HHS Public Access

Author manuscript

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

Published in final edited form as:

AIDS Behav. 2016 November ; 20(11): 2692–2699. doi:10.1007/s10461-016-1398-6.

Substance use and adherence among people living with HIV/AIDS receiving cART in Latin America

Raquel B. De Boni[1], **Bryan E. Shepherd**[2], **Beatriz Grinsztejn**[1], **Carina Cesar**[3], **Claudia Cortés**[4], **Denis Padgett**[5], **Eduardo Gotuzzo**[6], **Pablo F. Belaunzarán-Zamudio**[7], **Peter F. Rebeiro**[2], **Stephany N. Duda**[2], **Catherine C. McGowan**[2], and **the Caribbean, Central and South America network for HIV epidemiology (CCASAnet)**

[1]Instituto Nacional de Infectologia Evandro Chagas- FIOCRUZ, Brazil

[2]Vanderbilt University, USA

[3]Fundación Huésped, Argentina

[4]Fundación Arriaran, Chile

[5]Instituto Hondureno de Seguridad Social and Hospital Escuela, Honduras

[6]Universidad Peruana Cayetano Heredia, Peru

[7]Departamento de Infectología, Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico

Abstract

This cross-sectional study describes substance use prevalence and its association with cART adherence among 3343 individuals receiving care at HIV clinics in Argentina, Brazil, Chile, Honduras, Mexico, and Peru. A rapid screening tool evaluated self-reported 7-day recall of alcohol, marijuana, cocaine, heroin, and methamphetamine use, and missed cART doses. Overall, 29.3% individuals reported having ≥ 1 alcoholic drinks, 5.0% reported any illicit drug use and 17.0% reported missed cART doses. In the logistic regression model, compared to no substance use, alcohol use (adjusted odds ratio (AOR)=2.46, 95% confidence interval (CI): 1.99–3.05), illicit drug use (AOR=3.57, 95% CI: 2.02–6.30), and using both alcohol and illicit drugs (AOR=4.98, 95% CI: 3.19–7.79) were associated with missed cART doses. The associations between substance use and likelihood of missing cART doses point to the need of targeting alcohol and illicit drug use to improve adherence among people living with HIV in Latin America.

Abstract

Este estudio transversal describe la prevalencia del uso de sustancias y su asociación con la adherencia a TARVc en 3,433 individuos atendidos en centros clínicos de VIH en Argentina, Brasil, Chile, Honduras, México y Perú. Se aplicó una herramienta de escrutinio rápido para el uso de alcohol, marihuana, cocaína, heroína y metanfetaminas, así como para el reporte de dosis perdidas de TARV en los siete días anteriores. En general, 29.3% participantes reportaron haber

Corresponding author: Raquel B. De Boni, INI Evandro Chagas- FIOCRUZ, Av. Brasil 4365., Rio de Janeiro. Brazil. CEP 21040-360, Phone: 55-21-38659122, raqueldeboni@gmail.com.

consumido una o más bebidas alcohólicas, 5% reportaron haber usado alguna droga ilícita y 17% reportaron haber perdido al menos una dosis del TARVc. Usando un modelo de regresión logística, se observó que en comparación al grupo que no consumió ninguna sustancia, el uso de alcohol (odds ratio ajustada (AOR)=2.46, intervalo de confianza del 95% (IC95%): 1.99–3.05), el uso de cualquier sustancia ilícita (AOR=3.57, IC95%: 2.02–6.30), y el uso de ambos (AOR=4.98, 95% CI: 3.19–7.79) se asociaron a pierda de alguna dosis de TARVc. La relación entre el uso de sustancias y el incremento en la mala adherencia a la TARVc señala la necesidad de atender el uso de alcohol y drogas ilícitas para así mejorar la adherencia en personas que viven con VIH en América Latina.

Keywords

substance use; adherence; HIV/AIDS; Latin America

INTRODUCTION

Substance users remain a population of concern among persons living with HIV/AIDS (PLWHA). They suffer from adverse health outcomes(1), more rapid HIV disease progression(2), higher likelihood of disengaging from the HIV continuum of care(3), and a lower likelihood of receiving combination antiretroviral therapy (cART) than their nonusing peers(4). Active substance use has also been shown to decrease cART adherence among PLWHA, indirectly contributing to worse HIV outcomes(5–7). In addition to the well-characterized prevalence of injection drug use (IDU) among PLWHA in various settings(8), non-injection drug use (NIDU)(9) and alcohol related disorders (ARD) may also be highly prevalent in this population(10–12), indicating a relatively large public health impact of these exposures.

More specifically, use of alcohol, heroin, and cocaine, and despite a lack of consensus in the literature, possibly methamphetamines and marijuana, has been shown to be associated with poor cART adherence(13). However, a large meta-analysis estimated that 60% of substance users had ‘optimal’ adherence to cART, suggesting no differences in adherence between substance users and non-users(14). The authors noted that the analysis was limited by a high degree of heterogeneity between studies (including study time-frame, adherence measures, and routes/types of substance used). For example, compared to studies using narrower time-frames to measure adherence (e.g., 2 weeks), studies using a larger time frame had adherence estimates that were approximately 50% lower. Differences in methods used to measure both adherence and substance use disorders present a continuous challenge in clinical practice, and in research that attempts to quantify the prevalence and impact of substance use.

Substance use impacts communities globally to varying degrees(15), yet most evidence relating to the use of psychoactive drugs and cART adherence comes from high-income countries. There is a paucity of information from Latin America, which is a barrier to the planning and provision of adequate treatment programs for co-morbid drug dependence in the region. In one of few studies from the region, ‘high-intensity use of alcohol’ alone, and

the simultaneous use of alcohol and illicit drugs, were independently associated with an increased chance of cART non-adherence in a Brazilian cohort(16). Similarly, having an alcohol use disorder was associated with nonadherence among HIV-infected Peruvian men who have sex with men(17).

Although substance use has been associated with decreased cART adherence in other populations, data more generalizable to persons from low- and middle-income countries (LMIC) are scarce. The aims of this study were 1) to describe the prevalence of recent alcohol use and NIDU among PLWHA receiving care at CCASAnet (Caribbean, Central and South America network for HIV epidemiology) sites; and 2) to analyze the association between active substance use and missing doses of cART.

METHODS

Design

The CCASAnet cohort (www.ccasanet.org) is an ongoing observational research network established to collect clinical care data from HIV clinical and research sites in Central and South America and the Caribbean(18). This cross-sectional study combined routine patient care data with data from a clinical screening for substance use that was implemented at six CCASAnet sites. The Rapid Screening Tool (RST) is a short, self-reported questionnaire that evaluates the frequency of substance use and the number of missed cART doses in a 7-day recall period. It has been used by CCASAnet and Vanderbilt researchers and shown to correlate well with other measures (19) and was translated and back-translated by local research staff into Spanish or Portuguese. Clinic staff administered the questionnaire at patient visits. Basic demographic and clinical data were obtained from the CCASAnet data repositories.

Study population

A convenience sample of PLWHA (≥18 years of age) who attended routine clinical visits at CCASAnet sites responded to the RST. Sites contributing data to this study included Fundacion Huésped, Buenos Aires, Argentina (FH-Argentina); Instituto Nacional de Infectologia Evandro Chagas, FIOCRUZ, Rio de Janeiro, Brazil (INI-Brazil); Fundación Arriarán, Santiago, Chile (FA-Chile); Instituto Hondureño de Seguridad Social and Hospital Escuela, Tegucigalpa, Honduras (IHSS/HE-Honduras); Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico (INCMNSZ-Mexico); and Instituto de Medicina Tropical Alexander von Humboldt, Lima, Perú (IMTAvH-Peru).

Between June 2012 and December 2013, 6476 questionnaires were completed by 3586 individuals. If a patient responded to more than one questionnaire, the most recent questionnaire was selected for analysis. cART data was extracted from the CCASAnet database and 219 individuals who were not on cART in the 7 days prior to completing the questionnaire were excluded, as well as 15 individuals for whom there was no information regarding missed cART doses, and 9 individuals for whom alcohol and drug use information (marijuana, cocaine, crack, heroin) was missing. The final sample comprised 3343 individuals.

Variables and Definitions

Demographic information included *sex*, *age*, and CCASAnet *site*. Clinical variables included *transmission mode* (i.e., the probable route of HIV infection) categorized as heterosexual, homosexual, IDU, or other/unknown (bisexual was categorized as homosexual for men, and heterosexual for women); the first available *CD4 cell count* since entry in the cohort; *time on ART* (in years); and *undetectable viral load* (defined as <50 copies/mL) measured within 10 days(19) of the RST questionnaire.

The responses to RST questions regarding the frequency of alcohol, marijuana, cocaine, crack and heroin use in the previous seven days (i.e. *In the last week (7 days), how many times did you use any of these substances? a) marijuana, b) cocaine, c) crack, d) amphetamines/methamphetamines, e) heroin*) were dichotomized as 'yes' (if the substance was used one or more times) and 'no' (if the substance use was not reported). Substance use was then classified into four mutually exclusive categories, as follows:

- *None*: no alcohol or illicit drug use was reported;
- *Alcohol use only*: one or more alcoholic drinks were reported, but no illicit drug use;
- *Illicit drug use only*: any reported use of marijuana, cocaine, crack, or heroin, but no alcohol use;
- *Alcohol and illicit drug use*: reported both alcohol and illicit drug use.

The main outcome measured was the report of any missed cART doses in the 7-day recall period.

Ethical issues

The study was approved by institutional review boards at each participating site and at Vanderbilt University Medical Center. Written informed consent was required and obtained for participants at the IMTAvH site in Lima, Perú.

Statistical analysis

The prevalence of alcohol use only, illicit drug use only, alcohol and drug use, as well as the prevalence of use of each illicit drug is presented overall and by site. Among individuals who reported any alcohol use, the median number of alcoholic drinks was calculated. Substance use, demographics, and clinical variables were compared between individuals reporting missed cART doses and those reporting no missed doses. Chi-square tests were used for categorical variables and Kruskal-Wallis tests were used for continuous variables.

Logistic regression was performed to assess the association between substance use (considering the 4 groups: no substance use, alcohol use only, illicit drug use only, and alcohol + illicit drug use) and missed cART doses, controlling for demographics and clinical variables. Measures of association were adjusted odds ratios (AOR) and 95% confidence intervals (95% CI). Analyses were conducted in SAS 9.3 (SAS Institute Inc., Cary, NC) and scripts are posted at http://biostat.mc.vanderbilt.edu/ArchivedAnalyses.

RESULTS

Among the 3343 patients included in the study, alcohol was the most frequently used substance reported at all sites. Overall, 29.3% of the sample reported having at least one alcoholic drink in the 7-day recall period. Among alcohol users, the median (interquartile range [IQR]) number of drinks was 3 (2–7). Five percent of the sample reported using an illicit drug in the past 7 days; marijuana was the most frequent (4.1%), followed by cocaine (1.3%) and crack (0.3%). Two individuals reported heroin use. Methamphetamine use was not reported. The prevalence of substance use varied substantially across sites, as shown in Table I. Only 9.7% of participants at the site in Mexico had used alcohol in the past 7 days whereas 53.2% of participants had used alcohol at the site in Chile. Illicit drug use was most common at the site in Argentina. Most of the study population was male (76.2%) and median age was 41 years (IQR=34–49); 65% were between 30 and 49 years at the time of the questionnaire. Approximately 17% (n=570) reported missing at least one cART dose in the 7-day recall period (Table II). The proportions of men in each category of reported substance use were: 71.6% among those with no substance use, 85.5% among those with alcohol use alone, 90.6% among those with NIDU alone, and 92.2% among those with both alcohol use and NIDU ($p<0.001$). The median age (IQR) was 42 years (35–50) for those who did not use substances, 41 years (34–49) for alcohol-only users, 38 years (31–46) for NIDU-only, and 36 years (32–45) for those who reported both alcohol use and NIDU ($p<0.001$).

In univariate analyses, substance use, age, site, and transmission mode were associated with missed cART doses (Table III). In adjusted analyses, substance use remained strongly associated with self-reported missed cART doses ($p<0.001$). Compared to no substance use, patients reporting alcohol use (AOR=2.5, 95% CI: 2.0–3.1), any illicit drug use (AOR=3.6, 95% CI: 2.0–6.3), and both alcohol and drug use (AOR=5.0, 95% CI: 3.2–7.8) had higher odds of missing cART doses, as shown in Table III. Study site (AOR=1.87, 95% CI=1.17–3.01 for IHSS/HE-Honduras versus FH-Argentina; AOR=0.08, 95% CI=0.04–0.16 for INCMNSZ-Mexico versus FH-Argentina), probable route of HIV transmission via IDU compared to heterosexual (AOR =2.46, 95% CI=1.04–5.83), and younger age (each 10 year increase in age was associated with an AOR 0.88 in the chance of missing ART) were also associated with missed cART doses in the adjusted analysis. There was no evidence that the association between substance use and adherence differed by sex (interaction p-value=0.83). Viral load was not consistently measured at the time of the questionnaire because of clinic logistics. However, in a subset of patients who had a viral load measurement within 10 days of the study questionnaire (n=480), self-reported missing of cART doses was associated with lower odds of an undetectable viral load (OR=0.44, 95% CI: 0.27–0.73, p=0.001).

DISCUSSION

The concurrent use of alcohol and other drugs has been associated with increased health and social problems among both PLWHA(2,20) and people without HIV(21). Despite these well known relationships, ours is the first study to evaluate alcohol use and NIDU in the context of cART adherence among PLWHA in care at diverse clinics in Latin America. The prevalence of self-reported substance use varied across sites, but at all sites the most

frequently used substances were alcohol, marijuana, and cocaine. Self-reported use of alcohol or illicit drugs alone, and in combination, was associated with an increased odds of missing cART doses in our cohort, with persons reporting use of both alcohol and drugs having the highest likelihood of non-adherence.

Overall, the prevalence of marijuana, cocaine, and crack use was substantially lower than that reported in studies among PLWHA in other settings. These differences may be related to the timeframe utilized to measure substance use (e.g., use in the last 30 days(22) or the last 3 months(9)). Nonetheless, a study that used the same RST to evaluate substance use in a southeastern United States cohort found 12.1% and 3.3% prevalence of marijuana and cocaine (or crack) use, respectively(19). The lower prevalence observed in our cohort may reflect the variable distribution of substance use across geographical areas, but may also indicate that substance users within the studied regions are less likely to access health services. For example, in Brazil, there has been a decrease in injected cocaine use and an increase in crack-cocaine use over the past decade(23,24) (with the prevalence of smoked cocaine use in 2012 estimated at 0.8% in the general population(25)), and crack-cocaine users reported a low utilization of social and health services(26). Crack use is also known to be associated with an increased risk of HIV infection among inner-city young adults in the United States(27), and nearly one-third of PLWHA who use crack have reported never accessing HIV care in other settings(28,29). Failure to fully engage substance users, including crack cocaine users, in the HIV continuum of care may jeopardize the individual health and population benefits of early cART initiation.

Regarding alcohol use, other studies have demonstrated that PLWHA with co-morbid ARD have a 3-fold increased risk of hospitalization compared with either HIV-negative or HIV-infected persons without ARD(30). PLWHA may not perceive the medical risks associated with alcohol consumption(31) and ARDs often are underdiagnosed in health care settings(32). As nearly 30% of individuals included in our study reported having at least one alcoholic drink in the 7-day recall period, there is an important need for screening, diagnosing and, possibly, treating alcohol abuse and dependence in this population.

With respect to our primary study outcome, the lifesaving benefits of cART are strongly dependent on treatment adherence(33,34). A meta-analysis done in 2011 including studies from 20 countries estimated that only 62% of people on cART reported adherence ≥90%(35) and that the average proportion of adherence was higher in developing countries when compared to developed ones. In our study, self-reported missed cART doses in a 7-day recall period varied widely across CCASAnet sites, ranging from 1.6% in Mexico to 33.0% in Honduras. Although there are several methods for measuring adherence, and self-reported measures may overestimate the use of medication compared to microelectronic devices(7,36), our study shows an association between self-reported missed cART doses and a lower probability of viral suppression. These findings further support the use of the RST as a reliable measure of adherence that may be incorporated into routine clinical care(19).

Though the diagnosis of substance use disorders may be challenging in busy clinical settings, the RST used in this study was a helpful screening tool for NIDU at CCASAnet sites. Beyond treatment that addresses substance use directly, recent work has evaluated

interventions which may improve adherence among non-adherent substance users who have HIV(38). Among these interventions, medication assisted therapy (mainly methadone substitution therapy for opioid dependence) and directly administered antiretroviral therapy were shown to improve short-term viral load and CD4 measures. More research is needed to evaluate long-term outcomes after these programs are implemented, including the delivery of behavioral interventions and adherence monitoring through the use of mobile technologies (such as cell phones and the internet)(38). Considering the profile of substance use found in CCASAnet, alternative approaches that address NIDU and substances other than opioids are needed in Latin America.

Other factors associated with missing cART doses in a 7-day recall period in our study were age and transmission mode. Older individuals were less likely to report missing cART doses. This is in accordance with international studies that have shown worse adherence among young people(39–41), reinforcing the need to retain these individuals in care(42) and to design age-appropriate interventions to improve adherence. Although the number of individuals reporting IDU as possible route of HIV infection was low in our cohort (n=30), they had an increased chance of missing cART doses compared to those reporting heterosexual HIV transmission, contrary to prior findings from other studies(14). It is also important to note that CD4 at enrollment and time on cART were not associated with adherence in our study. The low median baseline CD4 among individuals in our study, whether missing cART doses or not (234 and 227 cells/mm^3, respectively), may indicate late entry into care and reinforces the need for improved efforts towards early testing and linkage to care in the region. Study strengths include the large number of patients recruited in low- and middle-income countries. To our knowledge, this is the first multisite study of substance use and adherence in Latin America. Patients were asked to recall their substance use and adherence over a 7-day period, but the data collection at each site was prospectively obtained among actively followed CCASAnet patients. The prospective nature of our data collection allowed us to capture active drug use.

This study had some limitations. First, the sample was non-probabilistic and results may therefore not be generalizable to the entire CCASAnet cohort, nor to the general population of PLWHA in Latin America. Second, given its cross-sectional nature, causality cannot be inferred within our study, and longitudinal studies evaluating how active substance use impacts patient adherence in LMIC are necessary. Third, other variables that are likely related to adherence, such as education and psychiatric comorbidities, were not measured. Fourth, although the prevalence of active use may be underestimated through use of the RST as a screening tool in this cross-sectional assessment, it is possible that more individuals who actively use drugs could be identified with systematic incorporation of the RST into routine follow-up visits. Further research is necessary to evaluate the predictive value of the RST to diagnose substance use disorders, but its implementation in routine care is an important step towards detecting the need of specific care delivery for substance users living with HIV. Further studies are also necessary to disentangle the complex scenario of substance use patterns (such as dependency, or binge drinking, for instance) and adherence among PLWHA in Latin America, as well as investigating other substances that may be used in some countries for cultural reasons.

In conclusion, implementation of the RST was feasible and useful for screening for substance use and missed cART doses in diverse Latin American settings. Although there were differences in the prevalence of substance use across sites, results from our analyses support the need for screening and interventions targeted toward alcohol and illicit drug use to improve cART adherence and, ultimately, HIV outcomes among PLWHA in Latin America.

Acknowledgments

Funding: This work was supported by the National Institute of Allergy and Infectious Diseases (NIAID) as part of the International Epidemiologic Databases to Evaluate AIDS (IeDEA): U01 AI069923

References

1. Degenhardt L, Hall W. Extent of illicit drug use and dependence, and their contribution to the global burden of disease. Lancet. England. 2012; 379(9810):55–70.
2. Kipp AM, Desruisseau AJ, Qian HZ. Non-injection drug use and HIV disease progression in the era of combination antiretroviral therapy. J Subst Abuse Treat. United States. 2011; 40(4):386–396.
3. Meyer JP, Althoff AL, Altice FL. Optimizing care for HIV-Infected people who use drugs: Evidence-based approaches to overcoming healthcare disparities. Clin Infect Dis. 2013; 57(9): 1309–1317. [PubMed: 23797288]
4. McGowan CC, Weinstein DD, Samenow CP, Stinnette SE, Barkanic G, Rebeiro PF, et al. Drug use and receipt of highly active antiretroviral therapy among HIV-infected persons in two U.S. clinic cohorts. PLoS One. 2011; 6(4):1–8.
5. Cohn SE, Jiang H, McCutchan JA, Koletar SL, Murphy RL, Robertson KR, et al. Association of ongoing drug and alcohol use with non-adherence to antiretroviral therapy and higher risk of AIDS and death: results from ACTG 362. AIDS Care. 2011; 23(6):775–785. [PubMed: 21293986]
6. Lucas GM. Substance abuse, adherence with antiretroviral therapy, and clinical outcomes among HIV-infected individuals. Life Sci. 2011; 88(21–22):948–952. [PubMed: 20888839]
7. Arnsten JH, Demas PA, Farzadegan H, Grant RW, Gourevitch N, Chang C, et al. Antiretroviral therapy adherence and viral suppression in HIV-infected drug users: comparison of self-reported and eletronic monitoring. Clin Infect Dis. 2001; 33(8):1417–1423. [PubMed: 11550118]
8. Mathers BM, Degenhardt L, Phillips B, Wiessing L, Hickman M, Strathdee SA, Wodak A, Panda S, Tyndall M, Toufik A, Mattick RP. 2007 Reference Group to the UN on HIV and Injecting Drug Use. Global epidemiology of injecting drug use and HIV among people who inject drugs: a systematic review. Lancet. England. 2008; 372(9651):1733–1745.
9. Mimiaga MJ, Reisner SL, Grasso C, Crane HM, Safren SA, Kitahata MM. Substance Use Among HIV-Infected Patients Engaged in Primary Care in the United States : Findings From the Centers for AIDS Research Network of Integrated Clinical Systems Cohort. Am J Public Health. 2013; 103(8): 1457–1467. [PubMed: 23763417]
10. Wakefield JC, Schmitz MF. The harmful dysfunction model of alcohol use disorder: revised criteria to improve the validity of diagnosis and prevalence estimates. Addiction. 2015; 110:931–942. [PubMed: 25622535]
11. 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):178–193. [PubMed: 20705402]
12. Chibanda D, Benjamin L, Weiss HA, Abas M. Mental, Neurological, and Substance Use Disorders in People Living With HIV/AIDS in Low- and Middle-Income Countries. J Acquir Immune Defic Syndr. 2014; 67:s54–s67. [PubMed: 25117961]
13. Gonzalez A, Barinas J, O'Cleirigh C. Substance use: impact on adherence and HIV medical treatment. Curr HIV/AIDS Rep [Internet]. 2011; 8(4):223–234.

14. Malta M, Magnanini M, Strathdee SA, Bastos FI. Adherence to Antiretroviral Therapy Among HIV-Infected Drug Users : A Meta-Analysis. AIDS Behav. 2010; 14:731–747. [PubMed: 19020970]
15. UNODC. World Drug Report. Vienna: United Nations: 2013.
16. Teixeira C, Dourado MDL, Santos MP, Brites C. Impact of Use of Alcohol and Illicit Drugs by AIDS Patients on Adherence to Antiretroviral Therapy in Bahia, Brazil. AIDS Res Hum Retroviruses. 2013; 29:799–804. [PubMed: 23294471]
17. Ferro E, Weikum D, Vagenas P, Copenhaver M, Gonzales P, Peinado J, et al. Alcohol use disorders negatively influence antiretroviral medication adherence among men who have sex with men in Peru. AIDS Care. 2015; 27(1):93–104. [PubMed: 25277252]
18. Mcgowan CC, Cahn P, Gotuzzo E, Padgett D, Pape JW, Wolff M, et al. Cohort Profile: Caribbean, Central and South America Network for HIV research (CCASAnet) collaboration within the International Epidemiologic Databases to Evaluate AIDS (IeDEA) programme. Int J Epidemiol. 2007; 36:969–976. [PubMed: 17846055]
19. Rasbach, Da; Desruisseau, AJ.; Kipp, AM.; Stinnette, S.; Kheshti, A.; Shepherd, BE., et al. Active cocaine use is associated with lack of HIV-1 virologic suppression independent of nonadherence to antiretroviral therapy: use of a rapid screening tool during routine clinic visits. AIDS Care. 2013 Jan; 25(1):109–117. [PubMed: 22670566]
20. Teixeira C, Dourado MDL, Santos MP, Brites C. Impact of use of alcohol and illicit drugs by AIDS patients on adherence to antiretroviral therapy in Bahia, Brazil. AIDS Res Hum Retroviruses [Internet]. 2013 May; 29(5):799–804. [cited 2013 Nov 12] Available from: http://www.ncbi.nlm.nih.gov/pubmed/23294471.
21. Macdonald S, Pakula B, Martin G, Wells S, Borges G, Roth E, et al. Health profiles of clients in substance abuse treatment: a comparison of clients dependent on alcohol or cocaine with those concurrently dependent. Subst Use Misuse. 2014 Dec; 49(14):1899–1907. [PubMed: 25099309]
22. Cofrancesco J, Scherzer R, Tien P, Gibert C, Southwell H, Sidney S, et al. Illicit drug use and HIV treatment outcomes in a US cohort. AIDS. 2008; 22(3):357–365. [PubMed: 18195562]
23. Bastos FI. Crack in Brazil: a public health emergency. Cad Saude Publica [Internet]. 2012; 28(6): 1016–1017.
24. Inciardi JA, Surratt HL, Pechansky F, Kessler F, von Diemen L, da Silva EM, et al. Changing patterns of cocaine use and hiv risks in the south of Brazil. J Psychoactive Drugs [Internet]. 2006 Sep; 38(3):305–310. [cited 2013 Apr 17] Available from: http://www.ncbi.nlm.nih.gov/pubmed/17165373.
25. Abdalla RR, Madruga CS, Ribeiro M, Pinsky I, Caetano R, Laranjeira R. Prevalence of cocaine use in Brazil: data from the II Brazilian National Alcohol and Drugs Survey (BNADS). Addict Behav. 2014; 39(1):297–301. [PubMed: 24455783]
26. Santos Cruz M, Andrade T, Bastos FI, Leal E, Bertoni N, Villar LM, et al. Key drug use, health and socio-economic characteristics of young crack users in two Brazilian cities. Int J Drug Policy. 2013; 24(5):432–438. [PubMed: 23632130]
27. Edlin R, Irwin K, Faruque S, McCoy C, Word C, Serrano Y, et al. Intersecting epidemics-crack cocaine use and HIV infection among inner-city young adults. N Engl J Med. 1994; 331(21): 1422–1427. [PubMed: 7969281]
28. Bell C, Metsch L, Vogenthaler N, Cardenas G, Rodriguez A, Locascio V, et al. Never in care:characteristics of HIV-infected crack cocaine users in two US cities who never been to outpatient HIV care. J Acquir Immune Defic Syndr. 2010; 54(4):376–380. [PubMed: 20173648]
29. Metsch LR, Pereyra M, Brewer TH. Use of HIV health care in HIV-seropositive crack cocaine smokers and other active drug users. J Subst Abuse. 2001; 13(1–2):155–167. [PubMed: 11547616]
30. Rentsch C, Tate JP, Akgün KM, Crystal S, Wang KH, Ryan Greysen S, et al. Alcohol-Related Diagnoses and All-Cause Hospitalization Among HIV-Infected and Uninfected Patients: A Longitudinal Analysis of United States Veterans from 1997 to 2011. AIDS Behav. 2015 Available from: http://link.springer.com/10.1007/s10461-015-1025-y.
31. Elliott JC, Aharonovich E, O'Leary A, Johnston B, Hasin DS. Perceived Medical Risks of Drinking, Alcohol Consumption, and Hepatitis C Status Among Heavily Drinking HIV Primary Care Patients. Alcohol Clin Exp Res. 2014; 38(12):3052–3059. [PubMed: 25581660]

32. Mitchell AJ, Meader N, Bird V, Rizzo M. Clinical recognition and recording of alcohol disorders by clinicians in primary and secondary care: meta-analysis. Br J Psychiatry. 2012; 201:93–100. [PubMed: 22859576]
33. Lima V, Harrigan R, Bangsberg D, Hogg R, Gross R, Yip B, et al. The combined effect of modern Highly Active Antiretroviral Therapy regimens and adherence on mortality over time. J Acquir Immune Defic Syndr. 2009; 50(5):529–536. [PubMed: 19223785]
34. Bangsberg DR, Perry S, Charlebois ED, Clark RA, Roberston M, Zolopa AR, et al. Non-adherence to highly active antiretroviral therapy predicts progression to AIDS. AIDS. 2001; 15(9):1181–1183. [PubMed: 11416722]
35. Ortego C, Huedo-Medina TB, Llorca J, Sevilla L, Santos P, Rodríguez E, et al. Adherence to highly active antiretroviral therapy (HAART): a meta-analysis. AIDS Behav. 2011; 15(7):1381–1396. [PubMed: 21468660]
36. Hugen PWH, Langebeek N, Burger DM, Zomer B, van Leusen R, Schuurman R, et al. Assessment of adherence to HIV protease inhibitors: comparison and combination of various methods, including MEMS (electronic monitoring), patient and nurse report, and therapeutic drug monitoring. J Acquir Immune Defic Syndr. 2002; 30(3):324–334. [PubMed: 12131570]
37. Altice FL, Kamarulzaman A, Soriano VV, Schechter M, Friedland GH. Treatment of medical, psychiatric, and substance-use comorbidities in people infected with HIV who use drugs. Lancet. 2010; 376(9738):367–387. [PubMed: 20650518]
38. Binford MC, Kahana SY, Altice FL. A systematic review of antiretroviral adherence interventions for HIV-infected people who use drugs. Curr HIV/AIDS Rep [Internet]. 2012 Dec; 9(4):287–312. [cited 2013 Nov 18] Available from: http://www.ncbi.nlm.nih.gov/pubmed/22936463.
39. Barclay TR, Hinkin CH, Castellon Sa, Mason KI, Reinhard MJ, Marion SD. Age-associated predictors of medication adherence in HIV-positive adults : health beliefs, self-efficacy, and neurocognitive status. Heal Psychol. 2010; 26(1):40–49.
40. Hinkin CH, Hardy DJ, Mason KI, Castellon Sa, Durvasula RS, Lam MN, et al. Medication adherence in HIV-infected adults: effect of patient age, cognitive status, and substance abuse. AIDS. 2004; 18(Suppl 1):S19–S25. Suppl 1.
41. Ghidei L, Simone M, Salow M, Zimmerman K, Paquin A, Skarf M, et al. Aging, antiretrovirals, and adherence: a meta analysis of adherence among older HIV-infected individuals. Drugs Aging. 2013; 30(10):997–1003.
42. Yehia BR, Rebeiro P, Althoff KN, Agwu AL, Horberg MA, Samji H, et al. Impact of Age on Retention in Care and Viral Suppression. JAIDS. 2015; 68(4):413–419. [PubMed: 25559604]

Table I

Substance use in a 7-day recall period stratified by CCASAnet site, 2012–2013.

	FH-Argentina	INI-Brazil	FA-Chile	IHSS/HE-Honduras	INCMNSZ-Mexico	IMTAvH-Peru	Total
	N=171(%)	N=1274(%)	N=715(%)	N=276(%)	N=776(%)	N=131(%)	N=3343(%)
Alcohol							
No drinks	112 (65.5)	938 (73.6)	335 (46.9)	193 (69.9)	701 (90.3)	86 (65.7)	2365 (70.7)
1–3 drinks	36 (21.1)	118 (9.3)	292 (40.8)	17 (6.2)	37 (4.8)	20 (15.3)	520 (15.6)
>3 drinks	23 (13.5)	218 (17.1)	88 (12.3)	66 (23.9)	38 (4.9)	25 (19.1)	458 (13.7)
Marijuana							
No	152 (88.9)	1241 (97.4)	670 (93.7)	254 (92.0)	761 (98.1)	128 (97.7)	3206 (95.9)
Yes	19 (11.1)	33 (2.6)	45 (6.3)	22 (8.0)	15 (1.9)	3 (2.3)	137 (4.1)
Cocaine							
No	165 (96.5)	1255 (98.5)	710 (99.3)	268 (97.1)	770 (99.2)	130 (99.2)	3298 (98.6)
Yes	6 (3.5)	19 (1.5)	5 (0.7)	8 (2.9)	6 (0.8)	1 (0.8)	45 (1.4)
Crack							
No	171 (100.0)	1273 (99.9)	715 (100.0)	267 (96.7)	775 (99.9)	131 (100.0)	3332 (99.7)
Yes	0 (0.0)	1 (0.1)	0 (0.0)	9 (3.3)	1 (0.1)	0 (0.0)	11 (0.3)
Heroin							
No	170 (99.4)	1274 (100.0)	715 (100.0)	276 (100.0)	775 (99.9)	131 (100.0)	3341 (99.9)
Yes	1 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	2 (0.1)
Any illicit drug							
No	147 (86.0)	1229 (96.5)	666 (93.2)	253 (91.7)	754 (97.2)	127 (97.0)	3176 (95.0)
Yes	24 (14.0)	45 (3.5)	49 (6.9)	23 (8.3)	22 (2.8)	4 (3.0)	167 (5.0)

FH-Argentina (Fundacion Huésped, Buenos Aires, Argentina), INI-Brazil (Instituto Nacional de Infectologia Evandro Chagas/FIOCRUZ, Rio de Janeiro, Brazil), FA-Chile (Fundación Arriarán, Santiago, Chile), IHSS/HE-Honduras (Instituto Hondureño de Seguridad Social and Hospital Escuela, Tegucigalpa, Honduras); INCMNSZ-Mexico (Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico); IMTAvH-Peru (Instituto de Medicina Tropical Alexander von Humboldt, Lima, Peru)

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

Table II

Demographic and clinical characteristics stratified by missing cART doses in a 7-day recall period at CCASAnet sites, 2012–2013.

		Missing ART doses in 7-day recall period		
	Total N=3343	**No N=2773(%)**	**Yes N=570(%)**	**p-value***
Sex				0.78
Female	795	662(83.3)	133(16.7)	
Male	2548	2111(82.9)	437(17.1)	
Age (years)				
Median (IQR) **	3343	41(34–49)	41(34–48)	0.12
Age groups				
18–29 years	415	348(83.9)	67(16.1)	0.04
30–39 years	1069	875(81.9)	194(18.1)	
40–49 years	1112	907(81.6)	205(18.4)	
≥50 years	747	643(86.1)	104(13.9)	
Site				<.0001
FH-Argentina	171	132(77.2)	39(22.8)	
INI-Brazil	1274	1053(82.7)	221(17.3)	
FA-Chile	715	538(75.2)	177(24.8)	
IHSS/HE-Honduras	276	185(67.0)	91(33.0)	
INCMNSZ-Mexico	776	764(98.5)	12(1.5)	
IMTAvH-Peru	131	101(77.1)	30(22.9)	
Substance use				<.0001
None	2301	2050(89.1)	251(10.9)	
Alcohol only	875	626(71.5)	249(28.5)	
Illicit drug only	64	41(64.1)	23(35.9)	
Alcohol and drug	103	56(54.4)	47(45.6)	
HIV transmission mode				<.0001
Heterosexual	1305	1088(83.4)	217(16.6)	
Homosexual	1667	1411(84.6)	256(15.4)	
IDU	30	21(70.0)	9(30.0)	

	Missing ART doses in 7-day recall period			
	Total N=3343	**No N=2773(%)**	**Yes N=570(%)**	**p-value***
Other	341	253(74.2)	88(25.8)	
CD4 cell count* **				
Median(IQR)**	3313	227(83–401)	234(100–407)	0.35
≥350 cells/mm^3	1037	857(82.6)	180(17.4)	0.23
<350 cells/mm^3	2276	1888(82.9)	388(17.1)	
Unknown	30	28(93.3)	2(6.7)	
Median years on cART (IQR)**		5.3(2.5–9.5)	5.1(2.1–9.6)	0.55

*Chi-square.

**Kruskall-Wallis test.

***First CD4 cell count at cohort entry.

cART: combination antiretroviral therapy. IQR: Interquartile range. IDU: injection drug use. FH-Argentina (Fundacion Huésped, Buenos Aires, Argentina), INI-Brazil (Instituto Nacional de Infectologia Evandro Chagas/FIOCRUZ, Rio de Janeiro, Brazil), FA-Chile (Fundación Arriarán, Santiago, Chile), IHSS/HE-Honduras (Instituto Hondureño de Seguridad Social and Hospital Escuela, Tegucigalpa, Honduras); INCMNSZ-Mexico (Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico); IMTAvH-Peru (Instituto de Medicina Tropical Alexander von Humboldt, Lima, Peru)

Table III

Factors associated with missing cART doses in 7-day recall period after logistic regression at CCASAnet sites, 2012–2013.

	Unadjusted				Adjusted			
	Odds Ratio	95% CI		P-value	Odds Ratio	95% CI		P-value
Substance use				<.001				<.001
Alcohol only vs None	3.25	2.67	3.96		2.46	1.99	3.05	
Illicit drug only vs None	4.58	2.71	7.76		3.57	2.02	6.30	
Alcohol and drug vs None	6.86	4.55	10.32		4.98	3.19	7.79	
Sex				0.78				0.93
Male vs. Female	1.03	0.83	1.28		0.99	0.75	1.30	
Age (per 10 years increase)	0.91	0.84	0.99	0.03	0.88	0.80	0.98	0.02
Site				<.001				<.001
FH-Argentina	1*				1*			
INI-Brazil	0.71	0.48	1.04		0.87	0.58	1.32	
FA-Chile	1.11	0.75	1.65		1.25	0.82	1.92	
IHSS/HE-Honduras	1.67	1.08	2.58		1.87	1.17	3.01	
INCMNSZ-Mexico	0.05	0.03	0.10		0.08	0.04	0.16	
IMTAvH - Peru	1.01	0.59	1.73		1.21	0.68	2.13	
HIV transmission mode				<.001				0.01
Homosexual vs. Heterosexual	0.91	0.75	1.11		0.88	0.67	1.16	
IDU vs. Heterosexual	2.15	0.97	4.76		2.46	1.04	5.83	
Other vs. Heterosexual	1.74	1.31	2.31		1.44	1.05	1.98	
CD4 cell count (per 100 cell/mm^3 increase)	1.01	0.97	1.05	0.58	1.00	0.96	1.05	0.86
Time on cART (per 1 year increase)	1.00	0.98	1.02	0.71	1.00	0.98	1.02	0.97

*Reference category.30 cases were excluded from the adjusted model due to missing values of CD4 cell count. FH-Argentina (Fundacion Huésped, Buenos Aires, Argentina), INI-Brazil (Instituto Nacional de Infectologia Evandro Chagas/FIOCRUZ, Rio de Janeiro, Brazil), FA-Chile (Fundación Arriarán, Santiago, Chile), IHSS/HE-Honduras (Instituto Hondureño de Seguridad Social and Hospital Escuela, Tegucigalpa, Honduras); INCMNSZ-Mexico (Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico); IMTAvH-Peru (Instituto de Medicina Tropical Alexander von Humboldt, Lima, Peru).