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Authors

Palar, Kartika
Wong, Mitchell D
Cunningham, William E

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Competing subsistence needs are associated with retention in care and detectable viral load among people living with HIV

Kartika Palar[a], **Mitchell D. Wong**[b], and **William E. Cunningham**[b,c]

[a]Division of HIV, Infectious Diseases and Global Medicine, San Francisco General Hospital, University of California, San Francisco (UCSF), San Francisco, CA, USA

[b]Division of General Internal Medicine and Health Services Research, University of California, Los Angeles (UCLA), Los Angeles, CA, USA

[c]Department of Health Policy and Management, UCLA, Los Angeles, CA, USA

Abstract

Competing priorities between subsistence needs and health care may interfere with HIV health. Longitudinal data from the Los Angeles-based HIV Outreach Initiative were analyzed to examine the association between competing subsistence needs and indicators of poor retention-in-care among hard-to-reach people with HIV. Sacrificing basic needs for health care in the previous six months was associated with a 1.55 times greater incidence of missed appointments (95% CI 1.17, 2.05), 2.32 times greater incidence of emergency department visits (95% CI 1.39, 3.87), 3.66 times greater incidence of not receiving ART if CD4 < 350 (95% CI 1.60, 8.37), and 1.35 times greater incidence of detectable viral load (95% CI 1.07, 1.70) (all $p < 0.01$). Among hard-to-reach PLHIV, sacrificing basic needs for health care delineates a population with exceptional vulnerability to poor outcomes along the HIV treatment cascade. Efforts to identify and reduce competing needs for this population are crucial to HIV health outcomes.

Keywords

hard-to-reach populations; HIV; retention in care; subsistence needs

Introduction

Ensuring the long-term survival and well-being of people living with HIV (PLHIV) depends on their successful engagement and retention in HIV care, including antiretroviral therapy (ART) (Giordano et al., 2007). Retention in care is the continued engagement with a primary HIV provider for medical care, once that care has been initiated. These consistent visits with a primary HIV provider predict survival (Giordano et al., 2007) and are crucial steps in the HIV treatment cascade which, if successful, culminates with HIV ribonucleic acid (RNA) viral suppression (Bradford, 2007; Coleman et al., 2007; Naar-King et al., 2007; Naar-King, Outlaw, Green-Jones, Wright, & Parsons, 2009; Tobias, Cunningham, Cunningham, &

CONTACT: Kartika Palar, PhD, kartika.palar@ucsf.edu, Division of HIV/AIDS, University of California San Francisco, San Francisco General Hospital, 995 Potrero Avenue, Building 80, Ward 84, Campus Box 0874, San Francisco, CA, 94110, USA.

Pounds, 2007). Lack of retention is typified by repeated missed visits, as well as more frequent visits to emergency departments (ED), often for severe symptoms (Kilbourne et al., 2002) that might have been avoided by more regular visits with a primary HIV provider. However, the persistence of disparities in HIV outcomes along the lines of social inequality (Cunningham, 2012; Cunningham et al., 2000; Levine et al., 2007; Ribaudo et al., 2013; Simard, Fransua, Naishadham, & Jemal, 2012) call for deeper inquiry into the factors associated with poor retention in care and subsequent negative health outcomes among hard-to-reach populations, that is, populations largely characterized with low financial resources, unstable housing, lack of adequate health insurance, unemployment, frequent substance use and mental illness, and/or racial/ethnic minority status (Cunningham et al., 2006).

The presence of competing demands between basic subsistence needs, such as food, shelter and clothing, and health care (competing needs [CN]) may present a significant barrier to maintaining regular HIV care for hard-to-reach populations (Gelberg, Andersen, & Leake, 2000). Previous studies in the United States indicate that a lack of access to basic needs can interfere with medical care in vulnerable populations (Gelberg, Gallagher, Andersen, & Koegel, 1997; Kushel, Gupta, Gee, & Haas, 2006; Reid, Vittinghoff, & Kushel, 2008). The concept of CN, however, goes beyond the mere presence of deficiencies in basic needs. Rather, it captures the explicit trade-offs individuals make between fulfilling these basic needs and fulfilling their health care requirements. Yet limited evidence exists to understand the extent to which competing subsistence needs negatively impact HIV care engagement, retention, and subsequent viral suppression in hard-to-reach populations.

It is essential to understand barriers to retention in care faced by vulnerable individuals in order to devise and appropriately implement interventions to retain these individuals and support optimal HIV outcomes. To address this gap in understanding, we prospectively assessed the association of CN with retention in care, ART use, and viral suppression in a sample of hard-to-reach adults living with HIV in Los Angeles, California. We hypothesized that CN would be associated with fewer HIV provider visits, greater missed HIV medical visits, increased ED use, lower initiation of ART among those in need, and detectable viral loads.

Methods

We conducted baseline and six-month follow-up assessments with Los Angeles-based participants in the HIV Outreach Initiative, a Special Project of National Significance (SPNS). This study was a multisite, longitudinal study examining engagement and retention in medical care among hard to reach populations living with HIV, sponsored by the Health Resources and Services Administration (HRSA). Between May 2004 and November 2005, bilingual staff enrolled 223 consenting participants and collected survey data via in-person interviews in the participants' preferred language (Spanish or English). Participants provided written consent to participate in the study and received $25 compensation per interview. The Institutional Review Boards of all participating institutions approved all study procedures.

Participants

Study participants living with HIV were recruited from two settings. First, we recruited HIV-positive clients from the Charles Drew University Mobile HIV Testing and Outreach Van, which operates routinely in low income neighborhoods throughout Los Angeles County. Second, we recruited participants from the waiting room of a large Los Angeles County public hospital HIV clinic. Eligibility requirements were reporting at least one missed medical visit that was not rescheduled in the previous six months or self-reporting a need for case management services. Additional eligibility criteria for all participants were that you must be 18 years or older and able to complete an oral survey in English or Spanish.

Main measures

All primary outcome measures and CN were assessed at both baseline and six-month follow-up interviews.

Primary outcome variables—Retention in care: We assessed poor retention in care along three related but distinct domains of HIV care utilization linked to suboptimal HIV outcomes in previous research. First, we assessed HIV provider visits, dichotomized as fewer than two visits in the previous six months, compared to greater than two visits (Mugavero, Davila, Nevin, & Giordano, 2010), and missed HIV medical visits, dichotomized as one or more missed HIV medical visits that were not rescheduled within two weeks in the previous six months, versus none (Mugavero et al., 2010). The third indicator of inconsistent or poor utilization of regular primary HIV care was one or more ED visits for anything other than an accident or injury in the last six months (Shapiro et al., 1999).

ART treatment status: ART treatment status was assessed by a standard battery of self-reported items, aided by picture cards of pills to enhance recognition. For this analysis, need for ART was defined as having CD4 cell count less than 350 cells/mm^3 at latest measurement, reflecting national guidelines for ART initiation at the time of data collection (Panel on Antiretroviral Guidelines for Adults and Adolescents, 2004).

Detectable viral load: We assessed detectable viral load in two ways. First, the participant was asked “What was your latest (most recent) viral load measurement?” We categorized answers as detectable versus undetectable viral load, defining detectable viral load as >400 copies/ml based on the highest threshold of all labs doing tests at the time of data collection. If the participant was unable to answer with an exact number or best estimate of viral load, he or she was then given categorical options, including “undetectable.” Self-reported detectable viral load was previously validated against both paper and electronic medical record lab data (among the subsets who had each type of data) in this study population (Kinsler, Cunningham, Mohanty, & Wong, 2008), as well as in other hard-to-reach populations in the United States (Buisker, Dufour, & Myers, 2015).

Primary independent variables—CN: We measured CN as having to choose between subsistence needs and the need for HIV medical care using two questions: (a) “In the last 6 months, have you ever had to go without health care that you needed because you needed the

money for food, clothing, housing, etc.?" (CN1), and (b) "In the last 6 months, have you ever had to go without food, clothing, housing, etc. because you needed the money for health care?" (CN2). We considered CN1 and CN2 separately, rather than collapsing, because while somewhat correlated (Pearson's correlation = 0.39), many people who answered affirmatively to CN1 did not report CN2, or vice versa.

Potential confounders—Based on previous studies,[15] we adjusted our analyses to control for demographic, socioeconomic, and health measures collected in the baseline survey. Demographic measures were age (18–34, 35–49, or >50), race (white or other race, black, or Hispanic), gender (male vs. female), marital status (married/committed relationship vs. single), educational attainment (high school diploma or higher vs. less than high school), and HIV risk category (MSM or transgender, injection drug user (non-MSM/transgender), or other. Socioeconomic measures included health insurance status (any insurance vs. uninsured), recent homelessness (yes/no), and annual income quartile (1st [lowest]), 2nd, 3rd, or 4th [highest] quartile). Health measures were heavy drinking (5 or more vs. less than 5 drinks/day in past 30 days), illicit drug use (any meth, crack, cocaine, or heroin use vs. no use in the past 30 days), CD4 cell count category (<200, 200–349, 350–499, or > = 500 cells/mm^3). We also controlled for mental health status using the mental health summary score of the SF-12.

Data analysis

We used generalized estimating equations (GEE) to model the population-average association between CN and retention in care measures, ART use and detectable viral load, adjusting for covariates. This method provides a correction for the clustering within individuals across time or between individuals observed at the same site, and utilizes information on all individuals with at least one observation in the data including those missing follow-up data. To provide more conservative estimates of association, we implemented GEE using a Poisson specification, reporting results as incidence rate ratios (IRRs). This method produces more conservative estimates of association than odds ratios from logistic regression when the prevalence of the outcome variable is high (Zou, 2004). Separate models were fitted on each outcome measure for the two time-varying CN independent variables (CN1 and CN2), controlling for baseline characteristics described above. Missing data at the variable level were dealt with using multiple imputation (Royston, 2004).

All analyses utilized semirobust or robust standard errors, as appropriate, and were conducted in Stata/IC 11.2 (StataCorp: College Station, Texas).

Results

Two-hundred and twenty-three individuals completed the survey at baseline, with 78% (174/223) completing the six-month follow-up survey. Seven participants (3%) died during the observation period. Participants who did not complete the follow-up survey were significantly more likely to be in the lowest income quartile, have recent homelessness, and report illicit drug use at baseline.

Table 1 describes the baseline characteristics of the study sample. Most study participants were male (79.8%), African American (45.7%), or Hispanic (40.4%), and between the ages of 35 to 49 (61.0%). Half of all participants identified as men who have sex with men (MSM) or transgender (50.2%). Over one third of the participants reported being homeless or marginally housed during the past six months (37.7%), 50% of all participants had incomes less than $481/month, and almost half reported having no health insurance (45.7%). One out of five participants reported heavy drinking (20.7%) or using illicit drugs (22.9%) in the past 30 days. The prevalence of having any competing need was 11.3%. Separated by type of competing need, giving up health care for basic needs (CN1) and giving up basic needs for health care (CN2) were each reported among 7.7% of the sample. The baseline correlation between CN1 and CN2 was 0.39.

Almost all participants reported a usual source of HIV care (97.9%). However, in the past six months, 17.4% attended fewer than two HIV medical visits, 60.9% had missed at least one HIV medical appointment, and 31.4% had visited the ED at least once (Table 1). Forty-one percent of participants had CD4 < 350 cells/uL, and almost one third (32.3%) of these participants were not receiving ART. Almost two thirds (62.8%) of the sample reported a detectable viral load at their last visit.

Giving up health care for basic needs (CN1) was associated with higher incidence of missed appointments (IRR = 1.39, 95% CI 1.07–1.81; $p < 0.05$) and higher incidence of not being on ART if CD4 < 350 (IRR = 1.91, 95% CI 1.14–3.18; $p < 0.05$) in bivariable analysis. Adjusting for potential confounders slightly attenuated the magnitude of these associations that remained in the same direction; however, they were no longer statistically significant at $p < 0.05$ (Table not shown).

In unadjusted analysis, giving up basic needs for health care (CN2) was associated with higher incidence of at least one missed medical appointment (IRR = 1.50, 95% CI 1.21–1.86; $p < 0.001$; Table 2), at least one ED visit (IRR = 2.53, 95% CI 1.70–3.77; $p < 0.001$; Table 3), not receiving ART if CD4 < 350 (IRR = 2.33, 95% CI 1.39–3.93; $p < 0.001$; Table 4) and detectable viral load (VL > 400) (IRR = 1.42, 95% CI 1.18–1.70; $p < 0.001$; Table 4).

After adjusting for potential confounders, CN2 continued to be associated with indicators of poor engagement and retention in care. Compared to those not reporting giving up basic needs for health care, CN2 was associated with 55% higher incidence of missed appointments (adjusted IRR (aIRR) = 1.55, 95% CI 1.17–2.05; $p < 0.01$; Table 2) and over two times higher incidence of ED visits (aIRR = 2.32, 95% CI 1.39–3.87; $p < 0.01$; Table 3) in the previous six months. In addition, among those with CD4 < 350, CN2 was associated with over three times higher incidence of not receiving ART (aIRR = 3.66, 95% CI 1.60–8.37; $p < 0.01$; Table 4). Finally, CN2 was associated with 35% higher incidence of reporting a detectable viral load (aIRR = 1.35, 95% CI 1.07–1.70; $p < 0.05$; Table 4). We detected no associations between CN2 and attending fewer than two HIV medical visits in the previous six months (Table 2).

Examining model covariates, illicit drug use, and being classified in the HIV risk category “other” (i.e., all individuals who are not MSM, transgender, or IDU) were associated with

higher incidence of missed HIV medical appointments (Table 2). Over age 35 and “other” HIV risk categories were associated with lower incidence of ART nonreceipt, while heavy drinking was associated with higher incidence of ART nonreceipt (Table 4). Finally, over age 35 was associated with lower incidence of detectable viral load, while African American race/ethnicity and being uninsured were associated with higher incidence of detectable viral load (Table 4).

Discussion

In this longitudinal study of a hard-to-reach population in HIV care, we found that CN between subsistence and health care were consistently associated with poor engagement and retention in care even after controlling for potential confounding factors. Specifically, giving up basic needs—including food, shelter, clothing or other necessities—in order to receive health care was associated with greater incidence of missed HIV medical visits and of ED visits. In addition, among individuals with CD4 counts <350 cells/uL, a stringent clinical threshold for ART initiation according to guidelines at the time of the study, CN were associated with not receiving ART. Most strikingly, giving up basic needs for health care was associated with elevated risk of having a detectable viral load. Detectable viral load is one of the most important predictors of AIDS progression and mortality (Mellors et al., 1996) among PLHIV, as well as HIV transmission to partners (Cohen et al., 2011). These results suggest that competing subsistence needs may affect not only health care behaviors and access to care, but also transmission of HIV to partners (Cohen et al., 2011).

Our results extend previous evidence suggesting that struggling to meet subsistence needs reduces engagement and retention in care among PLHIV. Previous research from the HIV Cost and Services Utilization Study (HCSUS), a nationally representative study of people with HIV receiving medical care, showed that individuals who reported trading off between basic needs and health care had higher odds of ever starting ART (Cunningham et al., 1999), visiting the ED (Cunningham et al., 1999; Penniman et al., 2007) and hospitalizations (Penniman et al., 2007) compared to those who reported having no CN. However, HCSUS represented all people receiving HIV care and did not explicitly examine CN among socially or economically disadvantaged individuals at particularly high risk for dropping out of care. Furthermore, HCSUS, nor any other study using a CN measure, has examined viral suppression as an outcome, the ultimate goal of successful HIV treatment.

The small literature on CN considered explicitly is complemented by a larger literature focusing on associations between unmet subsistence needs and subsequent HIV care behaviors and outcomes. For example, food insecurity was associated with increased ED utilization (Weiser, Hatcher, et al., 2012), low ART adherence and viral nonsuppression (Weiser et al., 2013) among homeless and marginally housed individuals in San Francisco. Among women with HIV in this same population and setting, unmet subsistence needs were ranked highest among factors negatively impacting physical and mental health, even when compared to poor ART adherence, poor social support, and substance use (Riley et al., 2011). Among homeless individuals in Los Angeles, difficulties accessing food, shelter, and other basic needs were associated with higher odds of not having regular source of care and going without needed medical care in the past year (Gelberg et al., 1997). Meanwhile,

national studies of low-income Americans identified associations between difficulties fulfilling housing and food needs with delays in seeking care, increased ED visits, and hospitalizations (Kushel et al., 2006; Reid et al., 2008).

The preceding literature describes a wide range of approaches to capturing the relationship between subsistence difficulties and health care outcomes. These studies consistently document how struggles to meet basic needs undermine health care and outcomes for vulnerable populations. Yet there is still a need for improved clarity on the relative value and performance of static measures of unmet needs versus those explicitly capturing trade-offs with health care (i.e., CN), given that marginalization and impoverishment can lead to a reordering of priorities (Riley, Gandhi, Hare, Cohen, & Hwang, 2007) that absolute measures of deprivation may not adequately capture. It is notable that only about 1 in 10 individuals reported trading-off among competing needs for health care in our study population despite high levels of social and economic disadvantage. Yet, CN—specifically giving up subsistence needs for health care—were strongly associated with indicators of poor engagement and retention in care, even after controlling for measures of socioeconomic status and overall mental health. This suggests that above and beyond material deprivation (i.e., homelessness, poverty, etc.), CN may capture an important domain of exceptional vulnerability characterized by the actual or perceived need to sacrifice basic needs in order to obtain health care. Therefore, it is important to measure CN in additional samples of hard-to-reach people with HIV and other vulnerable populations such as homeless and marginally housed individuals, where it may provide additional insight for the development of interventions to improve care for these populations.

Furthermore, one priority question is to understand whether CN are most salient to PLHIV when consolidated into an overall measure (i.e., that combines food, housing, and other subsistence needs) as in the present study as well as in HCSUS (Cunningham et al., 1999), or considered as distinct domains of need. For example, a study in Uganda examined competing demands between food and health care and found high prevalence of giving up medical care for food, and giving up food for medical care, particularly among severely food insecure individuals (Weiser, Tsai, et al., 2012). More work is still needed to understand what precipitates the trade-off between basic needs and health care in hard-to-reach populations with high absolute levels of resource deprivation, in order to develop effective strategies to address CN and reduce HIV health disparities along the treatment cascade.

A recent systematic review of interventions to improve retention in HIV primary care in the United States found a strong role for addressing resource-related barriers (i.e., transportation, housing, etc.) (Higa, Marks, Crepaz, Liau, & Lyles, 2012). Out of a total of 13 studies, 10 showed effectiveness and 5 employed interventions to reduce subsistence needs integrated with educational, peer navigation, and/or psychosocial approaches. Effective strategies to address resource-related barriers included direct support (Andersen et al., 2007) (e.g., providing transportation), providing resource referrals and/or advocacy(Andersen et al., 2007; Naar-King et al., 2007; Wohl et al., 2011), and co-locating health and social services (Hightow-Weidman, Smith, Valera, Matthews, & Lyons, 2011). The one study that provided only housing support (in the form of rental assistance) (Wolitski et al., 2010), but did not address other barriers to retention in care, did not show a significant

impact on retention in care although mental and physical health did improve. This suggests that integrated strategies that address but are not limited to subsistence needs may be most successful in helping patients cope with crises of CN and subsequent poor retention in care.

This study has several limitations. First, our study relies on self-reported measures and therefore may contain some measurement error. If individuals misreporting a detectable viral load at their last health care visit were also more likely to report having given up basic needs for health care in the previous six months, our estimates would be biased. However, the validation study, conducted among this same sample, comparing self-reported undetectable viral load to paper and electronic medical records in this population found no association between patient characteristics and the agreement between self-reported versus medical records (Kinsler et al., 2008). Therefore, we believe the measurement error is likely to be random and should not bias our results. Furthermore, these data were collected during 2004–2005, which may limit their applicability to patient populations today. Yet, subsistence difficulties have continued to emerge as major challenges to HIV treatment and retention in care over the last 10 years, particularly as medical guidelines have continued to expand the population eligible for ART. Thus, using this unique dataset to understand a critical barrier to care in a highly vulnerable population is still highly relevant. Finally, these results may not be generalizable to PLHIV more generally, as they are based on a sample recruited to understand issues in engagement and retention in care in a hard-to-reach population. However, despite these differences, a nationally representative sample of PLHIV documented strikingly similar rates of CN (11.5% reported giving up health care for subsistence needs, while 7.6% reported giving up subsistence needs for health care) (Cunningham et al., 1999). In addition, loss to follow-up was significantly associated with higher levels of economic distress and illicit substance use compared to those who completed the study, which may limit how generalizable our results are to populations with the highest levels of vulnerability.

Eliminating disparities in HIV outcomes along the lines of social inequality is one of the primary goals of the U.S. National AIDS Strategy through 2020. Achieving this goal will require integrated and creative approaches to supporting retention in care that includes attention to competing subsistence needs among hard-to-reach populations with HIV. Our study suggests that addressing not only absolute levels of deprivation but also the decision-making process a patient considers while trading off between their subsistence needs and health care may help to improve retention in care and contribute toward a more equitable and healthy future for all PLHIV.

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ABBREVIATIONS

ART	antiretroviral therapy
CN	competing needs
ED	emergency department
GEE	generalized estimating equations
HCSUS	HIV Cost and Services Utilization Study
HRSA	Health Resources and Services Administration
IDU	injecting drug use/user
IRR	incidence rate ratios
MSM	men who have sex with men
PLHIV	people living with HIV
SPNS	Special Project of National Significance

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Table 1

Baseline characteristics ($N = 223$).

Health care engagement	
Less than two HIV medical visits, past six months, %	17
At least one missed HIV appointment, past six months, %	61
At least one emergency department visit, past six months, %	31
Not receiving ART if CD4 < 350, %	32
HIV-related health	
CD4 category, %	
<200	18
200–349	24
350–499	24
>500	34
Reported detectable viral load, %	63
Competing needs in previous 6 months	
Gave up health care for basic needs, or vice versa (CN1 or CN2)	11
Gave up health care for basic needs (CN1), %	8[a]
Gave up basic needs for health care (CN2), %	8
Demographic, socioeconomic and health characteristics	
Age, %	
18–34	16
35–49	61
50+	23
Race/ethnicity, %	
White	9
African American	46
Hispanic	40
Other race	5
Male, %	80
HIV risk category, %	
MSM or trans	50
IDU (non-MSM/trans)	16
Other	34
Married or in a committed relationship, %	22
High school diploma/GED or higher, %	68
Average monthly income ($) by quartile, mean [SD]	
1st quartile	119.8 [107.9]
2nd quartile	481.6 [159.1]
3rd quartile	796.1 [22.0]
4th quartile	1377.9 [856.7]
Homeless/marginally housed in past six months, %	38
No health insurance, %	46

Had five or more drinks in a day in past 30 days, %	21
Used illicit drugs in past 30 days,	23
Mental health summary score (SF-12), mean [SD]	42.6 [10.6]

Note:

[a]Correlation between CN1 and CN2 is 0.39.

Table 2

Association between competing needs and medical visits over previous 6 months.

	Attended <2 HIV medical visits				Missed ≥ 1 HIV medical appointment			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	IRR	(95% CI)	aIRR	(95% CI)	IRR	(95% CI)	aIRR	(95% CI)
Gave up basic needs for health care in last 6 months (CN2)	1.06	(0.38–2.99)	0.98	(0.33–2.92)	**1.50** ***	(1.21–1.86)	**1.55** **	(1.17–2.05)
Age								
18–34	1.0 (Ref)				1.0 (Ref)			
35–49	1.08	(0.49–2.39)	0.76	(0.30–1.88)	1.21	(0.92–1.59)	1.12	(0.87–1.43)
50+	1.02	(0.40–2.62)	0.72	(0.25–2.06)	0.87	(0.60–1.27)	0.81	(0.56–1.17)
Race/ethnicity								
White or other race	1.0 (Ref)				1.0 (Ref)			
African American	1.19	(0.51–2.77)	1.24	(0.50–3.06)	1.08	(0.82–1.42)	1.10	(0.85–1.42)
Hispanic	0.53	(0.20–1.39)	0.62	(0.24–1.55)	0.83	(0.62–1.13)	0.83	(0.62–1.11)
Male	0.98	(0.47–2.07)	0.96	(0.39–2.33)	1.19	(0.90–1.59)	1.19	(0.88–1.61)
HIV risk category								
MSM or transgender	1.0 (Ref)				1.0 (Ref)			
Injection drug use (non-MSM/trans)	1.13	(0.53–2.43)	1.14	(0.45–2.88)	0.79	(0.56–1.12)	0.96	(0.68–1.35)
Other	0.88	(0.45–1.71)	0.99	(0.42–2.37)	1.00	(0.80–1.24)	**1.27** *	(1.01–1.61)
Married or in committed relationship	1.01	(0.52–1.94)	1.03	(0.50–2.15)	0.94	(0.76–1.16)	0.96	(0.78–1.19)
High school graduate/GED or higher	1.86	(0.88–3.94)	1.51	(0.75–3.05)	1.20	(0.94–1.53)	1.24	(0.96–1.59)
Income quartile								
1st	1.0 (Ref)				1.0 (Ref)			
2nd	1.03	(0.40–2.67)	1.21	(0.44–3.34)	1.05	(0.82–1.34)	1.16	(0.93–1.44)
3rd	1.34	(0.64–2.83)	1.55	(0.53–4.57)	0.88	(0.67–1.16)	1.00	(0.73–1.38)
4th	1.08	(0.48–2.42)	1.24	(0.42–3.65)	0.79	(0.60–1.05)	0.92	(0.67–1.25)
Homeless/marginally housed, past 6 months	1.41	(0.78–2.52)	1.35	(0.66–2.79)	1.04	(0.85–1.28)	0.90	(0.74–1.10)
Uninsured	0.79	(0.45–1.38)	1.12	(0.43–2.91)	1.03	(0.85–1.25)	1.13	(0.88–1.46)
5 or more drinks/day, past 30 days	**2.02** *	(1.11–3.70)	**1.96** *	(1.04–3.69)	**1.32** **	(1.07–1.63)	1.07	(0.84–1.35)
Used illicit drugs, past 30 days	1.31	(0.68–2.49)	0.97	(0.48–1.95)	**1.50** ***	(1.24–1.81)	**1.32** *	(1.06–1.64)

	Attended <2 HIV medical visits				Missed ≥ 1 HIV medical appointment			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	IRR	**(95% CI)**	**aIRR**	**(95% CI)**	**IRR**	**(95% CI)**	**aIRR**	**(95% CI)**
CD4 category								
<200	1.0 (Ref)				1.0 (Ref)			
200–349	1.01	(0.40–2.57)	0.95	(0.37–2.45)	0.85	(0.65–1.13)	0.88	(0.67–1.14)
350–499	1.02	(0.43–2.45)	1.07	(0.42–2.76)	0.97	(0.74–1.28)	0.99	(0.76–1.28)
>500	1.31	(0.57–2.99)	1.23	(0.48–3.15)	0.93	(0.72–1.20)	0.94	(0.72–1.22)
Mental Health Summary score – SF12	0.99	(0.97–1.02)	1.00	(0.97–1.03)	**0.98** ***	(0.97–0.99)	**0.98** **	(0.97–0.99)

Notes: Sample size: *n* = 389 (representing 219 unique individuals across two assessments). Estimates obtained using GEE with a Poisson specification, expressed as unadjusted or adjusted incidence rate ratios. IRR = incidence rate ratios; aIRR = adjusted incidence rate ratio. Results in IRR column are bivariable associations between the covariate and outcome. Results in the aIRR column are multivariable associations adjusting for all shown covariates simultaneously.

*** p < 0.001,

** p < 0.01,

* p < 0.05.

Table 3

Association between competing needs and emergency department use.

	≥1 emergency dept. visit, previous 6 months			
	Unadjusted		Adjusted	
	IRR	95% CI	aIRR	95% CI
Gave up basic needs for health care in last 6 months (CN2)	**2.53** ***	(1.70–3.77)	**2.32** **	(1.39–3.87)
Age				
18–34	1.0 (Ref)		1.0 (Ref)	
35–49	1.33	(0.78–2.28)	1.36	(0.74–2.50)
50+	1.33	(0.72–2.43)	1.22	(0.62–2.42)
Race/ethnicity				
White or other race	1.0 (Ref)		1.0 (Ref)	
African American	0.88	(0.52–1.47)	0.82	(0.50–1.35)
Hispanic	0.83	(0.49–1.41)	0.72	(0.41–1.27)
Male	1.00	(0.65–1.56)	1.33	(0.84–2.08)
HIV risk category				
MSM or transgender	1.0 (Ref)		1.0 (Ref)	
Injection drug use (non-MSM/trans)	1.42	(0.87–2.30)	1.42	(0.83–2.42)
Other	**1.47** *	(1.01–2.14)	1.49	(0.98–2.27)
Married or in committed relationship	0.61	(0.38–1.00)	0.65	(0.40–1.05)
HS/GED or higher	**0.65** *	(0.46–0.92)	0.73	(0.50–1.05)
Income quartile				
1st	1.0 (Ref)		1.0 (Ref)	
2nd	1.07	(0.65–1.75)	1.09	(0.69–1.71)
3rd	1.37	(0.91–2.06)	1.25	(0.78–2.01)
4th	0.56	(0.31–1.01)	0.54	(0.29–1.00)
Homeless/marginally housed, last 6 months	1.06	(0.74–1.52)	0.93	(0.67–1.29)
No health insurance	0.78	(0.56–1.08)	0.83	(0.54–1.27)
5 or more drinks/day, past 30 days	1.09	(0.74–1.60)	1.12	(0.77–1.65)
Used illicit drugs, past 30 days	0.96	(0.64–1.45)	0.80	(0.53–1.20)

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	≥1 emergency dept. visit, previous 6 months			
	Unadjusted		Adjusted	
	IRR	95% CI	aIRR	95% CI
CD4 category				
<200	1.0 (Ref)		1.0 (Ref)	
200–349	**0.52** *	(0.31–0.87)	**0.59** *	(0.36–0.96)
350–499	0.83	(0.54–1.27)	0.89	(0.58–1.36)
>500	**0.60** *	(0.39–0.94)	0.69	(0.44–1.07)
Mental health summary score, SF-12	**0.97** ***	(0.96–0.99)	**0.98** *	(0.97–1.00)

Note: Sample size was $n = 389$ (representing 219 unique individuals across two assessments). Estimates obtained using GEE with a Poisson specification, expressed as unadjusted or adjusted incidence rate ratios. IRR = incidence rate ratios, aIRR = adjusted incidence rate ratio. Results in IRR column are bivariable associations between the covariate and outcome. Results in the aIRR column are multivariable associations adjusting for all shown covariates simultaneously.

*** $p < 0.001$;

** $p < 0.01$;

* $p < 0.05$.

Table 4

Association between competing needs, ARV use, and viral load.

	Not on ART, among CD4 < 350				Reported detectable viral load (VL > 400)			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	IRR	95% CI	aIRR	95% CI	IRR	95% CI	aIRR	95% CI
Gave up basic needs for health care in last 6 months (CN2)	**2.33** ***	(1.39–3.93)	**3.66** **	(1.60–8.37)	**1.42** ***	(1.18–1.70)	**1.35** *	(1.07–1.70)
Age								
18–34	1.0 (Ref)		1.0 (Ref)		1.0 (Ref)			
35–49	**0.53** *	(0.31–0.91)	**0.50** *	(0.29–0.86)	0.82	(0.66–1.02)	**0.78** *	(0.62–0.97)
50+	**0.37** **	(0.18–0.78)	**0.33** *	(0.13–0.82)	**0.72** *	(0.53–0.97)	**0.70** *	(0.50–0.96)
Race/ethnicity								
White or other race	1.0 (Ref)				1.0 (Ref)			
African American	1.03	(0.48–2.22)	1.77	(0.80–3.92)	1.20	(0.88–1.64)	**1.36** *	(1.00–1.84)
Hispanic	0.77	(0.35–1.70)	0.97	(0.41–2.27)	1.04	(0.75–1.44)	0.99	(0.71–1.39)
Male	1.93	(0.52–7.20)	1.30	(0.31–5.41)	1.21	(0.93–1.59)	1.15	(0.84–1.57)
HIV risk category								
MSM or transgender	1.0 (Ref)		1.0 (Ref)		1.0 (Ref)			
IDU (non-MSM/trans)	1.12	(0.59–2.12)	1.73	(0.83–3.60)	1.06	(0.81–1.37)	1.18	(0.88–1.59)
Other	**0.38** **	(0.19–0.79)	**0.25** ***	(0.12–0.53)	0.89	(0.71–1.13)	0.88	(0.68–1.14)
Married or in committed relationship	0.76	(0.42–1.38)	0.83	(0.47–1.47)	0.88	(0.69–1.12)	1.04	(0.84–1.29)
High school graduate/GED or higher	1.24	(0.67–2.30)	0.91	(0.47–1.79)	0.99	(0.80–1.21)	0.93	(0.75–1.16)
Income quartile								
1st	1.0 (Ref)		1.0 (Ref)		1.0 (Ref)			
2nd	0.55	(0.23–1.31)	0.52	(0.20–1.34)	0.89	(0.68–1.17)	0.92	(0.70–1.21)
3rd	0.55	(0.24–1.23)	0.59	(0.21–1.69)	0.78	(0.60–1.02)	0.97	(0.69–1.36)
4th	0.65	(0.33–1.26)	0.53	(0.25–1.12)	**0.70** *	(0.53–0.93)	0.86	(0.62–1.20)
Homeless/marginally housed, last 6 months	1.34	(0.79–2.27)	1.05	(0.63–1.74)	**1.23** *	(1.02–1.50)	1.11	(0.90–1.37)
No health insurance	1.46	(0.87–2.47)	1.08	(0.52–2.23)	1.15	(0.95–1.40)	**1.34** *	(1.03–1.73)
5 or more drinks/day, past 30 days	**2.09** **	(1.28–3.40)	**2.40** ***	(1.58–3.65)	1.18	(0.94–1.48)	1.14	(0.92–1.43)

	Not on ART, among CD4 < 350				Reported detectable viral load (VL > 400)			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	IRR	95% CI	aIRR	95% CI	IRR	95% CI	aIRR	95% CI
Used illicit drugs, past 30 days	**1.71** *	(1.02–2.88)	0.90	(0.51–1.61)	1.13	(0.91–1.41)	0.94	(0.76–1.17)
CD4 category								
<200	1.0 (Ref)		1.0 (Ref)		1.0 (Ref)		1.0 (Ref)	
200–349	0.70	(0.42–1.15)	0.69	(0.44–1.07)	1.07	(0.80–1.42)	0.80	(0.62–1.02)
350–499	–	–	–	–	1.10	(0.82–1.46)	0.92	(0.72–1.17)
>500	–	–	–	–	0.83	(0.61–1.13)	**0.70** **	(0.54–0.91)
Mental health summary score, SF-12	0.98	(0.96–1.01)	1.02	(0.99–1.05)	0.99	(0.98–1.00)	0.99	(0.98–1.00)

Note: Sample sizes were $n = 157$ observations (on 114 unique individuals at 0 and 6 months) for ART use among individuals with CD4 < 350; $n = 389$ observations (on 219 unique individuals at 0 and 6 months) for detectable viral load. IRR = incidence rate ratio, aIRR = adjusted incidence rate ratio. Results in IRR column are bivariable associations between the covariate and outcome. Results in the aIRR column are multivariable associations adjusting for all shown covariates simultaneously. All estimates result from generalized estimating equations (GEE) using the Poisson specification with dichotomous outcome variables.

*** $p < 0.001$;

** $p < 0.01$;

* $p < 0.05$.