9. [PubMed: 19689089]
- Cohen CR, Grossman D, Onono M, Blat C, Newmann SJ, Burger RL...Bukusi EA (2017). Integration of family planning services into HIV care clinics: Results one year after a cluster randomized controlled trial in Kenya. *PLoS ONE*, 12(3), e0172992. doi:10.1371/journal.pone.0172992.
- Creanga AA, Gillespie D, Karikins S.& Tsui AO (2011). Low use of contraception among poor women in Africa: an equity issue. *Bull World Health Organ*, 89(4), 258–266. doi:10.2471/BLT.10.083329. [PubMed: 21479090]
- Eliason S, Awoonor-Williams JK, Eliason C, Novignon J, Nonvignon J.& Aikins M.(2014). Determinants of modern family planning use among women of reproductive age in the Nkwanta district of Ghana: a case-control study. *Reprod Health*, 11(1), 65. doi:10.1186/1742-4755-11-65. [PubMed: 25117887]
- Etiaba E, Onwujekwe O, Torpey K, Uzochukwu B.& Chiegil R.(2016). What is the economic burden of subsidized HIV/AIDS treatment services on patients in Nigeria and is this burden catastrophic to households?. *PLoS One*, 11(12), e0167117. doi:10.1371/journal.pone.0167117.
- Ettarh RR & Kyobutungi C.(2012). Physical access to health facilities and contraceptive use in Kenya: evidence from the 2008–2009 Kenya Demographic and Health Survey. *Afr J Reprod Health*, 16(3), 48–56. [PubMed: 23437499]
- Fiander A, Ndahani C, Mmuya K.& Vanneste T.(2013). Results from 2011 for the transportMYpatient program for overcoming transport costs among women seeking treatment for obstetric fistula in Tanzania. *Int J Gynaecol Obstet*, 120(3), 292–5. doi:10.1016/j.ijgo.2012.09.026. [PubMed: 23265834]
- Gebremeskel F, Dibaba Y.& Admassu B.(2015). Timing of first antenatal care attendance and associated factors among pregnant women in Arba Minch Town and Arba Minch District, Gamo Gofa Zone, south Ethiopia. *J Environ Public Health*, 2015(971506). doi:10.1155/2015/971506.
- Greenland S, Pearl J.& Robins JM (1999). Causal diagrams for epidemiologic research. *Epidemiology*, 10(1), 37–48. [PubMed: 9888278]
- Hardon AP, Akurut D, Comoro C, Ekezie C, Irunde HF, Gerrits T...Laing R.(2007). Hunger, waiting time and transport costs: time to confront challenges to ART adherence in Africa. *AIDS Care*, 19(5), 658–65. [PubMed: 17505927]
- Hlarlaithe MO, Grede N, de Pee S.& Bloem M.(2014). Economic and social factors are some of the most common barriers preventing women from accessing maternal and newborn child health (MNCH) and prevention of mother-to-child transmission (PMTCT) services: a literature review. *AIDS Behav*, 18 *Suppl* 5, S516–30. doi:10.1007/s10461-014-0756-5. [PubMed: 24691921]

- Kaona FA, Katsivo MN, Ondolo H, Ameerbeg AG, Said MA, Guma XP...Mpanju-Shumbusho W. (1996). Factors that determine utilization of modern contraceptives in East, Central, and southern, Africa. *Afr J Health Sci*, 3(4), 133–7. [PubMed: 17451316]
- Li N, Matchi E, Spiegelman D, Chalamilla G, Hertzmark E, Sando D...Fawzi W.(2014). Maternal mortality among HIV-infected pregnant women in Tanzania. *Acta Obstet Gynecol Scand*, 93(5), 463–8. doi:10.1111/aogs.12374. [PubMed: 24617748]
- Lopez LM, Grey TW, Chen M, Denison J.& Stuart G.(2016). Behavioral interventions for improving contraceptive use among women living with HIV. *Cochrane Database Syst Rev*(8), CD010243. doi:10.1002/14651858.CD010243.pub3.
- Mandelbrot L, Tubiana R, Le Chenadec J, Dollfus C, Faye A, Pannier E...ANRS-EPF Study Group. (2015). No perinatal HIV-1 transmission from women with effective antiretroviral therapy starting before conception. *Clin Infect Dis*, 61(11), 1715–25. doi:10.1093/cid/civ578. [PubMed: 26197844]
- Matthews LT, Kaida A, Kanters S, Byakwagamd H, Mocello AR, Muzoora C...Hunt PW (2013). HIV-infected women on antiretroviral treatment have increased mortality during pregnant and postpartum periods. *AIDS*, 27 *Suppl* 1(S105), 12. doi:10.1097/QAD.0000000000000040.
- McCoy SI, Njau PF, Czaicki NL, Kadiyala S, Jewell NP, Dow WH & Padian NS (2015). Rationale and design of a randomized study of short-term food and cash assistance to improve adherence to antiretroviral therapy among food insecure HIV-infected adults in Tanzania. *BMC Infect Dis*, 15, 490. doi:10.1186/s12879-015-1186-3. [PubMed: 26520572]
- McCoy SI, Njau PF, Fahey C, Kapologwe N, Kadiyala S, Jewell NP...Padian NS (2017). Cash vs. food assistance to improve adherence to antiretroviral therapy among HIV-infected adults in Tanzania. *AIDS*, 31(6), 815–25. doi:10.1097/QAD.0000000000001406. [PubMed: 28107221]
- Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) [Tanzania Mainland], Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS) & ICF International. (2016). Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) 2015–16. (Anonymous Trans.). Dar es Salaam, Tanzania, and Rockville, Maryland, USA: MoHCDGEC, MoH, NBS, OCGS, and ICF.
- Musumari PM, Wouters E, Kayembe PK, Kiumbu Nzita M, Mbikayi SM, Suguimoto SP...Kihara M. (2014). Food insecurity is associated with increased risk of non-adherence to antiretroviral therapy among HIV-infected adults in the Democratic Republic of Congo: a cross-sectional study. *PLoS One*, 9(1), e85327. doi:10.1371/journal.pone.0085327.
- Odeny TA, Bailey RC, Bukusi EA, Simoni JM, Tapia KA, Yugas K...McClelland RS (2012). Text messaging to improve attendance at post-operative clinic visits after adult male circumcision for HIV prevention: a randomized controlled trial. *PLoS One*, 7(9), e43832. doi:10.1371/journal.pone.0043832.
- Okech TC, Wawire NW & Mburu TK (2011). Contraceptive use among women of reproductive age in Kenya's city slums. *International Journal of Business and Social Science*, 2(1), 22–43.
- Orji EO & Onwudiegwu U.(2002). Prevalence and determinants of contraceptive practice in a defined Nigerian population. *J Obstet Gynaecol*, 22(5), 540–3. [PubMed: 12521426]
- Rutstein SO & Johnson K.(2004). The DHS Wealth Index (Report No. 6).
- Schwitters A, Lederer P, Zilversmit L, Gudo PS, Ramiro I, Cumba L...Jobarteh K.(2015). Barriers to health care in rural Mozambique: a rapid ethnographic assessment of planned mobile health clinics for ART. *Glob Health Sci Pract*, 3(1), 109–16. doi:10.9745/GHSP-D-14-00145. [PubMed: 25745124]
- Sowah LA, Turenne FV, Buchwald UK, Delva G, Mesidor RN, Dessaigne CG...Amoroso A.(2014). Influence of transportation cost on long-term retention in clinic for HIV patients in rural Haiti. *J Acquir Immune Defic Syndr*, 67(4), e123–30. doi:10.1097/QAI.0000000000000315. [PubMed: 25162815]
- StataCorp. (2015). Stata Statistical Software: Release 14. (Anonymous Trans.). College Station, TX: StataCorp LP.
- Tanzania Commission for AIDS (TACAIDS), Joint United Nations Programme on HIV/AIDS (UNAIDS) country office, World Health Organization (WHO) & Ministry of Health and Social Welfare (MoHSW). (2014). The United Republic of Tanzania Global AIDS Response Country Progress Report.

- Tanzania Commission for AIDS (TACAIDS), Zanzibar AIDS Commission (ZAC), National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS) & ICF International. (2013). Tanzania HIV/AIDS and Malaria Indicator Survey 2011–12. (Anonymous Trans.). Dar es Salaam, Tanzania: TACAIDS, ZAC, NBS, OCGS, and ICF International.
- Townsend CL, Byrne L, Cortina-Borja M, Thorne C, de Ruiter A, Lyall H...Tookey PA (2014). Earlier initiation of ART and further decline in mother-to-child HIV transmission rates, 2000–2011. *AIDS*, 28(7), 1049–57. doi:10.1097/QAD.0000000000000212. [PubMed: 24566097]
- von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP & STROBE Initiative. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Ann Intern Med*, 147(8), 573–577. [PubMed: 17938396]
- Vyas S.& Kumaranayake L.(2006). Constructing socio-economic status indices: how to use principal components analysis. *Health Policy Plan*, 21(6), 459–68. [PubMed: 17030551]
- World Health Organization (WHO). (2017). “Treat all” to end AIDS.
- World Health Organization HIV/AIDS Department. 2010. PMTCT Strategic Vision 2010–2015: Preventing mother-to-child transmission of HIV to reach the UNGASS and Millennium Development Goals.
- Yao J, Murray AT & Agadjanian V.(2013). A geographical perspective on access to sexual and reproductive health care for women in rural Africa. *Soc Sci Med*, 96, 60–8. doi:10.1016/j.socscimed.2013.07.025. [PubMed: 24034952]
- Yao J, Murray AT, Agadjanian V.& Hayford SR (2012). Geographic influences on sexual and reproductive health service utilization in rural Mozambique. *Appl Geogr*, 32(2), 601–7. doi:10.1016/j.apgeog.2011.07.009. [PubMed: 22505786]

Table 1:

Demographic characteristics of food insecure women initiating treatment for HIV in Shinyanga, Tanzania by modern contraceptive method use, 2013–2015.

	<u>All Women N (column %)</u>	<u>Modern Contraceptive Method Use * N (row %)</u>	
		Yes	No
N	421 (100.0)	86 (20.4)	335 (79.6)
Healthcare facility			
Clinic A	273 (64.9)	54 (19.8)	219 (80.2)
Clinic B	55 (13.1)	12 (21.8)	43 (78.1)
Clinic C	93 (22.1)	20 (21.5)	73 (78.5)
Age (years)			
18–24	53 (12.6)	17 (32.1)	36 (67.9)
25–34	197 (46.8)	52 (26.4)	145 (73.6)
35–44	135 (32.1)	15 (11.1)	120 (88.9)
45–49	36 (8.6)	2 (5.6)	34 (94.4)
Language			
Swahili	269 (63.9)	56 (20.8)	213 (79.2)
Sukuma/Other	152 (36.1)	30 (19.7)	122 (80.3)
Religion			
Christianity	324 (77.0)	64 (19.8)	260 (80.2)
Islam	83 (19.7)	20 (24.1)	63 (75.9)
None	14 (3.3)	2 (14.3)	12 (85.7)
Education level			
No education	98 (23.3)	17 (17.3)	81 (82.7)
Some primary	52 (12.4)	15 (28.8)	37 (71.2)
Completed primary	232 (55.1)	46 (19.8)	186 (80.2)
Above primary	39 (9.3)	8 (20.5)	31 (79.5)
Currently working			
Yes	222 (52.7)	50 (22.5)	172 (77.5)
No	199 (47.3)	36 (18.1)	163 (81.9)
Partnership status			
Married	127 (30.2)	37 (29.1)	90 (70.9)
Partnered	62 (14.7)	22 (35.5)	40 (64.5)
Previously married	177 (42.0)	20 (11.3)	157 (88.7)
Single, never married	55 (13.1)	7 (12.7)	48 (87.3)
Sex partner past 12 months			
Yes	369 (87.9)	83 (22.5)	286 (77.5)
No	51 (12.1)	3 (5.9)	48 (94.1)

	<u>All Women N (column %)</u>	<u>Modern Contraceptive Method Use * N (row %)</u>	
		Yes	No
Parity			
Have child(ren)	356 (84.6)	76 (21.3)	280 (78.7)
No children	65 (15.4)	10 (15.4)	55 (84.6)
Pregnancy intentions			
Trying for	46 (10.9)	7 (15.2)	39 (84.8)
Wouldn't mind	54 (12.8)	12 (22.2)	42 (77.8)
Wouldn't mind avoiding	119 (28.3)	24 (20.2)	95 (79.8)
Trying to avoid	202 (48.0)	43 (21.3)	159 (78.7)
Household assets index ^a			
1 st Quartile	105 (24.9)	18 (17.1)	87 (82.9)
2 nd Quartile	106 (25.2)	18 (17.0)	88 (83.0)
3 rd Quartile	110 (26.1)	25 (22.7)	85 (77.3)
4 th Quartile	100 (23.8)	25 (25.0)	75 (75.0)
Perceived HIV Stigma ^b			
Yes	122 (29.0)	33 (27.0)	89 (73.0)
No	299 (71.0)	53 (17.7)	246 (82.3)
Transportation time to facility			
<60 minutes	151 (36.0)	28 (18.5)	123 (81.5)
60–119 minutes	127 (30.2)	34 (26.8)	93 (73.2)
120 minutes	142 (33.8)	24 (16.9)	118 (83.1)
Transportation cost to facility ^c			
0 TZS	188 (44.7)	40 (21.3)	148 (78.7)
1–1000 TZS	77 (18.3)	21 (27.3)	56 (72.7)
1001–2000 TZS	79 (18.8)	18 (22.8)	61 (77.2)
>2000 TZS	77 (18.3)	7 (9.1)	70 (90.9)

* Modern contraceptive method use: self-reported use of condoms (N=53), injectable contraception (N=28), contraceptive implant (N=9), oral contraception (N=4), and/or sterilization (N=2).

^aHousehold assets index: quartiles from polychoric principal components analysis (PCA) of household possessions, agricultural assets, and household building materials.

^bConcern that HIV status will become known is reported to be a barrier to accessing medical care (yes, no).

^cRound-trip cost self-reported by participants.

Missing covariates: N=1 sex partner in past 12 months, N=1 transportation time to facility.

Table 2:

Perceived barriers to accessing medical care among food insecure women initiating treatment for HIV in Shinyanga, Tanzania, 2013–2015.

	Large problem	Somewhat of a problem	Not a problem	Identified as Largest Problem*
Cost of transportation to facility	55 (13.1)	113 (26.8)	253 (60.1)	88 (21.4)
Getting money needed for treatment	48 (11.4)	99 (23.5)	274 (65.1)	96 (23.4)
Concern HIV status will become known	14 (3.3)	108 (25.7)	299 (71.0)	81 (19.7)
Not feeling well or having energy	10 (2.4)	111 (26.4)	300 (71.3)	58 (14.1)
Travel time to facility	10 (2.4)	92 (21.9)	319 (75.8)	28 (6.8)
Time for visit	4 (1.0)	88 (20.9)	329 (78.1)	30 (7.3)
Hungry or not enough food	10 (2.4)	79 (18.8)	332 (78.9)	12 (2.9)
Concern for unfriendly providers	0 (0)	36 (8.6)	385 (91.4)	9 (2.2)
Concern for quality of care	1 (0.2)	21 (5.0)	399 (94.8)	2 (0.5)
Not wanting to go alone	1 (0.2)	16 (3.8)	404 (96.0)	6 (1.5)
Getting permission to go	4 (1.0)	8 (1.9)	409 (97.2)	1 (0.2)

N (%)

*Missing: N=10

Table 3:

Differences in the prevalence of modern contraceptive method use by the round-trip cost of transportation to the healthcare facility where women initiated treatment for HIV in Shinyanga, Tanzania, 2013–2015.

	Any Modern Method Use			Non-Condom Modern Method Use*		
	Prevalence Method Use	Unadjusted Difference (95% CI)	Adjusted Difference ^a (95% CI)	Prevalence Method Use	Unadjusted Difference (95% CI)	Adjusted Difference ^a (95% CI)
Transportation Cost						
0 TZS	21.3	Reference	Reference	12.2	Reference	Reference
1–1000 TZS	27.3	6.0 (–5.5, 17.5)	6.2 (–4.9, 17.3)	11.7	–0.5 (–9.1, 8.0)	0.2 (–8.9, 9.4)
1001–2000 TZS	22.8	1.5 (–9.4, 12.5)	–3.1 (–13.0, 6.8)	12.7	0.4 (–8.3, 9.1)	–1.4 (–9.6, 6.8)
>2000 TZS	9.1	–12.2 (–20.9, –3.5)	–12.9 (–21.3, –4.4)	1.3	–10.9 (–16.3, –5.6)	–11.6 (–16.6, –6.5)

Bold p<0.05

N=421 unadjusted, 420 adjusted.

* Non-condom modern method use: injectable contraception (N=28), contraceptive implant (N=9), oral contraception (N=4), and/or sterilization (N=2).

^aModel adjusted for age, healthcare facility, transportation time, household assets index, perceived HIV stigma, pregnancy intentions, partnership status, parity, religion, language, education level, and work status.