**ORIGINAL PAPER**

CrossMark

# Gender Differences and Psychosocial Factors Associated with Problem Drinking Among Adults Enrolling in HIV Care in Tanzania

Angela M. Parcesepe[1,2] · Denis Nash[2,3] · Olga Tymejczyk[2,3] · William Reidy[4] · Sarah Gorrell Kulkarni[2] · Batya Elul[4]

## Abstract

Problem drinking is commonly reported among people living with HIV (PLWH), associated with suboptimal HIV care outcomes and differs by gender. Psychosocial factors associated with problem drinking among PLWH remain poorly understood, including whether they differ by gender. This analysis examines the relationship between psychosocial factors and problem drinking separately by gender among PLWH in Tanzania. Cross-sectional data were collected from 812 men and non-pregnant women living with HIV aged 18 or older enrolling in HIV care at four health facilities in Tanzania. Problem drinking was assessed with the CAGE Questionnaire and defined as responding yes to two or more items. Sex-stratified multivariable logistic regression modeled the association of social support, HIV-related stigma, and physical or sexual violence on problem drinking, controlling for age, relationship status, employment, having been away from home for more than one month, and timing of first HIV-positive diagnosis. Thirteen percent of the sample reported problem drinking, with problem drinking significantly more commonly reported among men than non-pregnant women (17.6% vs. 9.5%). Among men and non-pregnant women, in multivariable analyses, enacted and internalized HIV-related stigma were significantly positively associated with problem drinking. Screening and treatment of problem drinking should be integrated into HIV care. Evidence-based substance abuse interventions should be adapted to address HIV-related stigma. Future research should longitudinally investigate the interrelationships between stigma, violence, and problem drinking among PLWH.

**Keywords** HIV · Alcohol · Stigma · Violence · Tanzania

✉ Angela M. Parcesepe
angela_parcesepe@unc.edu

Denis Nash
denis.nash@sph.cuny.edu

Olga Tymejczyk
olga.tymejczyk@sph.cuny.edu

William Reidy
wr2205@columbia.edu

Sarah Gorrell Kulkarni
sarah.kulkarni@sph.cuny.edu

Batya Elul
be2124@columbia.edu

[1] Department of Maternal and Child Health, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, CB#7445, Chapel Hill, NC 27599-7445, USA

[2] Institute for Implementation Science in Population Health, City University of New York, New York, NY, USA

[3] Graduate School of Public Health and Health Policy, City University of New York, New York, NY, USA

[4] Department of Epidemiology, Columbia University, New York, NY, USA

## Introduction

Alcohol is the most commonly used substance in sub-Saharan Africa [1]. Available data suggest that between 7 and 16% of PLWH in sub-Saharan Africa abuse alcohol or other substances [2]. Alcohol abuse has been associated with HIV infection. A meta-analysis of the relationship between alcohol use and HIV infection in sub-Saharan Africa found that individuals who abused alcohol were significantly more likely to be living with HIV compared to individuals who did not drink alcohol [3]. Alcohol abuse has also been associated with suboptimal HIV outcomes including poor adherence to antiretroviral therapy (ART), late ART initiation, rapid HIV disease progression, and mortality [4–8].

Patterns of alcohol use and abuse differ significantly by gender in the general population. On average, men are more likely to report drinking alcohol, report drinking alcohol more frequently, and report drinking in greater quantities compared to women [9]. According to the World Health Organization (WHO), 16% of African women and 30% of

African men report weekly episodes of heavy drinking, and 65% of African women and 49% of African men report lifetime abstention from alcohol [9]. Similar gender differences have been observed among PLWH in sub-Saharan Africa [2].

Among the general population, alcohol abuse has been associated with life stress and psychosocial adversity, including physical and sexual violence [10, 11], low levels of social support [12], and co-morbid mental health disorders, including depression and post-traumatic stress disorder [13, 14]. Despite the consistent relationship between alcohol abuse and poor HIV treatment outcomes, psychosocial factors associated with alcohol abuse among PLWH remain poorly understood, including in sub-Saharan Africa, where the majority of PLWH reside. Among extant research with PLWH in South Africa, high risk drinking has been associated with depressive symptoms [15]. Little is known about the extent to which psychosocial factors associated with problem drinking differ by gender among PLWH.

We investigated the relationship between three types of psychosocial adversity (i.e., low social support, HIV-related stigma, and violence) and problem drinking among PLWH enrolling in care and not known to be eligible for ART in Tanzania per national guidelines in 2012–2013 (i.e., prior to the introduction of the WHO's universal test and treat guidelines), and assessed the extent to which the relationship between these psychosocial factors and problem drinking differed by gender. A more nuanced understanding of the ways in which gender, psychosocial factors, and problem drinking intersect can inform the design and implementation of interventions to prevent and reduce problem drinking and its consequences among PLWH.

## Methods

We used data from a cohort study conducted at four HIV care and treatment clinics in the Kagera region of northwestern Tanzania. At the time of data collection, the clinics were supported by the Tanzanian Ministry of Health with technical assistance from ICAP at Columbia University via funding from the President's Emergency Plan for AIDS Relief (PEPFAR). The four study clinics were located in secondary health facilities and were purposively selected because they were high-volume sites that represented urban and rural settings. Individuals were eligible for study enrollment if they were: (1) aged 18 years and older, (2) newly enrolling in HIV care and 3) not known to be eligible for ART (based on WHO stage and/or CD4 count) between March 2012 and November 2013. From March 2012 until April 2013, the Tanzanian national guidelines recommended ART initiation for patients with WHO stage IV or CD4+ count < 200 cells/μL, or WHO III with CD4+ < 350 cells/μL; in April 2013 the guidelines were expanded to include all patients with CD4+ count < 350 cells/μL. The original study enrolled 920 individuals. The current sample is comprised of 812 men and non-pregnant women for whom information on alcohol use was available. Pregnant women (n = 80) were excluded from this analysis due to very low reporting of problem drinking (See Table 1). In addition, research indicates that,

**Table 1** Prevalence of alcohol use and problem drinking among adults enrolling in HIV care in Tanzania and not known to be eligible for ART in Tanzania

| | Men and non-pregnant women (n=812) n (%) | Non-pregnant women (n=483) n (%) | Men (n=329) n (%) | Pregnant women (n=80) |
|---|---|---|---|---|
| Alcohol use | | | | |
| Never or not in past 3 months | 504 (62.1) | 328 (67.9) | 176 (53.5) | 59 (73.8) |
| 1–4 times a month | 186 (22.9) | 110 (22.8) | 76 (23.1) | 13 (16.3) |
| 2 or more times a week | 122 (15.0) | 45 (9.3) | 77 (23.4) | 8 (10.0) |
| CAGE | | | | |
| Have you felt you should cut down on your drinking in the past 3 months? | 237 (29.2) | 118 (24.4) | 119 (36.2) | 15 (18.8) |
| Have people annoyed you by criticizing your drinking in the past 3 months | 38 (4.7) | 14 (2.9) | 24 (7.3) | 1 (1.3) |
| Have you felt bad or guilty about your drinking in the past 3 months? | 89 (11.0) | 46 (9.5) | 43 (13.1) | 5 (6.3) |
| Have you had a drink first thing in the morning to steady your nerves or get rid of a hangover in the past 3 months? | 41 (5.0) | 11 (2.3) | 30 (9.1) | 1 (1.3) |
| Problem drinking | | | | |
| No | 708 (87.2) | 437 (90.5) | 271 (82.4) | 77 (96.3) |
| Yes | 104 (12.8) | 46 (9.5) | 58 (17.6) | 3 (3.8) |

among women, risk factors associated with problem drinking during pregnancy may be meaningfully different than risk factors associated with problem drinking not during pregnancy. For example, a longitudinal study of pregnant women living with HIV in South Africa found that prior to pregnancy, alcohol abuse was significantly associated with educational attainment and having experienced intimate partner violence (IPV) [16]. However, continued alcohol abuse during pregnancy was significantly associated with gestational age of pregnancy when entering antenatal care and the perceived quality of the patient-healthcare provider relationship, but not with education or IPV [16]. Twenty-eight individuals were excluded from this analysis due to missing data on problem drinking. The study was approved by the Institutional Review Boards of the National Institute for Medical Research of the United Republic of Tanzania, Columbia University Medical Center, and the City University of New York.

## Setting

HIV prevalence among adults aged 15–49 in Tanzania is estimated to be 4.7% [17]. An estimated 1.3 million individuals age 15 or older are living with HIV in Tanzania, 780,000 of whom are female [17].

## Data Collection

Patients potentially eligible for study participation were identified by providers within 90 days of their first clinic visit. Eligible and interested patients were then referred to study staff for screening and consent procedures. Data collection consisted of a structured interview which included questions on sociodemographics, alcohol use, HIV-related stigma, emotional and financial support, and physical and sexual violence.

## Measures

### Alcohol Consumption

Alcohol consumption was assessed by asking study participants how often they consumed alcohol in the past 3 months. Responses were categorized into three levels of alcohol consumption: alcohol abstinence, low-risk drinking, and problem drinking. Participants who reported never having drunk alcohol or not having drunk alcohol in the past 3 months were coded as abstaining from alcohol in the past 3 months. Participants who reported drinking alcohol in the past 3 months, but did not screen positive for problem drinking

were coded as low-risk drinkers in the past 3 months. Problem drinking in the past 3 months was assessed using the four-item CAGE questionnaire which consists of the following items: "Have you ever felt you should cut down on your drinking?; Have people ever annoyed you by criticizing your drinking?; Have you ever felt bad or guilty about your drinking?; Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover?" [18]. The CAGE questionnaire has previously demonstrated high sensitivity and specificity in sub-Saharan Africa [19] and high positive predictive value among PLWH [20]. As recommended and consistent with other studies in sub-Saharan Africa, respondents were coded positive for problem drinking if they responded yes to two or more items [21, 22].

## Recent Internalized Stigma

Internalized stigma in the past 3 months was measured with the 5-item negative self-perception subscale (e.g. *You felt that you did not deserve to live, You felt that you were no longer a person*) of the HIV/AIDS Stigma Instrument, PLWHA (HASI-P), developed in sub-Saharan Africa [23]. An additional item not from this scale (*You thought someone had cursed you*) also was included. Response options ranged from *Never* (4) to *Most of the time* (1) and were recoded so that higher scores represented higher internalized stigma. Because the distribution of responses on this scale was skewed, responses were categorized into tertiles based on the distribution in the full population.

## Recent Enacted Stigma

Enacted stigma in the past three months was measured with eight items selected from HASI-P subscales (verbal abuse, fear of contagion, and social isolation); items inquired about how often the participant had experienced rejection due to their HIV status (e.g., *You were told that you have no future, You were told that God is punishing you, Someone stopped being your friend*), with response options ranging from *Never* (4) to *Most of the time* (1), [23]. Because the reported frequency of occurrence of all items was low, the summary measure was coded as *any* versus *none*.

## Sexual Violence

Sexual violence was assessed by asking participants if anyone had ever forced them to have sexual intercourse or perform any other sexual acts. Response options included: yes, no, and don't know. Sexual violence was coded as yes or no. No participants selected 'don't know' for this item.

## Physical Violence

Physical violence was assessed by asking participants if anyone had ever hit, slapped, kicked, or done anything else to hurt them physically. Response options included: yes, no, and don't know. Physical violence was coded as yes or no. No participants selected 'don't know' for this item.

## Emotional Support

Emotional support was assessed by asking participants if they have someone to turn to for advice or support when they are discourage or confused. Response options included: yes, no, and don't know. Emotional support was coded as yes vs no or don't know.

## Financial Support

Financial support was assessed by asking participants if there is someone who can help them with financial support related to health care. Response options included: yes, no, and don't know. Financial support was coded as yes vs no or don't know.

## Timing of First HIV Positive Diagnosis

Calendar month and year of first HIV-positive diagnosis was self-reported by participants in the study interview. Study participants were classified as having been diagnosed in the same calendar month as the study interview or diagnosed in a prior month.

## Sociodemographic Characteristics

Sociodemographic variables included age, sex, pregnancy status, education, religion, relationship status, employment status, food insufficiency, and time away from home. Food insufficiency was obtained by asking respondents how often in the last year their household had trouble satisfying their food needs. Time away from home was obtained by asking respondents if they had been away from their home community for more than one month at any time in the past 12 months.

## Statistical Analysis

Univariate analyses were conducted to assess the prevalence of alcohol use, problem drinking, HIV-related stigma, physical and sexual violence, and emotional and financial support overall and separately by gender. Sex-stratified analyses between psychosocial correlates (i.e., HIV-related stigma, violence, and support) and level of alcohol use were conducted using Pearson Chi squared tests or Fisher's

exact tests, as appropriate. Logistic regression was used to model the association of psychosocial correlates with problem drinking separately by gender. Adjusted analyses controlled for age, relationship status, employment status, time away from home, and timing of first HIV-positive diagnosis [24–26]. All analyses accounted for clustering by health facility using proc surveylogistic in SAS Version 9.4. Because internalized stigma was highly correlated with enacted stigma, multivariable regression models were run separately to examine the relationship between internalized and enacted HIV-related stigma and problem drinking. Due to the low prevalence of sexual violence victimization reported by men, sexual violence was not included in male bivariate or multivariable regression models. Similarly, due to limited variability of the emotional support variable among non-pregnant women, emotional support was not included in female bivariate or multivariable models.

## Results

Thirteen percent of males and non-pregnant females screened positive for problem drinking (Table 1). Alcohol use and problem drinking was significantly more commonly reported by men than by non-pregnant women with 17.6% of men reporting problem drinking compared to 9.5% of non-pregnant women (p < 0.0001). Alcohol use was also significantly associated with relationship status, religion, recent food insufficiency, having been away from home for more than one month in the past 12 months, employment status, CD4 count at HIV care enrollment, and the study site in which participants were recruited (Table 2).

In analyses stratified by sex, several psychosocial factors were significantly associated with level of alcohol use (Table 3). Among non-pregnant women, individuals who reported problem drinking reported higher prevalence of having experienced enacted HIV-related stigma compared to individuals who reported low-risk drinking or abstaining from alcohol. Experiencing enacted HIV-related stigma was reported by 33.3% of non-pregnant women who reported problem drinking compared to 20.8% of non-pregnant women who reported low-risk drinking and 12.0% of those who reported abstaining from alcohol (p = 0.0011). Among men, the relationship between experiencing enacted HIV-related stigma and level of alcohol use approached statistical significance (p = 0.0534). Experiencing enacted HIV-related stigma was reported by 19.6% of men who reported problem drinking as compared to 6.9% of men who reported low-risk drinking and 9.6% of men who reported abstaining from alcohol. Recent internalized HIV-related stigma was significantly associated with level of alcohol consumption among non-pregnant women and men. Approximately 37.8% of non-pregnant females who reported problem drinking also

**Table 2** Sociodemographic characteristics and alcohol use among adults enrolling in HIV care in Tanzania and not known to be eligible for ART in Tanzania

| | Total (n = 812) | Alcohol Abstinence (n = 504) | Low-risk drinking (n = 204) | Problem drinking (n = 104) | $\chi^2$ | p value |
|---|---|---|---|---|---|---|
| Sex and pregnancy status | | | | | | |
| Female, non-pregnant | 483 (59.5) | 328 (65.1) | 109 (53.4) | 46 (44.2) | 19.6879 | < 0.0001 |
| Male | 329 (40.5) | 176 (34.9) | 95 (46.6) | 58 (55.8) | | |
| Ever attended school | | | | | | |
| Yes | 634 (78.1) | 386 (76.6) | 166 (81.4) | 82 (78.8) | 1.9839 | 0.3709 |
| No | 178 (21.9) | 118 (23.4) | 38 (18.6) | 22 (21.2) | | |
| Relationship status | | | | | 13.5759 | 0.0347 |
| Married or in a relationship | 458 (56.4) | 264 (52.4) | 134 (65.7) | 60 (57.7) | | |
| Never married | 36 (4.4) | 21 (4.2) | 8 (3.9) | 7 (6.7) | | |
| Widowed | 116 (14.3) | 77 (15.3) | 26 (12.7) | 13 (12.5) | | |
| Divorced/separated | 202 (24.9) | 142 (28.2) | 36 (17.6) | 24 (23.1) | | |
| Age | | | | | 6.6724 | 0.3522 |
| 18–25 | 77 (9.6) | 56 (11.3) | 13 (6.4) | 8 (7.8) | | |
| 26–40 | 476 (59.4) | 290 (58.4) | 124 (61.4) | 62 (60.2) | | |
| 41–50 | 168 (20.9) | 100 (20.1) | 42 (20.8) | 26 (25.2) | | |
| > 50 | 81 (10.1) | 51 (10.3) | 23 (11.4) | 7 (6.8) | | |
| Missing | 10 | 7 | 2 | 1 | | |
| Religion | | | | | 18.4094 | 0.0484 |
| Catholic | 511 (62.9) | 305 (60.5) | 139 (68.1) | 67 (64.4) | | |
| Protestant | 178 (21.9) | 105 (20.8) | 48 (23.5) | 25 (24.0) | | |
| Muslim | 63 (7.8) | 49 (9.7) | 9 (4.4) | 5 (4.8) | | |
| Seventh day adventist | 8 (1.0) | 8 (1.6) | 0 | 0 | | |
| Born again | 49 (6.0) | 36 (7.1) | 7 (3.4) | 6 (5.8) | | |
| Other/none | 3 (0.4) | 1 (0.2) | 1 (0.5) | 1 (1.0) | | |
| Frequency of food insufficiency in past year | | | | | | |
| Never/seldom | 680 (84.7) | 440 (88.2) | 166 (83.0) | 74 (71.2) | 19.8068 | < 0.0001 |
| Sometimes/often/always | 123 (15.3) | 59 (11.8) | 34 (17.0) | 30 (28.8) | | |
| Missing | 9 | 5 | 4 | 0 | | |
| Currently employed for payment | | | | | | |
| Yes | 504 (62.5) | 295 (58.8) | 136 (67.7) | 73 (70.9) | 8.3569 | 0.0153 |
| No | 302 (37.5) | 207 (41.2) | 65 (32.3) | 30 (29.1) | | |
| Missing | 6 | 2 | 3 | 1 | | |
| Away from home > 1 month in last year | | | | | 9.5404 | 0.0085 |
| Yes | 220 (27.2) | 135 (26.8) | 45 (22.3) | 40 (38.8) | | |
| No | 588 (72.8) | 368 (73.2) | 157 (77.7) | 63 (61.2) | | |
| Missing | 4 | 1 | 2 | 1 | | |
| CD4 count at enrollment into HIV care | | | | | 20.1093 | 0.0005 |
| < 350 | 206 (28.1) | 145 (32.3) | 48 (25.0) | 13 (14.1) | | |
| 350–500 | 147 (20.1) | 97 (21.6) | 34 (17.7) | 16 (17.4) | | |
| > 500 | 380 (51.8) | 207 (46.1) | 110 (57.3) | 63 (68.5) | | |
| Missing | 79 | 55 | 12 | 12 | | |
| Time of first HIV positive diagnosis | | | | | | |
| Current calendar month | 544 (67.0) | 335 (66.5) | 138 (67.6) | 71 (68.3) | 0.1788 | 0.9145 |
| Prior to current calendar month | 268 (33.0) | 169 (33.5) | 66 (32.4) | 33 (31.7) | | |
| Study site | | | | | 78.0895 | < 0.0001 |
| Mugana | 151 (18.6) | 91 (18.1) | 40 (19.6) | 20 (19.2) | | |
| Ndolage | 248 (30.5) | 201 (39.9) | 27 (13.2) | 20 (19.2) | | |
| Nyakahanga | 223 (27.5) | 102 (20.2) | 72 (35.3) | 49 (47.1) | | |

**Table 2** (continued)

|  | Total (n = 812) | Alcohol Abstinence (n = 504) | Low-risk drinking (n = 204) | Problem drinking (n = 104) | $\chi^2$ | p value |
|---|---|---|---|---|---|---|
| Rubya | 190 (23.4) | 110 (21.8) | 65 (31.9) | 15 (14.4) | | |

reported medium or high levels of internalized stigma compared to 13.9% of non-pregnant women who reported low-risk drinking and 10.4% of women who reported abstaining from alcohol (p < 0.0001). Among men, 25.9% of those who reported problem drinking also reported medium or high levels of internalized stigma as compared to 5.3% of men who reported low-risk drinking and 7.0% of men who reported abstaining from alcohol (p < 0.0001). Lifetime experiences of physical violence were also significantly associated with alcohol consumption among men and non-pregnant women. Among non-pregnant women only, lifetime experiences of sexual violence were significantly associated with level of alcohol consumption and were more commonly reported among those who reported problem drinking as compared to those who reported low-risk drinking or abstaining from alcohol (p = 0.0005). Neither financial nor emotional support were significantly associated with alcohol consumption among men or non-pregnant women.

In multivariable analysis, enacted HIV-related stigma were associated with problem drinking among non-pregnant women and men (Table 4). Among non-pregnant women, those who reported having recently experienced enacted HIV-related stigma had 2.5 times the odds of reporting problem drinking [aOR 2.5 (1.1, 5.9)] compared to those who did not report having recently experienced enacted stigma. Similarly, among men, the odds of problem drinking were significantly higher for those who reported having recently experienced enacted stigma compared to those who did not report such experiences [aOR 2.6 (95% CI 1.0, 6.3)]. Internalized HIV-related stigma was also significantly associated with problem drinking among non-pregnant women and men. Non-pregnant women who reported medium or high levels of internalized HIV-related stigma had 3.6 times the odds [aOR 3.6 (95% CI 1.6, 8.0)] of problem drinking compared to those who did not report internalized stigma. Similarly, among men, those who reported medium or high levels of internalized HIV-related stigma had significantly higher odds of problem drinking compared to those who did not report internalized HIV-related stigma [aOR 4.7 (95% CI 2.0, 11.1)]. In unadjusted analyses, the odds of problem drinking were higher among women who had prior experiences of sexual violence compared to women who did not have such experiences [OR 3.5 (1.5, 8.2)]. This relationship did not persist in multivariable analyses. Similarly, in unadjusted analyses, the odds of problem drinking were higher among men who had prior experiences of physical violence compared to men who did not have such experiences [OR 2.5 (95% CI 1.1, 5.7)]. However, this relationship did not reach statistical significance in multivariable analyses.

## Discussion

This study assessed the prevalence and psychosocial correlates of alcohol consumption and problem drinking among a cohort of PLWH newly enrolling in care who were not known to be eligible to initiate ART during 2012–2013 (i.e., prior to the introduction of WHO's universal test and treat guidelines) at four HIV care and treatment sites in Tanzania. Thirteen percent of respondents reported problem drinking. Problem drinking was significantly more commonly reported among men as compared to non-pregnant women (17.6% vs. 9.5%, respectively). The prevalence of problem drinking in the current study is similar to previous prevalence estimates reported in the general population and among PLWH in Tanzania. According to the WHO's Global Status Report on Alcohol and Health, 14% of Tanzanians age 15 or older reported recent heavy episodic drinking (i.e., consumed 60 or more grams of pure alcohol on at least one occasion in the past 30 days) [27]. The prevalence of heavy episodic drinking was 7% among women and 21% among men [27]. A study of alcohol use among HIV and tuberculosis (TB) co-infected individuals receiving TB treatment in Tanzania found that 15% of individuals (14% of women and 15% of men) reported heavy drinking (i.e., > 1 drink/day for women; > 2 drinks/day for men) [28]. However, a study of alcohol use among PLWH in care in Tanzania found that just 2.2% were categorized as harmful or likely dependent drinkers (based on the Alcohol Use Disorders Identification Test [AUDIT]) [29]. Caution is warranted when making direct comparisons between estimates from previous studies and current study findings as previous studies operationalized alcohol misuse differently than the current study (e.g., problem drinking versus heavy episodic drinking or harmful drinking) and used different study eligibility criteria.

In sex-stratified, multivariable models, internalized and enacted HIV-related stigma were associated with problem drinking among both men and non-pregnant women. Further research is needed to understand the relationship between experiencing internalized or enacted HIV-related stigma and problem drinking. Literature investigating the relationship between HIV-related stigma and alcohol use among PLWH

**Table 3** Distribution of psychosocial factors and alcohol use among adults enrolling in HIV care and not known to be eligible for ART in Tanzania

| | Non-pregnant women (n=483) | | | | | Men (n=329) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Alcohol Abstinence (n=328) | Low-risk drinking (n=109) | Problem drinking (n=46) | $\chi^2$ | p-value | Alcohol Abstinence (n=176) | Low-risk drinking (n=95) | Problem drinking (n=58) | $\chi^2$ | p-value |
| Have someone who can help financially with health care | | | | 1.6250 | 0.4437 | | | | 4.4803 | 0.1064 |
| Yes | 143 (43.9) | 53 (48.6) | 17 (37.8) | | | 66 (38.2) | 44 (46.3) | 17 (29.3) | | |
| No/don't know | 183 (56.1) | 56 (51.4) | 28 (62.2) | | | 107 (61.9) | 51 (53.7) | 41 (70.7) | | |
| Missing | 2 | 0 | 1 | | | 3 | 0 | 0 | | |
| Have someone to turn to for advice/encouragement when disappointed/confused | | | | 2.6506 | 0.2657 | | | | 2.7840 | 0.2486 |
| Yes | 274 (84.3) | 90 (83.3) | 41 (93.2) | | | 142 (82.6) | 85 (89.5) | 47 (81.0) | | |
| No/don't know | 51 (15.7) | 18 (16.7) | 3 (6.8) | | | 30 (17.4) | 10 (10.5) | 11 (19.0) | | |
| Missing | 3 | 1 | 2 | | | 4 | 0 | 0 | | |
| Enacted stigma | | | | 13.6471 | 0.0011 | | | | 5.8581 | 0.0534 |
| Yes | 37 (12.0) | 20 (20.8) | 12 (33.3) | | | 16 (9.6) | 6 (6.9) | 10 (19.6) | | |
| No | 272 (88.0) | 76 (79.2) | 24 (66.7) | | | 151 (90.4) | 81 (93.1) | 41 (80.4) | | |
| Missing | 19 | 13 | 10 | | | 9 | 8 | 7 | | |
| Internalized stigma | | | | 41.6635 | <0.0001 | | | | 33.0035 | <0.0001 |
| None | 203 (62.1) | 43 (39.8) | 16 (35.6) | | | 108 (63.2) | 41 (43.2) | 26 (44.8) | | |
| Low | 90 (27.5) | 50 (46.3) | 12 (26.7) | | | 51 (29.8) | 49 (51.6) | 17 (29.3) | | |
| Medium/High | 34 (10.4) | 15 (13.9) | 17 (37.8) | | | 12 (7.0) | 5 (5.3) | 15 (25.9) | | |
| Missing | 1 | 1 | 1 | | | 5 | 0 | 0 | | |
| Lifetime sexual violence | | | | 15.2074 | 0.0005 | | | | 5.5937 | 0.0610 |
| No | 314 (96.0) | 97 (89.0) | 38 (82.6) | | | 172 (98.3) | 88 (92.6) | 56 (96.6) | | |
| Yes | 13 (4.0) | 12 (11.0) | 8 (17.4) | | | 3 (1.7) | 7 (7.4) | 2 (3.5) | | |
| Missing | 1 | 0 | 0 | | | 1 | 0 | 0 | | |
| Lifetime physical violence | | | | 16.6713 | 0.0002 | | | | 9.91296 | 0.0104 |
| No | 265 (80.8) | 75 (68.8) | 26 (56.5) | | | 167 (94.9) | 83 (87.4) | 48 (82.8) | | |
| Yes | 63 (19.2) | 34 (31.2) | 20 (43.5) | | | 9 (5.1) | 12 (12.6) | 10 (17.2) | | |

**Table 4** Sex-stratified bivariate and multivariable models of psychosocial factors and problem drinking among adults enrolling in HIV care and not known to be eligible for ART in Tanzania[a]

| | Non-pregnant Women (n = 483) | | | Males (n = 329) | | |
|---|---|---|---|---|---|---|
| | Bivariate OR (95% CI) | Multivariable[b] aOR (95% CI) | Multivariable[c] aOR (95% CI) | Bivariate OR (95% CI) | Multivariable[b] aOR (95% CI) | Multivariable[c] aOR (95% CI) |
| Financial support | | | | | | |
| Yes | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| No | 1.42 (0.74, 2.76) | 1.34 (0.65, 2.80) | 1.26 (0.65, 2.43) | 1.68 (0.59, 4.78) | 1.48 (0.73, 2.98) | 1.44 (0.73, 2.84) |
| Emotional support | | | | | | |
| Yes | – | – | – | 1.0 | 1.0 | 1.0 |
| No | – | – | – | 1.33 (0.48, 3.64) | 1.40 (0.61, 3.24) | 1.16 (0.52, 2.59) |
| Enacted HIV-related stigma | | | | | | |
| No | 1.0 | 1.0 | – | 1.0 | 1.0 | – |
| Yes | 2.94 (1.31, 6.60) | 2.53 (1.10, 5.86) | – | 2.57 (1.05, 6.29) | 2.56 (1.04, 6.29) | – |
| Internalized HIV-related stigma | | | | | | |
| None | 1.0 | – | 1.0 | 1.0 | – | 1.0 |
| Low | 1.25 (0.30, 5.21) | – | 1.06 (0.49, 2.26) | 0.97 (0.41, 2.29) | – | 1.12 (0.56, 2.23) |
| Medium/high | 4.94 (1.57, 15.58) | | 3.61 (1.63, 7.99) | 5.06 (3.00, 8.52) | | 4.73 (2.02, 11.10) |
| Physical violence | | | | | | |
| No | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Yes | 2.8 (0.77, 10.27) | 1.63 (0.72, 3.67) | 1.88 (0.96, 3.66) | 2.48 (1.09, 5.65) | 1.34 (0.49, 3.68) | 1.91 (0.81, 4.47) |
| Sexual violence | | | | | | |
| No | 1.0 | 1.0 | 1.0 | – | – | – |
| Yes | 3.46 (1.45, 8.24) | 2.09 (0.68, 6.44) | 2.08 (0.72, 6.03) | – | – | – |

[a]Multivariable models are adjusted for age, relationship status, employment status, time away from home, and time from first HIV+ diagnosis to study interview

[b]Model includes enacted HIV-related stigma, but not internalized HIV-related stigma

[c]Model includes internalized HIV-related stigma, but not enacted HIV-related stigma

remains limited. A study of PLWH in Russia found a positive relationship between stigma and alcohol dependence [30] while, in contrast, a study of PLWH in South Africa did not find a significant relationship between HIV-related stigma and alcohol use [15]. The relationship between problem drinking and internalized HIV-related stigma identified in the current study remains unclear. For some PLWH, problem drinking may serve as a coping strategy to manage the stigma associated with living with HIV [31–33]. In this way, it is possible that PLWH engage in problem drinking to manage the consequences of HIV-related stigma [31, 33]. It is also possible that PLWH who misuse alcohol have fewer psychosocial strategies or coping mechanisms to manage HIV-related stigma and are, thus, more likely to internalize HIV-related stigma that they experience [31]. Problem drinking may also function as a means to cope with experiences of enacted HIV-stigma [31, 33]. Alternatively, if problem drinking is also stigmatized, PLWH who report problem drinking may experience enacted stigma from multiple sources (both HIV-related and drinking-related stigma) which are likely difficult to disentangle and may have a synergistically detrimental effect [31, 33]. It is also possible that

problem drinking could inadvertently lead to disclosure of one's HIV status, thus, increasing opportunities for experiences of enacted HIV-related stigma.

It is also important to consider that problem drinking and HIV-related stigma may not be causally linked. Rather, they may co-occur as part of a larger syndemic among PLWH or among particular vulnerable populations of PLWH [34]. Further, the timing of problem drinking in relation to HIV acquisition or diagnosis is unknown among this study population. It is possible that problem drinking among this study population began prior to HIV acquisition or diagnosis. In this way, problem drinking may be a continuation of previous behavior and not a coping mechanism to manage stigma. Additional research is needed to more fully understand the relationship between HIV-related stigma and problem drinking. Such research should strive to advance understanding of the roles of multiple, intersecting forms of stigma that PLWH may experience. Longitudinal research which examines problem drinking, HIV acquisition, and HIV-related stigma are needed. Alcohol harm reduction interventions with PLWH should consider incorporating stigma-reduction components.

Sexual and physical violence were significantly associated with greater odds of problem drinking in bivariate, but not multivariable models. More specifically, in unadjusted analyses, sexual violence was associated with greater odds of problem drinking among non-pregnant women while physical violence was associated with greater odds of problem drinking among men. Previous work has found a relationship between sexual violence and alcohol misuse among women [35, 36]. Similar to the relationship between stigma and alcohol misuse, the nature of the relationship between sexual violence and alcohol misuse remains unclear. It is possible that alcohol use and problem drinking serve as coping mechanisms to manage the trauma of sexual violence [37, 38]. It is also possible that women who engage in problem drinking are at heightened risk of sexual violence due to impaired judgment and reasoning or increased risk taking that can result from problem drinking. Previous longitudinal studies have supported pathways leading from violence to subsequent alcohol use as well as pathways from alcohol use to subsequent violence [36]. Similarly, both sexual violence and problem drinking can increase women's risk of HIV infection [3, 39–42]. While research into violence victimization and problem drinking among men is relatively limited, previous research has found that, among men, physical intimate partner violence was significantly associated with greater alcohol use [43, 44]. Interrelationships between sexual violence, problem drinking, and HIV acquisition warrant further exploration.

Emotional or financial support was not associated with problem drinking in bivariate and multivariable models, where tested. Little is known about the relationship between emotional or financial support and problem drinking among PLWH. A study of people seeking HIV testing in India found no relationship between social support and alcohol use disorders [45]. Similarly, bivariate analyses with PLWH in Russia found that social support was not associated with unhealthy alcohol use [30]. More research into the relationship between social support and alcohol use among PLWH is needed.

While not the primary focus of this study, it is worth noting that food insufficiency was more commonly reported among those who reported problem drinking compared to those who reported low-risk drinking or abstaining from alcohol. Previous research into the relationship between food insufficiency and alcohol use remains equivocal. A study of PLWH in the United States found that higher level of food insecurity was significantly associated with higher likelihood of substance use [46]. However, a study of PLWH in Uganda and Russia did not find an association between heavy alcohol use and food insecurity [47]. A study of individuals with and without HIV in South Africa found that food insecurity was significantly associated with alcohol intake frequency and heavy episodic drinking among women, but not among

men [48]. The relationship between food insufficiency and alcohol use in the current study persisted when examined separately among non-pregnant women and men (data not shown). It is possible that problem drinking diverts financial resources away from food and towards alcohol leading to greater food insecurity among this population. Problem drinking may also create challenges to stable employment resulting in greater financial hardship and food insecurity. Additional exploration into the intersection of food insecurity and alcohol use among PLWH is warranted.

Having been away from home was also associated with alcohol consumption among study participants. More specifically, those who reported problem drinking also reported higher prevalence of having been away from home for more than one month in the past year. The context in which current study participants were away from home is unknown. Geographic mobility and labor migration have been previously associated with alcohol use and HIV sexual risk behavior [49, 50]. A study of adults in rural Zimbabwe found that the more months that study participants spent away from home the more likely they were to drink alcohol [24]. However, the frequency or quantity of use was not associated with months away from home [24]. The relationship between alcohol use and time away from home among PLWH should be examined further.

Problem drinking was also associated with higher CD4 count at enrollment into care. Some previous studies have found that heavy alcohol use was associated with lower CD4 cell count and accelerated HIV disease progression [6, 51]. However, other studies have not found such an association [52, 53]. Current findings may be informed by the fact that our sample was limited to PLWH newly enrolling in HIV care. It is possible that individuals with more advanced HIV and lower CD4 counts had already reduced their alcohol consumption as a result of compromised health. Longitudinal research is needed to more fully understand the relationship between problem drinking and HIV disease progression throughout the HIV care cascade. In particular, the extent to which problem drinking among PLWH precedes HIV diagnosis should be examined as such information can inform substance use treatment needs and strategies implemented with this population and in HIV care settings.

This work has limitations worth noting. All data were based on self-report and are subject to social desirability bias. Such bias would likely lead to underestimation of stigmatizing behaviors such as problem drinking and make true associations between problem drinking and psychosocial factors harder to detect. Further, due to the cross-sectional design, temporality of most observed associations cannot be established. Participants were recruited from four HIV clinics in Tanzania and may not be generalizable to PLWH in other parts of Tanzania or sub-Saharan Africa. Participants were also newly enrolling into care and not known

to be eligible to initiate ART at the time of data collection. In addition, study site was significantly associated with problem drinking. More research is needed to understand to what extent problem drinking differs throughout geographic regions of Tanzania.

In conclusion, problem drinking among PLWH newly enrolling into care in Tanzania was associated with internalized and enacted HIV-related stigma. Longitudinal studies are needed to elucidate the nature of interrelationships between HIV-related stigma, violence, and problem drinking, including whether such relationships are causal. Given the known relationship between problem drinking and suboptimal HIV treatment outcomes, screening and management of alcohol use disorders should be integrated into HIV care and should be adapted to address HIV-related stigma.

## Compliance with Ethical Standards

**Conflict of interest** The authors declare they have no conflict of interest.

**Ethical Approval** All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all participants included in the study.

## References

1. Chander G, Himelhoch S, Moore RD. Substance abuse and psychiatric disorders in HIV-positive patients: epidemiology and impact on antiretroviral therapy. Drugs. 2006;66(6):769–89.
2. Brandt R. The mental health of people living with HIV/AIDS in Africa: a systematic review. Afr J AIDS Res. 2009;8(2):123–33.
3. Fisher JC, Bang H, Kapiga SH. The association between HIV infection and alcohol use: a systematic review and meta-analysis of African studies. Sex Trans Dis. 2007;34(11):856–63.
4. Williams EC, Hahn JA, Saitz R, Bryant K, Lira MC, Samet JH. Alcohol use and human immunodeficiency virus (HIV) infection: current knowledge, implications, and future directions. Alcohol Clin Exp Res. 2016;40(10):2056–72.
5. Paolillo EW, Gongvatana A, Umlauf A, Letendre SL, Moore DJ. At-risk alcohol use is associated with antiretroviral treatment nonadherence among adults living with HIV/AIDS. Alcohol Clin Exp Res. 2017;41(8):1518–25.
6. Baum MK, Rafie C, Lai S, Sales S, Page JB, Campa A. Alcohol use accelerates HIV disease progression. AIDS Res Hum Retroviruses. 2010;26(5):511–8.
7. Azar MM, Springer SA, Meyer JP, Altice FL. A systematic review of the impact of alcohol use disorders on HIV treatment outcomes, adherence to antiretroviral therapy and health care utilization. Drug Alcohol Depen. 2010;112(3):178–93.
8. Nash D, Tymejczyk O, Gadisa T, Kulkarni SG, Hoffman S, Yigzaw M, et al. Factors associated with initiation of antiretroviral therapy in the advanced stages of HIV infection in six Ethiopian HIV clinics, 2012 to 2013. J Int AIDS Soc. 2016;19(1):20637.
9. World Health Organization. Global status report on alcohol and health. Geneva: World Health Organization; 2011.
10. Foran HM, O'Leary KD. Alcohol and intimate partner violence: a meta-analytic review. Clin Psychol Rev. 2008;28(7):1222–34.
11. Thompson MP, Kingree JB. The role of alcohol use in intimate partner violence and non-intimate partner violence. Viol Vict. 2004;19(1):63–74.
12. Andersson LMC, Twum-Antwi A, Staland-Nyman C, van Rooyen DR. Prevalence and socioeconomic characteristics of alcohol disorders among men and women in the Eastern Cape Province, South Africa. Health Soc Care Commun. 2017;36:143.
13. Kuntsche E, Kuntsche S, Thrul J, Gmel G. Binge drinking: health impact, prevalence, correlates and interventions. Psychol Health. 2017;32(8):976–1017.
14. Langdon KJ, Rubin A, Brief DJ, Enggasser JL, Roy M, Solhan M, et al. Sexual traumatic event exposure, posttraumatic stress symptomatology, and alcohol misuse among women: a critical review of the empirical literature. Clin Psychol. 2017;24(1):5–22.
15. Veld DHI, Pengpid S, Colebunders R, Skaal L, Peltzer K. High-risk alcohol use and associated socio-demographic, health and psychosocial factors in patients with HIV infection in three primary health care clinics in South Africa. Int J STD AIDS. 2017;28(7):651–9.
16. Brittain K, Remien RH, Phillips T, Zerbe A, Abrams EJ, Myer L, et al. Factors associated with alcohol use prior to and during pregnancy among HIV-infected pregnant women in Cape Town, South Africa. Drug Alcohol Depen. 2017;173:69–77.
17. UNAIDS. United Republic of Tanzania, Global AIDS Response Country Progress Report. 2014.
18. Ewing JA. Detecting alcoholism. The CAGE questionnaire. JAMA. 1984;252(14):1905–7.
19. Claassen JN. The benefits of the CAGE as a screening tool for alcoholism in a closed rural South African community. S Afr Med J. 1999;89(9):976–9.
20. Samet JH, Phillips SJ, Horton NJ, Traphagen ET, Freedberg KA. Detecting alcohol problems in HIV-infected patients: use of the CAGE questionnaire. AIDS Res Human Retroviruses. 2004;20(2):151–5.
21. Dhalla S, Kopec JA. The CAGE questionnaire for alcohol misuse: a review of reliability and validity studies. Clin Invest Med. 2007;30(1):33–41.
22. Magni S, Christofides N, Johnson S, Weiner R. Alcohol use and transactional sex among women in South Africa: results from a nationally representative survey. PLoS ONE. 2015;10(12):e0145326.
23. Holzemer WL, Uys LR, Chirwa ML, Greeff M, Makoae LN, Kohi TW, et al. Validation of the HIV/AIDS stigma instrument—PLWA (HASI-P). AIDS Care. 2007;19(8):1002–12.
24. Cubbins LA, Kasprzyk D, Montano D, Jordan LP, Woelk G. Alcohol use and abuse among rural Zimbabwean adults: a test of a community-level intervention. Drug Alcohol Depen. 2012;124(3):333–9.

25. O'Connell R, Chishinga N, Kinyanda E, Patel V, Ayles H, Weiss HA, et al. Prevalence and correlates of alcohol dependence disorder among TB and HIV infected patients in Zambia. PLoS ONE. 2013;8(9):e74406.

26. Mongi AS, Baisley K, Ao TT, Chilongani J, Aguirre-Andreasen A, Francis SC, et al. Factors associated with problem drinking among women employed in food and recreational facilities in northern Tanzania. PLoS ONE. 2013;8(12):e84447.

27. World Health Organization. Alcohol consumption: levels and patterns. Geneva: World Health Organization; 2014.

28. Mwiru RS, Nagu TJ, Kaduri P, Fawzi W, Mugusi F. Prevalence and factors associated with alcohol drinking among HIV and tuberculosis co-infected patients in Dar es Salaam, Tanzania. AIDS Care. 2017;30:173–7.

29. Medley A, Seth P, Pathak S, Howard AA, DeLuca N, Matiko E, et al. Alcohol use and its association with HIV risk behaviors among a cohort of patients attending HIV clinical care in Tanzania, Kenya, and Namibia. AIDS Care. 2014;26(10):1288–97.

30. Lunze K, Lioznov D, Cheng DM, Nikitin RV, Coleman SM, Bridden C, et al. HIV stigma and unhealthy alcohol use among people living with HIV in Russia. AIDS Behav. 2017;21:2609–17.

31. Wardell JD, Shuper PA, Rourke SB, Hendershot CS. Stigma, coping, and alcohol use severity among people living with HIV: a prospective analysis of bidirectional and mediated associations. Ann Behav Med. 2018;52(9):762–72.

32. Lewis RJ, Winstead BA, Mason TB, Lau-Barraco C. Social factors linking stigma-related stress with alcohol use among lesbians. J Soc Issues. 2017;73(3):545–62.

33. Peacock E, Andrinopoulos K, Hembling J. Binge drinking among men who have sex with men and transgender women in San Salvador: correlates and sexual health implications. J Urban Health. 2015;92(4):701–16.

34. Pitpitan EV, Kalichman SC, Eaton LA, Cain D, Sikkema KJ, Watt MH, et al. Co-occurring psychosocial problems and HIV risk among women attending drinking venues in a South African township: a syndemic approach. Ann Behav Med. 2013;45(2):153–62.

35. World Health Organization. World report on violence and health. Geneva: World Health Organization; 2002.

36. Devries KM, Child JC, Bacchus LJ, Mak J, Falder G, Graham K, et al. Intimate partner violence victimization and alcohol consumption in women: a systematic review and meta-analysis. Addiction. 2014;109(3):379–91.

37. Illangasekare S, Burke J, Chander G, Gielen A. The syndemic effects of intimate partner violence, HIV/AIDS, and substance abuse on depression among low-income urban women. J Urban Health. 2013;90(5):934–47.

38. Gilbert L, Raj A, Hien D, Stockman J, Terlikbayeva A, Wyatt G. Targeting the SAVA (substance abuse, violence, and AIDS) syndemic among women and girls: a global review of epidemiology and integrated interventions. J Acquir Immune Defic Syndr. 2015;69(Suppl 2):S118–27.

39. Campbell JC, Baty ML, Ghandour RM, Stockman JK, Francisco L, Wagman J. The intersection of intimate partner violence against women and HIV/AIDS: a review. Int J Inj Control Saf Promot. 2008;15(4):221–31.

40. Wingood GM, DiClemente RJ, Raj A. Adverse consequences of intimate partner abuse among women in non-urban domestic violence shelters. Am J Prev Med. 2000;19(4):270–5.

41. Liebschutz JM, Feinman G, Sullivan L, Stein M, Samet J. Physical and sexual abuse in women infected with the human immunodeficiency virus: increased illness and health care utilization. Arch Intern Med. 2000;160(11):1659–64.

42. Pithey A, Parry C. Descriptive systematic review of Sub-Saharan African studies on the association between alcohol use and HIV infection. SAHARA J. 2009;6(4):155–69.

43. Coker AL, Davis KE, Arias I, Desai S, Sanderson M, Brandt HM, et al. Physical and mental health effects of intimate partner violence for men and women. Am J Prev Med. 2002;23(4):260–8.

44. Davis A, Kaighobadi F, Stephenson R, Rael C, Sandfort T. Associations between alcohol use and intimate partner violence among men who have sex with men. LGBT Health. 2016;3(6):400–6.

45. Mayston R, Patel V, Abas M, Korgaonkar P, Paranjape R, Rodrigues S, et al. Determinants of common mental disorder, alcohol use disorder and cognitive morbidity among people coming for HIV testing in Goa, India. Trop Med Int Health. 2015;20(3):397–406.

46. Pellowski JA, Huedo-Medina TB, Kalichman SC. Food insecurity, substance use, and sexual transmission risk behavior among people living with HIV: a daily level analysis. Arch Sex Behav. 2018;47(7):1899–907.

47. Patts GJ, Cheng DM, Emenyonu N, Bridden C, Gnatienko N, Lloyd-Travaglini CA, et al. Alcohol use and food insecurity among people living with HIV in Mbarara, Uganda and St. Petersburg, Russia. AIDS Behav. 2017;21(3):724–33.

48. Eaton LA, Cain DN, Pitpitan EV, Carey KB, Carey MP, Mehlomakulu V, et al. Exploring the relationships among food insecurity, alcohol use, and sexual risk taking among men and women living in South African townships. J Prim Prev. 2014;35(4):255–65.

49. Thapa S, Bista N, Hannes K, Buve A, Vermandere M, Mathei C. Vulnerability of wives of Nepalese labor migrants to HIV infection: integrating quantitative and qualitative evidence. Women Health. 2016;56(7):745–66.

50. Schuyler AC, Edelstein ZR, Mathur S, Sekasanvu J, Nalugoda F, Gray R, et al. Mobility among youth in Rakai, Uganda: trends, characteristics, and associations with behavioural risk factors for HIV. Global Pub Health. 2017;12(8):1033–50.

51. Malbergier A, Amaral RA, Cardoso LD. Alcohol dependence and CD4 cell count: is there a relationship? AIDS Care. 2015;27(1):54–8.

52. Hahn JA, Cheng DM, Emenyonu NI, Lloyd-Travaglini C, Fatch R, Shade SB, et al. Alcohol use and HIV disease progression in an antiretroviral naive cohort. J Acquir Immune Defic Syndr. 2018;77(5):492–501.

53. Conen A, Fehr J, Glass TR, Furrer H, Weber R, Vernazza P, et al. Self-reported alcohol consumption and its association with adherence and outcome of antiretroviral therapy in the Swiss HIV Cohort Study. Antiviral Ther. 2009;14(3):349–57.