

UCLA

UCLA Previously Published Works

Title

Alcohol Use, HIV Treatment Adherence, and Sexual Risk Among People with a History of Injecting Drug Use in Vietnam

Permalink

<https://escholarship.org/uc/item/5cq8q86t>

Journal

AIDS and Behavior, 21(Suppl 2)

ISSN

1090-7165

Authors

Li, Li
Luo, Sitong
Lan, Chiao-Wen
[et al.](#)

Publication Date

2017-11-01

DOI

10.1007/s10461-017-1860-0

Peer reviewed



HHS Public Access

Author manuscript

AIDS Behav. Author manuscript; available in PMC 2017 November 01.

Published in final edited form as:

AIDS Behav. 2017 November ; 21(Suppl 2): 167–173. doi:10.1007/s10461-017-1860-0.

Alcohol Use, HIV Treatment Adherence, and Sexual Risk Among People with a History of Injecting Drug Use in Vietnam

Li Li¹, Sitong Luo¹, Chiao-Wen Lan¹, Chunqing Lin¹, Le Anh Tuan², Nan Feng¹, and Nguyen Anh Tuan²

¹Semel Institute for Neuroscience and Human Behavior, University of California, 10920 Wilshire Blvd., Suite 350, Los Angeles, CA 90024, USA

²National Institute of Hygiene and Epidemiology, Hanoi, Vietnam

Abstract

Alcohol use can limit the effectiveness of antiretroviral therapy (ART) for people living with HIV (PLH) who have a history of injecting drug use. This study described the patterns of alcohol use among PLH with a history of injecting drug use in Vietnam and examined the relationships between alcohol use, adherence to ART, and sexual risks. We utilized cross-sectional data of 109 PLH on ART collected from a randomized controlled intervention trial in Vietnam. Approximately 30 and 46% of the participants were frequent and occasional drinkers, respectively. Frequent drinkers reported the highest number of missed medication days. About 61% of frequent drinkers reported having sex using alcohol. Additionally, 23, 34, and 24% of nondrinkers, occasional drinkers, and frequent drinkers, respectively, reported inconsistent condom use during sex. Future intervention programs should address the issues of alcohol use and sexual risks to maximize the effectiveness of HIV treatment programs in Vietnam.

Keywords

Alcohol; HIV; Treatment adherence; Sexual behavior; Vietnam

Introduction

Alcohol use has been widely recognized as a significant contributor to illness and injury, accounting for a substantial proportion of the global burden of disease [1, 2]. People living with HIV (PLH) often report high levels of alcohol consumption and alcohol use disorders [3, 4]. However, previous studies have shown that alcohol use might present a unique risk to PLH and could result in faster disease progression, higher potentiation of comorbid conditions, and increased HIV-related morbidity and mortality [5–8]. Furthermore, alcohol use can influence HIV viral replication, exacerbate immunosuppression, and induce liver

Compliance with Ethical Standards

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

Ethical Approval All procedures performed in studies 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.

fibrosis [9–11]. Additionally, compared with HIV-negative individuals, PLH may be more susceptible to alcohol-related harms such as alcohol intoxication, alcohol-related death, and physiological injury, even with a low level of alcohol use [3, 9].

Alcohol use has been considered a prominent risk factor in the transmission of HIV, as it can impair individual's sexual decision making, reduce the use of a condom, and weaken immune systems [12, 13]. A prior study reported that drinkers had a 57% greater chance of being HIV positive compared to nondrinkers [14]. Alcohol use among people with a history of injecting drug use has been associated with sexual risk behaviors, including using condoms inconsistently and having multiple sex partners [15, 16]. Similarly, alcohol use was found to be associated with unprotected sex among PLH [17, 18]. For PLH who have a history of injecting drug use, alcohol use may also increase needle-sharing behaviors [19]; however, studies on this topic have reported conflicting results [20–22]. A meta-analysis found that alcohol use before or during discrete sexual encounters was not correlated with condom use [23].

In addition to the risks that alcohol itself poses to PLH, those who drink alcohol experience frequent interruptions to antiretroviral therapy (ART), an increased occurrence of adverse medical events due to ART, and an impaired response to treatment [9, 24, 25]. Specifically, alcohol use has been shown to be a strong risk factor for poor ART adherence, with estimated odds ratios ranging from 1.7 to 4.7 [9, 26–28]. The need to maintain a high level of adherence to ART has remained a challenge to achieve maximal treatment benefits [29, 30]. The fear of mixing alcohol with ART which could result in antiretroviral toxicity can lead to treatment interruptions in PLH [31]. The relationship between alcohol use and ART has attracted increased attention in recent years [32]; however, the findings related to the effects of alcohol consumption on ART outcomes have been mixed. Several studies have shown that alcohol consumption does not affect HIV treatment or survival outcomes, including CD4 count and viral suppression [33–35].

There are approximately 256,000 PLH in Vietnam, where the epidemic has been largely driven by injecting drug use [36]. Vietnam is among the few countries in the world with the highest increasing rates of alcohol consumption [37]. By the end of 2013, ART coverage in Vietnam had reached 68%, with a 12-month treatment retention rate of 85% [36]. PLH with a history of injecting drug use have been found to be more likely to be heavy drinkers [38, 39], to have a lower uptake of ART, and to engage in more sexual risk behaviors than the general population [22, 40]. Therefore, there is an urgent need to examine the associations between alcohol use, HIV treatment adherence, and sexual risk in this population. The objective of this study was to describe the patterns of alcohol use and examine the associations of alcohol use with ART adherence and sexual risk among PLH in Vietnam who have a history of injecting drug use and are currently on ART.

Method

Study Design and Participant Recruitment

This study used baseline data from a randomized controlled intervention trial for people with a history of injecting drug use in Vietnam. The trial was conducted in two provinces, Vinh

Phúc and Phú Thọ, in northern Vietnam. The baseline assessment was conducted from October 2014 to February 2015. There were 60 communes selected from the two provinces. We recruited study participants at the commune health centers where individuals with a history of injecting drug use typically seek health services [41]. Health care providers at the centers verbally introduced the project to potential participants and showed them a printed flyer. Trained recruiters met individually with prospective participants to screen them for eligibility. The inclusion criteria of the intervention trial were as follows: (1) being at least 18 years old; (2) reporting a history of injecting drug use; (3) being a resident of one of the selected communes; (4) providing informed consent. At baseline, 900 people with a history of drug use were recruited, 146 of whom were HIV positive and 109 were receiving ART at the time of the study. Thus, 109 PLH on ART were included in this study. The study obtained ethical approval from the participating institutional review boards (IRBs) in the United States and Vietnam.

Data Collection

After providing informed consent, the participants completed the assessment individually using Audio Computer-Assisted Self-Interview (ACASI), which allowed the participants to listen to prerecorded survey questions through headphones and privately answer sensitive personal questions on a computer using a keypad. An interviewer was available to provide clarifications of the survey questions and assistance with ACASI. We conducted the assessment in a private room at the local health centers. Each assessment took approximately 45 min, and each participant received 80,000 ðng (4 U.S. dollars) for their participation. The refusal rate of participation was less than 5%.

Measures

Alcohol Use—The participants were asked currently how often they drink alcohol, including beer, red wine, white wine, and other alcoholic beverages. The responses were divided into six categories (1 = almost daily; 2 = 3–4 times a week; 3 = 1–2 times a week; 4 = 1–2 times a month; 5 = no more than once a month; 6 = never). For the analyses, the alcohol use patterns were categorized into three groups (0 = non-drinker; 1 = occasional drinker; 2 = frequent drinker). Participants were defined as “nondrinkers” if they reported never drinking alcohol, “occasional drinkers” if they reported using alcohol no more than once or 1–2 times a month, and “frequent drinkers” if they consumed alcohol 1–4 times a week or almost daily.

ART Adherence—The participants were asked how long they had been receiving ART and the number of times that they had missed taking their ART medication in the past 30 days. Additionally, we used the Antiretroviral General Adherence Scale (AGAS) to describe how people felt about and adhered to their ART regimen in the past 30 days [42]. The participants were asked to rate the frequency with which they experienced each of the five items on a 5-point scale (1 = none of the time; 2 = a little of the time; 3 = some of the time; 4 = most of the time; 5 = all of the time). Four items from the original 5-item scale were included in the current study based on internal consistency, including “I found it easy to take my ART medications as my health care provider advised” and “I took my medicines exactly as my health care providers advised”. Scores on the four items were summed to create an

overall measure of general ART adherence that ranged from 4 to 20, with a higher score reflecting better adherence. The internal consistency (Cronbach's alpha) of the adapted AGAS in this sample was 0.92.

Sexual Risk—Sexual risk was assessed via two categorical indicators: sex after alcohol use and condom use in the past 6 months. The participants were asked to report whether they had had sex after using alcohol (0 = no; 1 = yes). They also reported on their use of condoms during sex in the past six months with different types of partners: (1) regular, (2) casual, and (3) commercial sex partners. Participants who reported that they had not used condoms with any type of sexual partners were considered to have inconsistent condom use, whereas participants who reported that they had not had sex or had always used condoms with all sexual partners were categorized as having consistent condom use/no sex.

Demographic and background characteristics were also collected, including gender, age, education, marital status, annual family income, and year of HIV diagnosis.

Data Analysis

First, the distributions of demographic and background variables were described for all 109 participants and by patterns of alcohol use. Second, self-reported days of missing ART and adapted AGAS scores were calculated according to patterns of alcohol use. Third, the sexual risk indicators, including sex after alcohol use and consistent condom use, were summarized by patterns of alcohol use. Finally, Fisher's exact test and analysis of variance (ANOVA) were performed to determine whether there were significant differences in the variables above between participants with different patterns of alcohol use. The statistical analyses were conducted using SAS software version 9.4 (Cary, NC).

Results

The demographic and background characteristics of the sample by patterns of alcohol use are summarized in Table 1. The mean age of all 109 participants was 39.4 years, with more than half ($n = 61$; 56.0%) of them aged between 36 and 45 years old. Males accounted for the majority of the sample ($n = 98$; 89.9%). Approximately half ($n = 57$; 52.3%) of the participants reported 10 or more years of education, and the majority ($n = 79$; 72.5%) were married or living with a partner. The average annual family income was approximately 2103 U.S. dollars, with nearly a fifth ($n = 21$; 19.3%) of the participants reporting household incomes less than 1000 U.S. dollars. About forty percent of the sample ($n = 44$; 42.7%) were diagnosed with HIV between 2006 and 2010. The average duration of ART was 4.5 years, with 39.8% ($n = 43$) of the participants having received more than five years of treatment. Non-drinkers, occasional drinkers, and frequent drinkers accounted for 23.9% ($n = 26$), 45.8% ($n = 50$), and 30.3% ($n = 33$) of the sample, respectively. No significant differences were observed in the associations between participant background characteristics and patterns of alcohol use, except that males were more likely to be frequent drinkers and occasional drinkers than females (Fisher's exact test p value = 0.0019).

Table 2 shows the results of ART adherence and sexual risk by patterns of alcohol use. First, a significant difference in self-reported days of missed ART in the past 30 days was

observed between participants with different patterns of alcohol use. Missing at least one day of ART was more common (Fisher's exact test p value = 0.0014) among frequent drinkers ($n = 7$; 21.2%) than nondrinkers ($n = 2$; 7.7%) and occasional drinkers ($n = 0$; 0%). The average AGAS score was 18.0 (standard deviation (SD) = 2.1), 17.8 (SD = 2.0), and 17.1 (SD = 2.7) for nondrinkers, occasional drinkers, and frequent drinkers, respectively, with no significant differences by pattern of alcohol use ($F = 1.18$; $p = 0.3105$). For sexual risk, 49.0% ($n = 24$) of occasional drinkers and 60.6% ($n = 20$) of frequent drinkers reported having had sex after alcohol use, without significant differences (Fisher's exact test p value = 0.4820). Approximately 23.1% ($n = 6$) of nondrinkers, 34.0% ($n = 17$) of occasional drinkers, and 24.2% ($n = 8$) of frequent drinkers reported inconsistent condom use when having sex with regular/casual/commercial partners in the past 6 months, but these differences were not statistically significant (Fisher's exact test p value = 0.5598).

Discussion

This study found that approximately a third of the PLH with a history of injecting drug use who were currently on ART frequently drank alcohol (at least once a week), and most of the drinkers were males. This finding is consistent with previous studies conducted in Vietnam [39, 43]. Alcohol use is culturally acceptable in Southeast Asia, where the prevalence of alcohol use disorders is the highest in the world and males attribute much greater than females [44]. Additionally, the prevalence of problematic alcohol use is much higher in at-risk populations, such as drug users and sex workers, than in the general population [45]. These factors may have contributed to the finding that many people in Vietnam with a history of injecting drug use continue to drink alcohol even after being diagnosed with HIV and initiating ART [39]. Alternatively, this finding could be explained by the theory of entitlement, which has previously been used to understand the illicit drug use problem in people with disabilities [40]. Similar to how people with disabilities may feel societally "entitled" to using drugs because of their disabilities, PLH with a history of injecting drug use may be more inclined to believe that they are entitled to use alcohol due to their HIV status and drug use problems [46, 47]. Evidence suggests that alcohol consumption can adversely affect biological HIV treatment outcomes, leading to lower CD4 cell counts and higher HIV RNA viral loads [48]. Our findings suggest that alcohol reduction interventions should be incorporated into HIV treatment programs and should target PLH with a history of injecting drug use.

Another important finding in this study was that frequent alcohol drinkers appeared to have poorer ART adherence than nondrinkers and occasional drinkers. This finding contributes to the debate regarding whether alcohol has an influence on HIV treatment. Previous studies have discussed possible mechanisms of how alcohol use could negatively affect HIV treatment adherence [9, 31]. One of the hypotheses was that PLH may choose to skip their ART regimens after drinking alcohol for fear of an alcohol-ART interactive toxicity [31, 32]. Another proposed explanation was that problematic alcohol use often co-occurs with psychiatric disorders that can subsequently impair the ability of PLH to take their daily medications [44]. Despite the continued problems with alcohol use among PLH receiving ART in Vietnam, efforts to address these issues in the past decades have been inadequate [43]. Notably, research has shown positive effects of methadone maintenance treatment

(MMT) in reducing the use of both drugs and alcohol and in improving ART adherence among PLH [38, 40]. Thus, scaling up MMT clinics and integrating MMT and alcohol reduction services into HIV treatment programs could be beneficial for improving the HIV care continuum in Vietnam.

This study found that half of the occasional drinkers and frequent drinkers had sex after alcohol use, and at least a third of them did not consistently use condoms. This finding supports previous evidence which showed that a substantial proportion of PLH consumed alcohol and engaged in sexual risk behaviors and that PLH with a history of injecting drug use had more unprotected sex than other subgroups of PLH [17, 39]. Alcohol use is typically associated with social outgoingness, and alcohol consumption is commonly associated with meeting random sexual partners and having unplanned sex [49]. A recent study reported that compared to marijuana, alcohol use was more likely to lead to atypical partner choices or post-sex regret [50]. Given the potential negative effects of alcohol on sexual behaviors, future HIV prevention and harm reduction programs should consider patterns of alcohol use, especially those living with HIV, to increase their awareness of the sexual risks associated with alcohol use and to guide them toward making safer sexual decisions.

Some limitations of this study should be considered when interpreting the results. First, the data were from a cross-sectional study, which limited our ability to draw causal inferences between alcohol use, ART adherence, and sexual risk. Second, as the study participants were exclusively PLH from two provinces in Vietnam and were mostly male, the conclusions may not be generalizable to other groups of PLH with a history of injecting drug use, such as female sex workers. Third, the sample size of this study was relatively small, which might decrease the statistical power and the representativeness of the study. Fourth, the measures used to assess alcohol use in this study did not quantify the volume of alcohol consumption; they only rated the frequency of use.

Conclusions

Working with PLH for safer sexual practice has become increasingly important with the expansion of HIV treatment [51]. Reducing alcohol use should be emphasized in PLH with a history of injecting drug use during the HIV treatment process. In addition, programs aimed at reducing alcohol use could be integrated into current ART care for this population. As PLH typically have regular visits with service providers for treatment and care, routine contacts may create greater opportunities for providers to help PLH identify situations that could lead to sexual risks and to address challenges related to ART and the HIV care continuum.

Acknowledgments

The authors would like to thank the project team members in Vietnam for their contributions to this study.

Funding This study was funded by the National Institute of Health/National Institute on Drug Abuse (Grant Number R01DA033609)

References

1. Rehm J, Baliunas D, Borges GL, et al. The relation between different dimensions of alcohol consumption and burden of disease: an overview. *Addiction*. 2010; 105(5):817–43. [PubMed: 20331573]
2. World Health Organization. [Accessed August 17, 2016] Global status report on alcohol and health. 2014. http://www.who.int/substance_abuse/publications/global_alcohol_report/en/
3. Justice AC, McGinnis KA, Tate JP, et al. Risk of mortality and physiologic injury evident with lower alcohol exposure among HIV infected compared with uninfected men. *Drug Alcohol Depend*. 2016; 161:95–103. [PubMed: 26861883]
4. Savage CL, Sanchez M. Alcohol and substance use disorder screening, brief intervention, and referral to treatment among people living with HIV/AIDS. *J Addict Nurs*. 2016; 27(3):214–7. [PubMed: 27580195]
5. Ghebremichael M, Paintsil E, Ickovics JR, et al. Longitudinal association of alcohol use with HIV disease progression and psychological health of women with HIV. *AIDS Care*. 2009; 21(7):834–41. [PubMed: 20024739]
6. Hahn JA, Samet JH. Alcohol and HIV disease progression: weighing the evidence. *Curr HIV/AIDS Rep*. 2010; 7(4):226–33. [PubMed: 20814765]
7. Kahler CW, Liu T, Cioe PA, et al. Direct and indirect effects of heavy alcohol use on clinical outcomes in a longitudinal study of HIV patients on ART. *AIDS Behav*. 2016; doi: 10.1007/s10461-016-1474-y
8. McGinnis KA, Fiellin DA, Tate JP, et al. Number of drinks to “feel a buzz” by HIV status and viral load in men. *AIDS Behav*. 2016; 20(3):504–11. [PubMed: 26936030]
9. Braithwaite RS, Bryant KJ. Influence of alcohol consumption on adherence to and toxicity of antiretroviral therapy and survival. *Alcohol Res Health*. 2010; 33(3):280–7. [PubMed: 23584069]
10. Lim JK, Tate JP, Fultz SL, et al. Relationship between alcohol use categories and noninvasive markers of advanced hepatic fibrosis in HIV-infected, chronic hepatitis C virus-infected, and uninfected patients. *Clin Infect Dis*. 2014; 58(10):1449–58. [PubMed: 24569533]
11. Sundararajan R, Wyatt MA, Woolf-King S, et al. Qualitative study of changes in alcohol use among HIV-infected adults entering care and treatment for HIV/AIDS in rural southwest Uganda. *AIDS Behav*. 2015; 19(4):732–41. [PubMed: 25323678]
12. Rehm J, Shield KD, Joharchi N, Shuper PA. Alcohol consumption and the intention to engage in unprotected sex: systematic review and meta-analysis of experimental studies. *Addiction*. 2012; 107(1):51–9. [PubMed: 22151318]
13. Shuper PA, Neuman M, Kanteres F, Baliunas D, Joharchi N, Rehm J. Causal considerations on alcohol and HIV/AIDS—a systematic review. *Alcohol Alcohol*. 2010; 45(2):159–66. [PubMed: 20061510]
14. Fisher JC, Bang H, Kapiga SH. The association between HIV infection and alcohol use: a systematic review and meta-analysis of African studies. *Sex Transm Dis*. 2007; 34(11):856–63. [PubMed: 18049422]
15. Chaudhry AA, Botsko M, Weiss L, et al. Participant characteristics and HIV risk behaviors among individuals entering integrated buprenorphine/naloxone and HIV care. *J Acquir Immune Defic Syndr*. 2011; 56(Suppl 1):S14–21. [PubMed: 21317589]
16. Crooks D, Tsui J, Anderson B, Dossabhoy S, Herman D, Lieb-schutz JM, Stein MD. Differential risk factors for HIV drug and sex risk-taking among non-treatment-seeking hospitalized injection drug users. *AIDS Behav*. 2015; 19(3):405–11. [PubMed: 25063229]
17. Scott-Sheldon LA, Walstrom P, Carey KB, Johnson BT, Carey MP. MASH Research Team. Alcohol use and sexual risk behaviors among individuals infected with HIV: a systematic review and meta-analysis 2012 to early 2013. *Curr HIV/AIDS Rep*. 2013; 10(4):314–23. [PubMed: 24078370]
18. Shuper PA, Joharchi N, Irving H, Rehm J. Alcohol as a correlate of unprotected sexual behavior among people living with HIV/AIDS: review and meta-analysis. *AIDS Behav*. 2009; 13(6):1021–36. [PubMed: 19618261]

19. Stein MD, Charuvastra A, Anderson B, Sobota M, Friedmann PD. Alcohol and HIV risk taking among intravenous drug users. *Addict Behav.* 2002; 27(5):727–36. [PubMed: 12201380]
20. Leigh BC, Morrison DM, Hoppe MJ, Beadnell B, Gillmore MR. Retrospective assessment of the association between drinking and condom use. *J Stud Alcohol Drugs.* 2008; 69(5):773–6. [PubMed: 18781253]
21. Metrik J, Caswell AJ, Magill M, Monti PM, Kahler CW. Sexual risk behavior and heavy drinking among weekly marijuana users. *J Stud Alcohol Drugs.* 2016; 77(1):104–12. [PubMed: 26751360]
22. Arasteh K, Des Jarlais DC, Perlis TE. Alcohol and HIV sexual risk behaviors among injection drug users. *Drug Alcohol Depend.* 2008; 95(1–2):54–61. [PubMed: 18242009]
23. Leigh BC. Alcohol and condom use: a meta-analysis of event-level studies. *Sex Transm Dis.* 2002; 29(8):476–82. [PubMed: 12172533]
24. Braithwaite RS, Conigliaro J, Roberts MS, et al. Estimating the impact of alcohol consumption on survival for HIV+ individuals. *AIDS Care.* 2007; 19(4):459–66. [PubMed: 17453583]
25. Chander G, Himelhoch S, Moore RD. Substance abuse and psychiatric disorders in HIV-positive patients. *Drugs.* 2006; 66(6):769–89. [PubMed: 16706551]
26. Cook RL, Sereika SM, Hunt SC, Woodward WC, Erlen JA, Conigliaro J. Problem drinking and medication adherence among persons with HIV infection. *J Gen Intern Med.* 2001; 16(2):83–8. [PubMed: 11251758]
27. Samet JH, Horton NJ, Meli S, Freedberg KA, Palepu A. Alcohol consumption and antiretroviral adherence among HIV-infected persons with alcohol problems. *Alcohol Clin Exp Res.* 2004; 28(4):572–7. [PubMed: 15100608]
28. Tucker JS, Burnam MA, Sherbourne CD, Kung FY, Gifford AL. Substance use and mental health correlates of nonadherence to antiretroviral medications in a sample of patients with human immunodeficiency virus infection. *Am J Med.* 2003; 114(7):573–80. [PubMed: 12753881]
29. Paterson DL, Swindells S, Mohr J, et al. Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Ann Intern Med.* 2000; 133(1):21–30. [PubMed: 10877736]
30. Viswanathan S, Justice AC, Alexander GC, et al. Adherence and HIV RNA suppression in the current era of highly active antiretroviral therapy. *J Acquir Immune Defic Syndr.* 2015; 69(4):493–8. [PubMed: 25886923]
31. Fatch R, Emenyonu NI, Muyindike W, Kekibiina A, Woolf-King S, Hahn JA. Alcohol interactive toxicity beliefs and ART non-adherence among HIV-infected current drinkers in Mbarara. *Uganda AIDS Behav.* 2016; doi: 10.1007/s10461-016-1429-3
32. Pellowski JA, Kalichman SC, Kalichman MO, Cherry C. Alcohol-antiretroviral therapy interactive toxicity beliefs and daily medication adherence and alcohol use among people living with HIV. *AIDS Care.* 2016; 28(8):963–70. [PubMed: 26964014]
33. Conen A, Wang Q, Glass TR, et al. Association of alcohol consumption and HIV surrogate markers in participants of the Swiss HIV Cohort Study. *J Acquir Immune Defic Syndr.* 2013; 64(5):472–8. [PubMed: 23892243]
34. Kowalski S, Colantuoni E, Lau B, et al. Alcohol consumption and CD4 T-cell count response among persons initiating antiretroviral therapy. *J Acquir Immune Defic Syndr.* 2012; 61(4):455–61. [PubMed: 22955054]
35. Wandeler G, Kraus D, Fehr J, et al. The J-Curve in HIV: low and moderate alcohol intake predicts mortality but not the occurrence of major cardiovascular events. *J Acquir Immune Defic Syndr.* 2016; 71(3):302–9. [PubMed: 26444500]
36. National Committee for AIDS, Drugs and Prostitution Prevention and Control. [Accessed 17 Aug 2016] Vietnam AIDS response progress report. http://files.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2014countries/VNM_narrative_report_2014.pdf
37. World Health Organization. [Accessed 19 Sept 2016] Global status report on alcohol and health. 2011. http://www.who.int/substance_abuse/publications/global_alcohol_report/msbgsruprofiles.pdf
38. Tran BX, Ohinmaa A, Duong AT, et al. Changes in drug use are associated with health-related quality of life improvements among methadone maintenance patients with HIV/AIDS. *Qual Life Res.* 2012; 21(4):613–23. [PubMed: 21732198]

39. Tran BX, Nguyen LT, Do CD, Nguyen QL, Maher RM. Associations between alcohol use disorders and adherence to antiretroviral treatment and quality of life amongst people living with HIV/AIDS. *BMC Public Health*. 2014; 14:27. [PubMed: 24411007]
40. Palepu A, Horton NJ, Tibbetts N, Meli S, Samet JH. Uptake and adherence to highly active antiretroviral therapy among HIV-infected people with alcohol and other substance use problems: the impact of substance abuse treatment. *Addiction*. 2004; 99(3):361–8. [PubMed: 14982549]
41. World Health Organization. [Accessed 17 Aug 2016] Good practice in Asia: targeted HIV prevention for injecting drug users and sex workers. www.who.int/hiv/pub/idu/good_practice_aisa_idu.pdf
42. Holstad MM, Foster V, Diiorio C, McCarty F, Teplinskiy I. An examination of the psychometric properties of the Antiretroviral General Adherence Scale (AGAS) in two samples of HIV-infected individuals. *J Assoc Nurses AIDS Care*. 2010; 21(2):162–72. [PubMed: 19804994]
43. Tran BX, Nguyen N, Ohinmaa A, et al. Prevalence and correlates of alcohol use disorders during antiretroviral treatment in injection-driven HIV epidemics in Vietnam. *Drug Alcohol Depend*. 2013; 127(1–3):39–44. [PubMed: 22749565]
44. Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, Patra J. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *Lancet*. 2009; 373(9682):2223–33. [PubMed: 19560604]
45. Fritz K, Morojele N, Kalichman S. Alcohol: the forgotten drug in HIV/AIDS. *Lancet*. 2010; 376(9739):398–400. [PubMed: 20650516]
46. Moore, D. Substance abuse and persons with disabilities: a significant public health problem. American Public Health Association Conference; Atlanta. 1991;
47. Moore D, Li L. Prevalence and risk factors of illicit drug use by people with disabilities. *Am J Addict*. 1998; 7(2):93–102. [PubMed: 9598213]
48. 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 Depend*. 2010; 112(3):178–93. [PubMed: 20705402]
49. Townshend JM, Kambouropoulos N, Griffin A, Hunt FJ, Milani RM. Binge drinking, reflection impulsivity, and unplanned sexual behavior: impaired decision-making in young social drinkers. *Alcohol Clin Exp Res*. 2014; 38(4):1143–50. [PubMed: 24428268]
50. Palamar JJ, Acosta P, Ompad DC, Friedman SR. A qualitative investigation comparing psychosocial and physical sexual experiences related to alcohol and marijuana use among adults. *Arch Sex Behav*. 2016; doi: 10.1007/s10508-016-0782-7
51. Kalichman, SC. Positive prevention: reducing HIV transmission among people living with HIV/AIDS. New York: Springer; 2005.

Table 1

Sample characteristics of people living with HIV by patterns of alcohol use (N = 109)

Characteristics	Total N (%)	Alcohol use, N (%)		<i>p</i> ^a	
		Non-drinker (N = 26)	Occasional drinker (N = 50)		Frequent drinker (N = 33)
Age (years)					
35 or young	32 (29.4)	8 (30.8)	17 (34.0)	7 (21.2)	0.0639
36–45	61 (56.0)	10 (38.4)	29 (58.0)	22 (66.7)	
46 or older	16 (14.6)	8 (30.8)	4 (8.0)	4 (12.1)	
Gender					
Male	98 (89.9)	19 (73.1)	46 (92.0)	33 (100.0)	0.0019
Female	11 (10.1)	7 (26.9)	4 (8.0)	0 (0.0)	
Education (years)					
6 or less	16 (14.7)	4 (15.4)	9 (18.0)	3 (9.1)	0.7110
7–9	36 (33.0)	7 (26.9)	18 (36.0)	11 (33.3)	
10 or more	57 (52.3)	15 (57.7)	23 (46.0)	19 (57.6)	
Marital status					
Single/divorced/widowed	30 (27.5)	7 (26.9)	12 (24.0)	11 (33.3)	0.6766
Married/living with partner	79 (72.5)	19 (73.1)	38 (76.0)	22 (66.7)	
Annual family income (USD)					
1000 or less	21 (19.3)	7 (26.9)	8 (16.0)	6 (18.2)	0.5893
1001–2500	55 (50.5)	14 (53.9)	24 (48.0)	17 (51.5)	
2501 or more	33 (30.3)	5 (19.2)	18 (36.0)	10 (30.3)	
Time of HIV diagnosis					
2005 or early	26 (25.2)	5 (20.0)	10 (21.3)	11 (35.5)	0.3478
2006–2010	44 (42.7)	9 (36.0)	24 (51.1)	11 (35.5)	
2011 or later	33 (32.0)	11 (44.0)	13 (27.7)	9 (29.0)	
Length of ART (years)					
5 or less	65 (60.2)	19 (73.1)	28 (57.1)	18 (54.6)	0.2922
6 or more	43 (39.8)	7 (26.9)	21 (42.9)	15 (45.4)	
ART antiretroviral therapy					

^aThe *p* value was obtained from the Fisher's exact test

Table 2

ART adherence and sexual risk among people living with HIV by patterns of alcohol use (N = 109)

Variables	Non-drinker (N = 26)	Occasional drinker (N = 50)	Frequent drinker (N = 33)	<i>p</i> ^a
<i>ART adherence</i>				
Self-reported missing days on ART, last 30 days, % (N)				
No missing	92.3 (24)	100.0 (50)	78.8 (26)	0.0014
Missed at least one day	7.7 (2)	0.0 (0)	21.2 (7)	
General adherence (AGAS), mean ± SD	18.0 ± 2.1	17.8 ± 2.0	17.1 ± 2.7	0.3105
<i>Sexual risks</i>				
Sex after alcohol use, % (N)				
No	–	51.0 (25)	39.4 (13)	0.4820
Yes	–	49.0 (24)	60.6 (20)	
Condom use, past 6 months, % (N)				
Consistent condom use/no sex	76.9 (20)	66.0 (33)	75.8 (25)	0.5598
Inconsistent condom use	23.1 (6)	34.0 (17)	24.2 (8)	

AGAS Antiretroviral General Adherence Scale

^aThe Fisher's exact test was used for categorical outcomes. The analysis of variance (ANOVA) test was used for continuous outcomes