Substance abuse treatment utilization among adults living with HIV/AIDS and alcohol or drug problems

John Orwat, PhD[1], **Richard Saitz, MD, MPH**[2,6], **Christopher P. Tompkins, PhD**[4], **Debbie M. Cheng, ScD**[2,5], **Michael P. Dentato, MSW**[1], and **Jeffrey H. Samet, MD, MA, MPH**[2,3]

[1]Loyola University Chicago, Chicago, IL

[2]Clinical Addiction Research and Education Unit, Section of General Internal Medicine, Department of Medicine, Boston Medical Center, Boston University School of Medicine, Boston, MA

[3]Department of Community Health Sciences, Boston University School of Public Health, Boston, MA

[4]Brandeis University, Heller School for Social Policy & Management, Waltham, MA

[5]Department of Biostatistics, Boston University School of Public Health, Boston, MA

[6]Department of Epidemiology and Youth Alcohol Prevention Center, Boston University School of Public Health, Boston, MA

Abstract

A prospective cohort study to identify factors associated with receipt of substance abuse treatment (SAT) among adults with alcohol problems and HIV/AIDS. Data from the Human Immunodeficiency Virus-Longitudinal Interrelationships of Viruses and Ethanol (HIV-LIVE) study were analyzed. Generalized estimating equation logistic regression models were fit to identify factors associated with any service utilization. An alcohol dependence diagnosis had a negative association with SAT (adjusted odds ratio [AOR] = 0.36; 95% confidence interval [95% CI] = 0.19, 0.67), as did identifying as a sexual orientation other than heterosexual (AOR = 0.46; CI = 0.29, 0.72), and having social supports that use alcohol/drugs (AOR = 0.62; CI = 0.45, 0.83). Positive associations with SAT include: presence of hepatitis C antibody (AOR = 3.37; CI = 2.24, 5.06), physical or sexual abuse (AOR = 2.12; CI = 1.22, 3.69), social supports that help with sobriety (AOR = 1.92; CI = 1.28, 2.87), homelessness (AOR = 2.40; CI = 1.60, 3.62) drug dependence diagnosis (AOR = 2.64; CI = 1.88, 3.70), and clinically important depressive symptoms (AOR = 1.52, CI = 1.08, 2.15). While reassuring that factors indicating need for SAT among people with HIV and alcohol problems (e.g. drug dependence) are associated with receipt, non-need factors (e.g. sexual orientation, age) that should not decrease likelihood of receipt of treatment were identified.

Keywords

Substance abuse; treatment; addiction; HIV/AIDS; alcohol

1. Introduction

An estimated 44% of adults living with HIV/AIDS have alcohol and other drug (AOD) use disorders, much higher than the general population (Bing, Burnam, Longshore, Fleishman, Sherbourne, London, et al., 2001; Galvan, Bing, Fleishman, London, Caetano, Burnam, et al., 2002; Galvan, Burnam, & Bing, 2003; Rabkin, Ferrando, Jacobsberg, & Fishman, 1997; Rabkin, McElhiney, & Ferrando, 2004). AOD use by people with HIV has particularly deleterious results, including an increased burden on support and medical systems (Masson, Sorensen, Phibbs, & Okin, 2004), a higher likelihood of engagement in risk behaviors that result in infection transmission (Palepu, Raj, Horton, Tibbetts, Meli, & Samet, 2005), non-adherence with HIV/AIDS treatments and faster biomedical decline (Conigliaro, Madenwald, Bryant, Braithwaite, Gordon, Fultz, et al., 2004; Dausey & Desai, 2003; Kelley & Petry, 2000; Lucas, Gebo, Chaisson, & Moore, 2002; Meyerhoff, 2001; Petry, 1999), and liver complications, particularly considering the impact of co-occurring alcohol use, HIV/AIDS medications, and hepatitis C (Lucas, Gebo, Chaisson, & Moore, 2002; Petry, 1999; Moore, Keruly, & Chaisson, 2004; Palepu, Tyndall, Yip, O'Shaughnessy, Hogg, & Montaner, 2003; Samet, Cheng, Libman, Nunes, Alperen, & Saitz, 2007). Despite the magnitude of substance abuse problems among people living with HIV, individual factors other than need influence receipt of SAT for those who might benefit (Burnam, Bing, Morton, Sherbourne, Fleishman, London, et al, 2001).

Substance abuse treatment (SAT) can be effective in reducing these consequences (Klinkenberg & Sacks, 2004; Loughlin, Metsch, Gardner, Anderson-Mahoney, Barrigan, & Strathdee, 2004; Palepu, Horton, Tibbetts, Meli, & Samet, 2004), although outcomes are more complex than mere attendance. These include characteristics of the treatment system, such as staff characteristics and availability (Hser, 1995; Najavits & Weiss, 1994; Najavits, Crits-Christoph et al., 2000) as well as the relationship with the client outside of what occurs within treatment sessions (Najavits & Weiss, 1994). SAT outcomes are also dependent on the severity of other significant life problems such as family relations, employment, or medical and mental health problems (McLellan & Weisner, 1996), which necessitates matching clients to specific treatment services that best treat co-occurring problems (Gastfriend & McLellan, 1997). Ultimately, the interaction of many interpersonal and intrapersonal factors may impact the potential for relapse or chronic relapse of a client utilizing SAT (Marlatt, 1985a, 1996a, 1996b; Marlatt, Barrett et al., 1999).

Burnam, Bing, Morton, Sherbourne, Fleishman, London, et al., (2001) analyzed HIV Cost and Services Utilization Study (HCSUS) data, a national probability survey of adults with HIV receiving medical care in 1996. Controlling for need, outpatient AOD service utilization was positively associated with lower income levels and lower educational levels. African Americans were more likely to access AOD treatment services. Respondents who identified as gay were less likely to utilize AOD services, but were more likely to seek treatment through medical providers and use psychiatric medications. Insurance coverage had little impact on utilization. The unemployed and disabled were more likely to use outpatient treatment. Only one indicator of HIV severity, lower CD4 cell count, was positively associated with AOD services.

The identification of individual level factors is particularly important since HIV/AIDS disproportionately strikes vulnerable populations who may experience barriers, such as

people living in poverty and racial/ethnic minorities, particularly African American women, gay men, and other disenfranchised populations (Orwat, 2004). This exploratory analysis adds to the literature by examining the factors associated with SAT in the context of contemporary HIV-related medical practice including highly active antiretroviral therapies and examined factors associated with SAT utilization in a prospective cohort of individuals living with HIV/AIDS and alcohol or other drug problems. Secondary analyses of the factors associated with four specific types of treatment (detoxification program, residential, outpatient, and "other" treatment) were also conducted. Andersen's Socio-Behavioral Model, as adapted for vulnerable populations, guided the identification and organization of factors of interest (Andersen & Newman, 1995; Aday & Andersen, 1974; Andersen, 1994).

2. Materials and Methods

Data from the HIV-Longitudinal Interrelationships of Viruses and Ethanol (HIV-LIVE) study were analyzed, a prospective cohort study of 400 adults with HIV infection and alcohol problems. Eligibility criteria included documentation of HIV infection, a current or lifetime alcohol problem as evidenced by two or more positive responses to the CAGE (Cut down, Annoyed, Guilty, and Eye opener) alcohol screening questionnaire (Ewing, 1984; Samet, Phillips, Horton, Traphagen, & Freedberg, 2004) or an alcohol use disorder in the judgment of a physician investigator, an ability to speak English or Spanish, a score of 21 or greater on the Mini Mental State Examination (Folstein, Folstein, & McHugh, 1975; Smith, Horton, Saitz, & Samet, 2006) and plans to remain in the area for at least one year. Classification of an alcohol problem ("none", "moderate", "at risk") was derived from the National Institute on Alcohol Abuse and Alcoholism (NIAAA) definition of amounts that risk consequences (Samet, et al. 2007). The current analysis included subjects with at least two study interviews. All subjects were 18 years of age or older and provided written informed consent. A certificate of confidentiality was provided by NIAAA as an additional protection of subject privacy.

Subjects were recruited from two urban hospital-based outpatient practices: an intake clinic for HIV positive clients at Boston Medical Center and a specialty clinic for HIV primary care at Beth Israel Deaconess Medical Center in Boston, by referral of a practicing physician, and from flyers posted in the community, medical clinics, and SAT facilities. Approximately 38% of participants were recruited from previous observational studies conducted by these investigators. The largest proportion of subjects was recruited from Boston Medical Center (43%) and all subjects resided in the Boston area.

After informed consent was obtained, subjects were enrolled from August 2001 until July 2003. Data were collected at baseline and every 6 months thereafter for up to 42 months. Data collection ended in March 2006. Domains of data collected included demographics, HIV risk behaviors, AOD severity and diagnosis, health care utilization, SAT service utilization, indicators of HIV disease progression, and medical co-morbidities. Extensive efforts were employed to maximize follow-up: 100% had at least one follow up interview (2 total interviews) with a median of 3 follow up interviews (4 total); the 25th percentile was 2 follow up interviews (3 total) and the 75th percentile was 5 follow-ups (6 total interviews).

2.1 Dependent variables

The primary outcome was self-reported receipt of any SAT in the past six months, which was assessed by asking subjects, "During the past six months, did you receive any substance abuse services?" For the four secondary outcomes of specific types of substance abuse treatment (i.e. detoxification program, residential, outpatient, and "other" treatment), self reported utilization was evaluated by asking "How many days did you receive substance abuse services from each of the following programs during the past six months?" Subjects

were asked about the following specific types of substance abuse treatment: a detoxification program, a halfway house or residential facility, a substance abuse counselor in an outpatient program, a day treatment program, and/or some "other" type of treatment, such as doctor, priest or rabbi, or an employee assistance program. Due to low rates of participation, day treatment was excluded from multivariable analysis (Table 2). Attendance at Alcoholics Anonymous and Narcotics Anonymous Groups (AA/NA) was not examined in this analysis and was reported on separately (Orwat et al., 2011).

2.2 Independent variables

The Andersen model was used to identify independent variables potentially associated with SAT and organize them into predisposing characteristics, enabling resources, and need variables (Andersen, 1995; Weisner, Matzger, Tam, & Schmidt, 2002). This model is commonly used in studies to understand utilization of health care by examining three individual level domains: those factors that predispose people to utilize care (e.g., demographics), factors that enable use (e.g., ability to pay), and factors associated with need for the specific service (Andersen, 1995). The rich database allowed for the exploration of other factors which have yet to be tested in the literature (e.g., literacy, hepatitis C).

Predisposing characteristics consisted of age (defined as greater than the median, 44.5), sex, race (black, white, and other (due to small sample sizes, other includes other race and Hispanic)), marital status (single, married or partnered but not married), sexual orientation (gay, bisexual, other vs. heterosexual), education level (high school education), living alone, born in the USA, sexual or physical abuse or trauma, and high school literacy level (defined as a score > 60 on the Rapid Estimate of Adult Literacy in Medicine (REALM) (Davis, Crouch, Long, Jackson, Bates, George, et al., 1991). HIV/AIDS disease severity were considered predisposing variables to remain consistent with the literature (Burnam et al., 2001) and assessed using CD4 cell count (greater than vs. less than or equal to 350 cells/mm^3, the median, CD4 count), the presence of opportunistic infections or cancers, and HIV-Symptom Index score - measure of how often and bothersome clients experience 20 common HIV symptoms (Justice, Homes, Gifford, et al., 2001; Kilbourne, Justice, Rollman, et al., 2002). The presence or absence of hepatitis C virus (HCV) antibody indicated exposure. Testing for HCV was completed at the first opportunity if the results of HCV testing for clinical purposes were not available.

Enabling resources included employment status, social support use of alcohol or drugs, social support that is supportive of sobriety, living with children, receipt of government disability income, and homelessness (spending one or more nights "on the street, without shelter" over the past 6 months). Social support use of alcohol or drugs was assessed by asking "how many of the people you spend time with" followed by three prompts "currently drink alcohol," "are currently heavy or problem drinkers," and "currently use drugs." Social support for sobriety was assessed by asking "How many of the people that you spend time with support your sobriety or abstinence." Use of HIV antiretroviral medications was assessed by asking about specific medication use over the previous six months as listed with photographic prompts, generic and brand names. Cohort members were not assessed with regard to use of naltrexone or other medications used to treat substance use disorder as at the time of the study, its use for alcohol problems, although indicated, occurred rarely in practice.

Need/Severity for SAT included alcohol dependence in the past six months, which was assessed using the Composite International Diagnostic Interview Short Form (CIDI-SF) (Kessler, Andrews, Mroczeek, et al., 1998) as well as the diagnosis of drug dependence in the previous 6 months. Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression scale (CES-D) (Radloff, 1977; Andresen, Malmgren,

Carter, & Patrick, 1994), and dichotomized at a score of 16 or greater, which indicates clinically important depressive symptoms in the general population (Eaton & Kessler, 1991; Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977). Involvement in the criminal justice system was measured by asking respondents if they were in jail during the previous six months.

2.3 Analysis

To account for correlation in the data due to incorporating repeated measures from the same subject, the multivariable analysis that explored the association between selected factors and SAT utilization was conducted using generalized estimating equations (GEE) (Zeger and Liang, 1986; Liang and Zeger, 1986) logistic regression models. Models were fit using a logit link, an exchangeable working correlation structure, and standard errors were based on the empirical-sandwich estimator for all analyses. The GEE approach yields robust results (i.e. valid estimates can be obtained from the empirical variance estimator even if the correlation structure is misspecified), is flexible and can accommodate analyses where subjects have varying numbers of follow-up interviews. The following predisposing characteristics were modeled as time-dependent variables: married, partnered, living alone, and all HIV status variables; all enabling resources and need/severity variables were modeled as time-dependent variables. Time varying independent variables were "lagged" to predict SAT utilization in the subsequent interview to ensure such factors preceded the episode of SAT. If a participant missed a follow-up interview, the outcome at the next available interview was used; the models adjusted for the duration of time between interviews for the lagged independent variables and outcomes. In addition, the time that the outcome was assessed (number of months since baseline) was included as a covariate to account for potential temporal trends in the data. Preliminary crude analyses were performed that included only a single independent variable. A full multivariable model was then fit including all independent variables in the same model. Potential collinearity was initially assessed by verifying that no pair of independent variables were highly correlated (> 0.40). In addition, the variance inflation factor (VIF) was calculated for each independent variable and covariate to further evaluate potential collinearity. A criterion of VIF>10 was used to indicate collinearity (Kutner, et al., 2004). The largest observed VIF was 1.84, suggesting multicollinearity was likely not an issue in our regression models.

Analyses of the four secondary outcomes were performed using the same approach as described for the primary outcome. Analyses were conducted using two-sided tests and a significance level of 0.05. Due to the exploratory nature of the analyses we did not adjust for multiple comparisons. All analyses were conducted using SAS version 9.0 (SAS Institute, Inc., Cary, NC).

3. Results

3.1 Sample characteristics

Of the 400 HIV-LIVE subjects, 369 completed at least two research interviews and therefore constituted the study sample. Baseline characteristics are displayed in Table 1. Most subjects were non-white and male, and the mean age was 42.7 years. A small minority were gay or bisexual while a vast majority had experienced sexual or physical trauma or abuse. Few had an opportunistic condition, mean CD4 count was 462 cells/mm^3, and over half had a positive hepatitis C antibody test (58%). A majority reported spending time with people who use alcohol, while less than half spent time with people who use drugs; a majority had social support for sobriety. At baseline, 31.5% were classified as "at risk" drinkers by the NIAAA classification for an alcohol problem, 10.8% as "moderate" drinkers, and 57.8% non-drinkers. These numbers varied somewhat over time and across observations (Bertholet et

al., 2010). Criteria for a current (past 6 months) alcohol dependence diagnosis were met by 12% of the sample and 43% met the criteria for a current (past 6 months) drug dependence diagnosis. At study entry, almost half (45%) had used SAT services in the preceding 6 months, 18% detoxification services, 20% residential, 17% outpatient counseling, and 6% utilized some other treatment (Table 1). In subsequent interviews, 40% (n=133) utilized SAT in the 6 months prior to the second interview, 34% (n=94) prior to the third interview, 35% (n=64) prior to the fourth, 30% (n=35) prior to the fifth, 28% (n=14) prior to the sixth, and 33% (n=1) prior to the eighth interview.

3.2 Multivariable models: Predictors of Any Substance Abuse Treatment

Predisposing characteristics positively associated with any SAT included physical or sexual trauma or abuse, the presence of HCV antibody (Table 2). Identifying as gay, bisexual, or other (compared with heterosexual) and CD4 cell count were negatively associated with SAT. Enabling resources positively associated included social support help with sobriety, living without children and homelessness; a social support system using alcohol and/or drugs was negatively associated. Alcohol dependence was negatively associated with SAT; a drug dependence diagnosis and depressive symptoms were positively associated.

3.3 Multivariable models: Predictors of Specific Types of SAT

3.31 Detoxification—Older age and lower CD4 count were associated with lower odds of participation in a detoxification program, while the presence of HCV antibody was positively associated (Table 3). As for enabling resources, homelessness was positively associated with detoxification as were the need factors of drug dependence and depressive symptoms.

3.32 Residential treatment—Of the predisposing characteristics, living alone was negatively associated with residential treatment and the presence of HCV antibody was positively associated, as was the need factor of a drug dependence diagnosis, but no HIV disease severity variable was significantly associated with receipt of residential treatment (Table 3). Enabling resources positively associated with residential treatment included social support for sobriety, living without children and homelessness; social support use of alcohol/ drugs was negatively associated.

3.33 Outpatient treatment—The presence of HCV antibody was positively associated with outpatient treatment, the only statistically significant predisposing characteristic (Table 3). Living without children and homelessness were also positively associated while social support use of alcohol and drugs was negatively associated. A drug dependence diagnosis was associated with higher odds of outpatient treatment.

4. Discussion

This exploratory study of those living with HIV/AIDS and alcohol or drug problems identified a number of non-need factors associated with receipt of SAT. These associations were found for any SAT as well as for each of four types of SAT: detoxification program, residential treatment, and outpatient treatment. Identification of the factors that facilitate or impede use of effective SAT suggests areas in need of improvement. Specifically, we identified a negative association between gay, lesbian or "other" sexual orientation and SAT utilization, while past physical or sexual abuse or trauma was positively related. We detected a negative association between median CD4 cell count and utilization of SAT, although the presence of the HCV antibody was strongly and positively associated. Social supports were important factors related to receipt of SAT; supports that help with sobriety were positively associated and those that used alcohol or drugs, negatively associated. Homelessness had a

positive and strong association with SAT. In this sample of people with alcohol problems, most of whom had lifetime dependence, current alcohol dependence diagnosis was negatively associated with SAT, although a current drug dependence diagnosis and depressive symptoms were each positively associated.

This research partially supports studies that demonstrate SAT is under-utilized by sexual minorities in the general population (Goldstein, Rotheram-Borus, Johnson, Weinhardt, Remien, Lightfoot, et al., 2005) as well as those living with HIV/AIDS (Burnam, Bing, Morton, Sherbourne, Fleishman, London, et al., 2001; Goldstein, Rotheram-Borus, Johnson, Weinhardt, Remien, Lightfoot, et al., 2005). Burnam et al., (2001) found that, among those with HIV/AIDS, those who identify as gay were less likely to participate in residential or outpatient treatment. The present study examined the effect of sexual orientation among people living with HIV/AIDS by controlling for variables such as homelessness, sexual or physical abuse or trauma, and social support for substance use or abstinence. Lower SAT utilization may be related to concerns about the following: the treatment setting (e.g., emotional and physical safety) if sexual orientation is disclosed; insensitivity to the experience of anti-gay discrimination; lack of appreciation for non-traditional support systems; attempts to change the person's sexual orientation; and/or the failure to understand non-traditional forms of socialization (Cochran & Cauce, 2006).

We did not detect an independent association of race and gender on utilization of treatment, which is somewhat inconsistent with previous studies that suggest that women are less likely than men to utilize treatment and African Americans are more likely than Whites to utilize treatment (Burnam, Bing, Morton, Sherbourne, Fleishman, London, et al., 2001; Goldstein, Rotheram-Borus, Johnson, Weinhardt, Remien, Lightfoot, et al., 2005; Greenfield, Brooks, Gordon, Green, Kropp, McHugh, et al., 2007). This may be due to regional differences, such as Boston's diverse substance abuse treatment resources, which may have increased efforts to reach minorities and women as well as to design appropriate treatment programs (McAuliffe & Dunn, 2004). However, this important issue warrants further exploration, especially in light of the increasing prevalence of HIV/AIDS in ethnic and racial minorities and women.

The positive association of past sexual or physical abuse or trauma and SAT is congruent with the literature, although this analysis supported the association in a sample living with HIV/AIDS and controlling for factors often related to an increased likelihood of trauma, such as being female, gay, lesbian, or bisexual, and race (Farley, Golding, Young, Mulligan, & Minkoff , 2004). Close to 90% of individuals seeking treatment for substance use disorders have had an experience of trauma (Farley, Golding, Young, Mulligan, & Minkoff , 2004). Individuals exposed to trauma are more likely to experience a wide range of negative outcomes that complicate substance abuse treatment, including an increased likelihood of mental health problems such as Post Traumatic Stress Disorder (PTSD) (Kayo & Rojas, 2004) which increase the likelihood of relapse (Farley, Golding, Young, Mulligan, & Minkoff , 2004; Wadsworth, Stampneto, & Halbrook, 1995). Previous treatment experiences for these individuals may not have adequately addressed issues related to trauma (Farley, Golding, Young, Mulligan, & Minkoff, 2004).

Few measures of HIV disease severity were associated with treatment, although our findings suggested that people with more advanced HIV are more likely to receive SAT. This is consistent with previous studies (Burnam, Bing, Morton, Sherbourne, Fleishman, London, et al., 2001). The strong and positive association of hepatitis C and SAT may be the result of clinical and/or policy efforts to facilitate access to treatment, or by patient concerns. Tsui et al., (Tsui, Saitz, Cheng, Nunes, Libman, Alperen, & Samet, 2007) observed that people who knew their hepatitis C status were more likely to abstain from alcohol. We speculated that it

may also be the case that when concern rises about hepatitis C, people make attempts to decrease substance use and seek SAT. Therapies for hepatitis C are complex, requiring weekly injections that have adverse effects and hold no guarantees of cure. With increased treatment complexities related to AOD patients with co-occurring hepatitis C and HIV, clinicians may influence such patients being treated for hepatitis C to also address substance abuse issues (Mehta, Thomas, Sulkowski, et al., 2009). However, most people in this cohort had barriers to treatment of hepatitis C (Nunes, Saitz, Libman, Cheng, Vidaver, & Samet, 2006). Therefore the association between hepatitis C and SAT may also be explained by testing occurring in or by referral from SAT programs. Ultimately, a multidisciplinary approach to SAT and co-occurring HIV and hepatitis C may be most effective that includes pharmacotherapy, mental health services, along with medical care (Nunes, Saitz, Libman, Cheng, Vidaver, & Samet, 2006).

The social support findings in this study were consistent with general population studies (Hasin & Grant, 1995; Kaskutas, Bond, & Humphreys, 2002; Witbrodt & Kaskutas, 2005). This analysis found that social support matters, as social support that is supportive of sobriety influences utilization of services while social supports that are currently using substances, does not. Not only does research show the importance of social support in the utilization of substance abuse services, it affirms the role of social support in HIV treatment adherence (Knowlton, Arnsten, Eldred, Wilkinson, Gourevitch, Shade, Dowling, & Purcell, 2006).

The significant positive association of homelessness with SAT utilization is consistent with the Goldstein et al. (2005) analysis of people living with HIV/AIDS; the current analysis has similar findings when controlling for factors often found to be related to SAT among the homeless, such as gender, race/ethnicity, and social support (Kertesz, Larson, Cheng, Tucker, Winter, Mullins, et al., 2006; Song, 1999). The association of homelessness with detoxification services was particularly strong, which may be related to triage decisions in which few options exist for emergency housing, particularly for those that are currently using substances (Kertesz, Larson, Cheng, Tucker, Winter, Mullins, et al., 2006; Song, 1999). However, service utilization may also be the result of residing in temporary shelters or participation in long-term housing programs, which may require SAT as part of the programmatic requirements or as a condition of participation (Kertesz, Larson, Cheng, Tucker, Winter, Mullins, et al., 2006).

We found a significant positive association of a drug dependence diagnosis and depressive symptoms on the receipt of SAT, but a current alcohol dependence diagnosis was negatively associated. This finding may seem curious at first glance, but may be related to the sample, almost all of whom likely have lifetime alcohol dependence and many have co-occurring drug dependence. Drug dependence may lead to seeking specific care (e.g., pharmacotherapy) while those with current alcohol dependence are less likely to do so.

This study had notable strengths and limitations. First, this analysis identified association, not causation, between various factors and SAT. For example, it may be that treatment led to social support rather than social support motivating SAT. We attempted to capture the temporal relationship between variables by "lagging" outcome variables so that they were taken from the time period subsequent to explanatory factors. A second limitation may be the reliance on self-report of SAT utilization, although asking whether or not substance abuse treatment occurred is valid and reliable, particularly when not seeking quantity of treatment (Goldberg, Seybolt, & Lehman, 2002). However, self-report of SAT may capture interventions that may not appear in comprehensive databases (e.g. from a personal physician or clergy member).

Due to concerns related to sample size, we do not report a sub analysis of those individuals with the highest need (i.e. meeting 6-month criteria for alcohol and/or drug dependence at follow-up time points), even though that might have provided further insight into SAT utilization among those with the highest need. Additional limitations may relate to generalizability of the findings, based on the recruitment site(s), urban setting with a spectrum of sexual orientation representation, many homeless, and minorities. This acknowledged limitation is also a strength given the epidemiology of this epidemic that disproportionately affects this population. Bias in self-report may have been attenuated in this study by use of validated survey questions as well as the minimization of contextual factors that may influence the possibility of biased self report (Del Boca & Darkes, 2003).

Identifying as gay, lesbian, or some other sexual orientation was negatively associated with SAT, however the association was not significant when specific types of SAT were examined. Although previous research supports this finding, additional analysis with sexual minorities is in order to further examine the interaction of sexual orientation with other factors that may be correlated, such as marital status or living with children.

Future analysis might include some variables not available in this analysis in order to address potential limitations of this study. One specific example is the lack of a measure concerning respondent health insurance status and benefit structure. People living with HIV in Massachusetts have access to health insurance (Orwat, 2004), so despite the absence of this variable we assume all participants had access. Future studies may examine the impact of different insurance products (i.e. public, private, none) and benefit structures (i.e., networks and copayments) on SAT utilization. Other variables potentially associated with SAT that were not included in this analysis included lifetime experience with SAT attendance at more than one type of SAT concurrently, the focus of treatment on admission (e.g., alcohol, drugs, substance abuse/mental health) clinical orientation of treatment programs utilized, or use of addiction pharmacotherapy (e.g. Naltrexone).

One strength of the study is the clinical detail, which enabled consideration of variables not previously explored, including social support, HIV/AIDS disease severity, and hepatitis C. A second strength is the prospective research quality of assessments and follow-ups. Third, the analysis adjusted for several potential confounding variables and used lagged analyses to better capture the temporal relationship between the independent and dependent variables. Finally, the study used a strong theory-based approach in the use of the Andersen model.

This research provides a better understanding of the factors that facilitate or impede SAT for HIV-infected persons, particularly factors not related to treatment need, which informs the development of strategies to increase utilization. Barriers to treatment include having a sexual orientation other than heterosexual and social supports that use alcohol and/or drugs. Sexual or physical abuse or trauma, the presence of HCV antibody, a social network that supports sobriety, homelessness, drug dependence, and depressive symptoms were factors with a positive association with SAT. Removing barriers to SAT for affected HIV-infected persons includes the consideration of systemic as well as individual level factors. Individuals can be helped to seek social networks that support sobriety. System level interventions may include the development of specialty interventions for populations at risk, such programs for those who are not heterosexual. The findings of this study may assist clinicians as they motivate people living with HIV/AIDS to utilize SAT as well as administrators as they consider system design, particularly for those who access both SAT and medical services.

Acknowledgments

References

Aday L, Andersen R. A framework for the study of access to medical care. Health Services Research. 1974; 9(3):208–220. [PubMed: 4436074]

Alterman AI, Droba M, McLellan AT. Response to day hospital treatment by patients with cocaine and alcohol dependence. Hospital & Community Psychiatry. 1992; 43(9):930–932. [PubMed: 1427705]

Alterman AI, McLellan AT, O'Brien CP, et al. Effectiveness and costs of inpatient versus day hospital cocaine rehabilitation. Journal of Nervous & Mental Disease. 1994; 182:157–163. [PubMed: 8113776]

Andersen RM. Revisiting the behavioral-model and access to medical care - Does it matter. Journal of Health and Social Behavior. 1995; 36(1):1–10. [PubMed: 7738325]

Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. Milbank Memorial Fund Quarterly. 1973; 51(1):95–124.

Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults—Evaluation of a short-form of the CES-D. American Journal of Preventive Medicine. 1994; 10:77–84. [PubMed: 8037935]

Bertholet N, Cheng DM, Samet JH, Quinn E, Saitz R. Alcohol consumption patterns in HIV-infected adults with alcohol problems. Drug Alcohol Depend. 2010; 112(1-2):160–163. [PubMed: 20579819]

Bing EG, Burnam A, Longshore D, Fleishman JA, Sherbourne CD, London AS, et al. Psychiatric disorders and drug use among human immunodeficiency virus-infected adults in the United States. Archives of General Psychiatry. 2001; 58(8):721–728. [PubMed: 11483137]

Burnam MA, Bing EG, Morton SC, Sherbourne C, Fleishman JA, London AS, et al. Use of mental health and substance abuse treatment services among adults with HIV in the United States. Archives of General Psychiatry. 2001; 58(8):729–736. [PubMed: 11483138]

Cochran BN, Cauce AM. Characteristics of lesbian, gay, bisexual, and transgender individuals entering substance abuse treatment. Journal of Substance Abuse Treatment. 2006; 30(2):135–146. [PubMed: 16490677]

Conigliaro J, Madenwald T, Bryant K, Braithwaite S, Gordon A, Fultz SL, et al. The veterans aging cohort study: Observational studies of alcohol use, abuse, and outcomes among human immunodeficiency virus-infected veterans. Alcoholism-Clinical and Experimental Research. 2004; 28(2):313–321.

Dausey DJ, Desai RA. Psychiatric comorbidity and the prevalence of HIV infection in a sample of patients in treatment for substance abuse. Journal of Nervous and Mental Disease. 2003; 191(1):10–17. [PubMed: 12544594]

Davis T, Crouch M, Long S, Jackson R, Bates P, George R, et al. Rapid assessment of literacy levels of adult primary care patients. Family Medicine Journal. 1991; 23(6):433–435.

Del Boca FK, Darkes J. The validity of self-reports of alcohol consumption: State of the science and challenges for research. Addiction. 2003; 98:1–12. [PubMed: 14984237]

Eaton WW, Kessler LG. Rates of Symptoms of Depression in a National Sample. American Journal of Epidemiology. 1981; 114(4):528–538. [PubMed: 7304583]

Ewing JA. Detecting Alcoholism - the Cage Questionnaire. JAMA-Journal of the American Medical Association. 1984; 252(14):1905–1907.

Farley M, Golding JM, Young G, Mulligan M, Minkoff JR. Trauma history and relapse probability among patients seeking substance abuse treatment. Journal of Substance Abuse Treatment. 2004; 27(2):161–167. [PubMed: 15450649]

Folstein MF, Folstein SE, McHugh PR. Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. Journal of Psychiatric Research. 1975; 12:189–198. [PubMed: 1202204]

Galvan FH, Bing EG, Fleishman JA, London AS, Caetano R, Burnam MA, et al. The prevalence of alcohol consumption and heavy drinking among people with HIV in the United States: Results from the HIV cost and services utilization study. Journal of Studies on Alcohol. 2002; 63(2):179–186. [PubMed: 12033694]

Galvan FH, Burnam MA, Bing EG. Co-occurring psychiatric symptoms and drug dependence or heavy drinking among HIV-positive people. Journal of Psychoactive Drugs. 2003; 35(1):153–160. [PubMed: 12825758]

Gatsfriend DR, Lu SH, Sharon E. Placement matching: Challenges and technical progress. Substance Use & Misuse. 2000; 35:2191–2213. [PubMed: 11138721]

Gastfriend, DR.; McLellan, AT. Treatment matching: Theoretical basis and practical implications. In: Samet, J.; Stein, M., editors. Medical Clinics of North America. NY: W B Saunders; 1997.

Goldberg RW, Seybolt DC, Lehman A. Reliable self-report of health service use by individuals with serious mental illness. Psychiatric Services. 2002; 53(7):879–881. [PubMed: 12096173]

Goldstein RB, Rotheram-Borus MJ, Johnson MO, Weinhardt LS, Remien RH, Lightfoot M, et al. Insurance coverage, usual source of care, and receipt of clinically indicated care for comorbid conditions among adults living with human immunodeficiency virus. Medical Care. 2005; 43(4): 401–410. [PubMed: 15778643]

Greenfield SF, Brooks AJ, Gordon SM, Green CA, Kropp F, McHugh RK, et al. Substance abuse treatment entry, retention, and outcome in women: A review of the literature. Drug and alcohol dependence. 2007; 86(1):1–21. [PubMed: 16759822]

Hasin DS, Grant BF. AA and other helpseeking for alcohol problems: Former drinkers in the U.S. general population. Journal of Substance Abuse. 1995; 7(3):281–292. [PubMed: 8749788]

Hser YI. Drug treatment counselor practices and effectiveness. Evaluation Review. 1995; 19:389–408.

Justice AC, Homes W, Gifford AL, et al. Development and validation of a self completed symptom index. Journal of Clinical Epidemiology. 2001; 54(1):77–90.

Kaskutas LA, Bond J, Humphreys K. Social networks as mediators of the effect of Alcoholics Anonymous. Addiction. 2002; 97(7):891–900. [PubMed: 12133128]

Kayo R, Rojas J. A closer look at how trauma and PTSD can effect substance abuse treatment for women. Alcoholism-Clinical and Experimental Research. 2004; 28(5):156A–156A.

Kelley JL, Petry NM. HIV risk behaviors in male substance abusers with and without antisocial personality disorder. Journal of Substance Abuse Treatment. 2000; 19(1):59–66. [PubMed: 10867302]

Kertesz SG, Larson MJ, Cheng DM, Tucker JA, Winter M, Mullins A, et al. Need and non-need factors associated with addiction treatment utilization in a cohort of homeless and housed urban poor. Medical Care. 2006; 44(3):225–233. [PubMed: 16501393]

Kilbourne AM, Justice AC, Rollman BL, et al. Clinical importance of HIV and depressive symptoms among veterans with HIV infection. Journal of General Internal Medicine. 2002; 17:512–520. [PubMed: 12133141]

Klinkenberg WD, Sacks S. Mental disorders and drug abuse in persons living with HIV/AIDS. AIDS Care-Psychological and Socio-Medical Aspects of Aids/HIV. 2004; 16:S22–S42.

Knowlton A, Arnsten J, Eldred L, Wilkinson J, Gourevitch M, Shade S, Dowling K, Purcell D. the INSPIRE Team. Individual, interpersonal, and structural correlates of effective HAART use among urban active injection drug users. Journal of Acquired Immunodeficiency Diseases. 2006; 41(4):486–492.

Kutner, MH.; Nachtsheim, CJ.; Neter, J. Applied Linear Regression Models. 4. McGraw-Hill Irwin; 2004.

Liang KY, Zeger SL. Longitudinal data-analysis using generalized linear-models. Biometrika. 1986; 73(1):13–22.

Loughlin A, Metsch L, Gardner L, Anderson-Mahoney P, Barrigan M, Strathdee S. Provider barriers to prescribing HAART to medically-eligible HIV-infected drug users. AIDS Care-Psychological and Socio-Medical Aspects of AIDS/HIV. 2004; 16(4):485–500.

Lucas GM, Gebo KA, Chaisson RE, Moore RD. Longitudinal assessment of the effects of drug and alcohol abuse on HIV-1 treatment outcomes in an urban clinic. AIDS. 2002; 16(5):767–774. [PubMed: 11964533]

Marlatt, GA. Relapse prevention: Theoretical rationale and overview of the model. In: Marlatt, GA.; Gordon, J., editors. A Self-Control Strategy for the Maintenance of Behavior Change. NY: Guilford; 1985a. p. 3-70.

Marlatt GA. Taxonomy of high-risk situations for alcohol relapse: Evolution and devlopment of a cognitive behavior model. Addiction. 1996a; 91(Suppl 1):S37–S49. [PubMed: 8997780]

Marlatt GA. Lest taxonomy become taxidermy: A comment on the relapse replication and extension project. Addiction. 1996b; 91(Suppl 1):147–154.

Marlatt, GA.; Barrett, K.; Daley, DC. Relapse prevention. In: Galanter, M.; Kleber, HD., editors. Textbook of Substance Abuse. 2nd. Washington, DC: American Psychiatric Press; 1999. p. 353-365.

Masson CL, Sorensen JL, Phibbs CS, Okin RL. Predictors of medical service utilization among individuals with co-occurring HIV infection and substance abuse disorders. Aids Care-Psychological and Socio-Medical Aspects of AIDS/HIV. 2004; 16(6):744–755.

Mattick RP, Jarvis T. In-patient setting and long duration for the treatment of alcohol dependence? Out-patient care is as good. Drug and Alcohol Review. 1994; 13:127–135. [PubMed: 16818400]

Mehta SH, Thomas DL, Sulkowski MS, et al. A framework for understanding factors that affect access and utilization of treatment for hepatitis C virus infection among HCV-mono-infected and HIV/HCV-co-infected injection drug users. AIDS. 2005; 19(3):S179–S189. [PubMed: 16251816]

McAuliffe WE, Dunn R. Substance abuse treatment needs and access in the USA: Interstate variations. Addiction. 2004; 99(8):999–1014. [PubMed: 15265097]

McKay JR, Cacciola J, McLellan AT, et al. An initial evaluation of the psychosocial dimensions of the ASAM criteria for inpatient and day hospital substance abuse rehabilitation. Journal of Studies on Alcohol. 1997; 58:239–252. [PubMed: 9130215]

McLellan, AT.; Weisner, C. Achieving the public health potential of substance abuse treatment: Implications for patient referral, treatment "matching" and outcome evaluation. In: Bickel, W.; DeGrandpre, R., editors. Drug Policy and Human Nature. PA: Williams & Wilkins; 1996.

McLellan, AT.; McKay, JR. Components of Successful Addiction Treatment. In: Graham, AW.; Schultz, TK.; Mayo-Smith, MF., editors. Principles of Addiction Medicine. 3. MD: American Society of Addiction Medicine, Inc; 2003. p. 429-442.

Meyerhoff DJ. Effects of alcohol and HIV infection on the central nervous system. Alcohol Research & Health. 2001; 25(4):288–298. [PubMed: 11910707]

Miller WR, Hester RK. Inpatient alcoholism treatment: Who benefits? American Psychologist. 1986; 41:794–805. [PubMed: 3017164]

Moore RD, Keruly JC, Chaisson RE. Differences in HIV disease progression by injecting drug use in HIV-infected persons in care. Jaids-Journal of Acquired Immune Deficiency Syndromes. 2004; 35(1):46–51.

Najavits LM, Crits-Christoph P, Dierberger A. Clinicians impact on the quality of substance use disorder treatment. Substance Use & Misuse. 2000; 35:2161–2190. [PubMed: 11138720]

Najavits LM, Weiss RD. Variations in therapist effectiveness in the treatment of patients with substance use disorders: An empirical review. Addiction. 1994; 89(6):679–688. [PubMed: 8069169]

Nelder JA, Wedderburn WM. Generalized linear models. Journal of the Royal Statistical Society Series a-General. 1972; 135(3):370.

Nunes D, Saitz R, Libman H, Cheng D, Vidaver J, Samet JH. Barriers to treatment of hepatitus C in HIV/HCV-coinfected adults with alcohol problems. Alcoholism: Clinical and Experimental Research. 2006; 30(9):1520–1526.

Orwat J, Samet JH, Cheng DM, Dentato MP, Saitz R. Factors associated with attendance in 12-step groups (Alcoholics Anonymous/Narcotics Anonymous) among adults with alcohol problems living with HIV/AIDS. Drug Alcohol Dependence. 2011; 113(2-3):165–171.

Orwat, J. HIV/AIDS in Massachusetts: A decade of change and challenge. Boston: Massachusetts Health Policy Forum; 2004.

Palepu A, Raj A, Horton NJ, Tibbetts N, Meli S, Samet JH. Substance abuse treatment and risk behaviors among HIV-infected persons with alcohol problems. Journal of Substance Abuse Treatment. 2005; 28(1):3–9. [PubMed: 15723726]

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):361–368. [PubMed: 14982549]

Palepu A, Tyndall M, Yip B, O'Shaughnessy MV, Hogg RS, Montaner JSG. Impaired virologic response to highly active antiretroviral therapy associated with ongoing injection drug use. JAIDS-Journal of Acquired Immune Deficiency Syndromes. 2003; 32(5):522–526.

Petry NM. Alcohol use in HIV patients: What we don't know may hurt us. International Journal of STD & AIDS. 1999; 10(9):561–570. [PubMed: 10492422]

Rabkin JG, Ferrando SJ, Jacobsberg LB, Fishman B. Prevalence of Axis I disorders in an AIDS cohort: A cross-sectional, controlled study. Comprehensive Psychiatry. 1997; 38(3):146–164. [PubMed: 9154370]

Rabkin JG, McElhiney MC, Ferrando SJ. Mood and substance use disorders in older adults with HIV/AIDS: Methodological issues and preliminary evidence. AIDS. 2004; 18:S43–S48. [PubMed: 15075497]

Radloff L. The CES-D Scale: a self-report depression scale for research in the general population. Applied Psychological Measurement. 1977; 1:385–401.

Robins LN, Wing J, Wittchen HU, Helzer JE, Babor TF, Burke J, et al. The composite international diagnostic interview. An epidemiologic instrument suitable for use in conjunction with different diagnostic systems and in different cultures. Archives of General Psychiatry. 1988; 45:1069–1077. [PubMed: 2848472]

Samet JH, Cheng DM, Libman H, Nunes DP, Alperen JK, Saitz R. Alcohol consumption and HIV disease progression. Journal of AIDS. 2007; 46(2):194–199. [PubMed: 17667330]

Samet JH, Phillips SJ, Horton NJ, Traphagen ET, Freedberg KA. Detecting alcohol problems in HIV-infected patients: Use of the CAGE questionnaire. AIDS Research and Human Retroviruses. 2004; 20(2):151–155. [PubMed: 15018702]

Smith KL, Horton NJ, Saitz R, Samet JH. The use of mini-mental state examination in recruitment for substance abuse research studies. Drug and Alcohol Dependence. 2006; 82(3):231–237. [PubMed: 16256278]

Song, J. HIV/AIDS & Homelessness. Nashville TN: National Health Care for the Homeless Council; 1999.

Tsui JI, Saitz R, Cheng DM, Nunes D, Libman H, Alperen JK, Samet JH. Awareness of hepatitis C diagnosis is associated with less alcohol use among persons co-infected with HIV. Journal of General Internal Medicine. 2007; 22(6):822–825. [PubMed: 17503108]

Wadsworth R, Stampneto AM, Halbrook BM. The role of sexual trauma in the treatment of chemically dependent women: Addressing the relapse issue. Journal of Counseling and Development. 1995; 73:401–406.

Weisner C, Matzger H, Tam T, Schmidt L. Who goes to alcohol and drug treatment? - Understanding utilization within the context of insurance. Journal of Studies on Alcohol. 2002; 63(6):673–682. [PubMed: 12529067]

Weissman MM, Sholomskas D, Pottenger M, Prusoff BA, Locke BZ. Assessing Depressive Symptoms in 5 Psychiatric Populations-Validation-Study. American Journal of Epidemiology. 1977; 106(3): 203–214. [PubMed: 900119]

Witbrodt J, Kaskutas LA. Does diagnosis matter? Differential effects of 12-step participation and social networks on abstinence. American Journal of Drug and Alcohol Abuse. 2005; 31(4):685–707. [PubMed: 16320441]

Zeger SL, Liang KY. Longitudinal data-analysis for discrete and continuous outcomes. Biometrics. 1986; 42(1):121–130. [PubMed: 3719049]

Table 1
Baseline Characteristics of 400 Subjects Recruited for HIV-LIVE Study (n=369)

	Variable	Study Sample No. (Percent)
SAT Utilization[d]	Any substance abuse treatment services[a]	167 (45.3%)
	Detoxification[b]	65 (17.6%)
	Residential	74 (20.1%)
	Outpatient counseling	63 (17.1%)
	Other treatment[c]	22 (6.0%)
Predisposing Characteristics: Traditional domains	Age, years, Mean (SD)	42.7 (7.5)
	Sex (female)	92 (24.9%)
	Race (White)	120 (32.5%)
	Race (Black)	158 (42.8%)
	Race (Other)	91 (24.7%)
	Married	24 (6.7%)
	High school graduate [d]	240 (65.0%)
	Lives alone	106 (28.7%)
Predisposing Characteristics: Vulnerable domains	Born in the USA	323 (87.5%)
	Literacy, High school level [e]	235 (63.7%)
	Gay, Bisexual, Other Sexual Orientation	
		121 (32.8%)
	Any traumatic abuse, ever [f]	297 (80.4%)
	HIV Severity Variables	
	Any opportunistic conditions [g]	61 (16.6%)
	HIV Quality of Life Scale, Mean (SD) [h]	9.6 (4.9)
	CD4 Count (cells/mm3), Mean (SD)	462.1 (299.4)
	HCV antibody present	214 (58.0%)
Enabling Resources: Traditional Domain	Employment status (unemployed) [g]	271 (73.4%)
	Social support uses alcohol or drugs	
	Social support drinks alcohol	228 (61.7%)
	Social support uses drugs	174 (47.3%)
	Social support helps with sobriety	327 (88.8%)
	Currently taking anti-HIV medications	235 (63.7%)
Enabling Resources: Vulnerable Domain	Received disability [g]	
		271 (73.4%)
	Homeless [g]	
		89 (24.1%)
Need/ Severity	Alcohol Diagnosis [g, i]	43 (11.8%)
	Drug dependence diagnosis [g]	159 (43.1%)

Variable	Study Sample No. (Percent)
Depressive symptoms [j]	230 (62.3%)
In jail [g]	67 (18.2%)

[a] Any SAT was assessed by "…did you receive any substance abuse treatment services?"

[b] Detoxificaion is defined as any in- our out- patient program.

[c] Other treatment such as doctor, priest or rabbi, or an employee assistance program.

[d] High school graduate (12 or more years of education).

[e] Literacy score > 60 (Davis et al., 1991).

[f] Sexual or physical trauma or abuse.

[g] In the past 6 months.

[h] Justice et al. (2001) and Kilbourne et al. (2002).

[i] Alcohol diagnosis assessed using Composite International Diagnostic Interview Short Form (CIDI-SF) (Kessler et al., 1998).

[j] Measure of depressive symptoms where Center for Epidemiologic Studies Depression Scale (CES-D) score 16 indicates substantial depressive symptoms.

Table 2
Factors Associated with Any Substance Abuse Treatment[¥]

	Variable	Unadjusted Model Odds Ratio (95% CI)	Fully Adjusted Model (N=1,153) Odds Ratio (95% CI)
Predisposing Characteristics: Traditional domains	Age [a]	1.10 (0.88, 1.38)	0.98 (0.95, 1.01)
	Sex (female)	1.74 (1.35, 2.25)***	1.24 (0.75, 2.03)
	RACE (Black)	1.03 (0.80, 1.32)	1.16 (0.72, 1.89)
	(Other)	1.40 (1.03, 1.89)*	0.85 (0.45, 1.61)
	Married	1.49 (0.99, 2.31)	1.67 (0.83, 3.34)
	Partnered, not married	1.33 (1.06, 1.68)*	1.35 (0.95, 1.91)
	High school graduate [b]	0.70 (0.55, 0.88)**	0.96 (0.62, 1.47)
Predisposing Characteristics: Vulnerable domains	Lives alone	0.47 (0.37, 0.61)***	0.75 (0.54, 1.05)
	Born in the USA	0.74 (0.52, 1.03)	0.62 (0.3, 1.29)
	Literacy, High school level [c]	0.93 (0.73, 1.18)	1.27 (0.82, 1.95)
	Gay, Bisexual, Other Sexual Orientation	0.29 (0.22, 0.38)***	0.46 (0.29, 0.72)***
	Any traumatic abuse, ever [d]	1.57 (1.18, 2.09)**	2.12 (1.22, 3.69)
	HIV STATUS VARIABLES		
	Any opportunistic conditions [e]	1.29 (0.99, 1.69)	0.72 (0.50, 1.04)
	HIV Quality of Life Scale [f]	1.20 (1.59, 2.51)***	1.01 (0.97, 1.05)
	CD4 Count [g]	0.86 (0.68, 1.08)	0.95 (0.90, 1.00)*
	HCV antibody present	4.12 (3.21, 5.25)***	3.37 (2.24, 5.06)***
Enabling Resources: Traditional Domain	Unemployed [e]	2.82 (2.13, 3.73)***	1.29 (0.88, 1.9)
	Social support uses alcohol or drugs	0.58 (0.45, 0.74)***	0.62 (0.45, 0.83)**
	Social support helps with sobriety	2.08 (1.42, 3.04)***	1.92 (1.28, 2.87)**
	Lives without kids	1.04 (0.71, 1.54)	1.89 (1.09, 3.27)*
	Currently taking anti-HIV medications	0.67 (0.53, 0.84)***	0.96 (0.68, 1.36)
Enabling Resources: Vulnerable Domain	Received disability [e]	2.11 (1.56, 2.86)***	0.87 (0.52, 1.46)
	Homeless [e]	3.25 (2.42, 4.36)***	2.4 (1.6, 3.62)***
Need/ Severity	Alcohol Diagnosis [e, h]	0.84 (0.59, 1.19)	0.36 (0.19, 0.67)**
	Drug dependence diagnosis	4.04 (3.14, 5.19)***	2.64 (1.88, 3.70)***
	Depressive symptoms [i]	2.88 (2.26, 3.68)***	1.52 (1.08, 2.15)*
	In jail [c]	2.34 (1.64, 3.35)***	0.99 (0.58, 1.70)

*
p<.05

**
p<.01

***
p<.001

¥ Unit of analysis is person-observation period. These are observations not patients.

a Age is a dichotomous variable at median (44.5 years).

b High school graduate is 12 or more years of education)

c Literacy score > 60 (Davis et al., 1991).

d History of sexual or physical traumatic abuse.

e Past 6 months; time varying.

f Justice et al. (2001) and Kilbourne et al. (2002).

g CD4 count a dichotomous variable at median (407.5 cells/mm3).

h Alcohol diagnosis using Composite International Diagnositc Interview (CIDI) (Kessler et al., 1998).

i Measure of depressive symptoms where a CESD score   16 indicate depressive symptoms.

Table 3

Factors Associated with types of SAT [¥]

	Variable	Detox Adjusted OR (95% CI)	Residential Adjusted OR (95% CI)	Outpatient Adjusted OR (95% CI)	Other treatment Adjusted OR (95% CI)
		(N=1,153)	(N=1,153)	(N=1,153)	(N=1,153)
Predisposing Characteristics: Traditional domains	Age [a]	**0.96 (0.92, 0.99)** *	0.98 (0.95, 1.02)	1.01 (0.98, 1.04)	0.97 (0.93, 1.02)
	Sex (female)	0.74 (0.41, 1.33)	0.77 (0.42, 1.41)	1.59 (0.93, 2.71)	0.84 (0.38, 1.90)
	RACE (Black)	1.56 (0.94, 2.59)	1.7 (0.93, 3.09)	1.61 (0.95, 2.72)	1.59 (0.78, 3.24)
	(Other)	0.73 (0.34, 1.57)	0.49 (0.2, 1.2)	1.02 (0.46, 2.25)	**2.45 (1.03, 5.83)** *
	Married	1.06 (0.45, 2.46)	0.45 (0.15, 1.39)	1.13 (0.54, 2.38)	1.81 (0.67, 4.88)
	Partnered, not married	1.02 (0.62, 1.68)	0.63 (0.38, 1.03)	1.36 (0.94, 1.97)	1.33 (0.76, 2.35)
	High school graduate [b]	1.18 (0.76, 1.84)	1.16 (0.67, 2.02)	1.41 (0.83, 2.42)	0.97 (0.53, 1.78)
Predisposing Characteristics: Vulnerable domains	Lives alone	0.99 (0.58, 1.68)	**0.48 (0.27, 0.86)**	0.93 (0.61, 1.4)	0.82 (0.40, 1.70)
	Born in the USA	0.86 (0.35, 2.09)	0.57 (0.21, 1.55)	0.55 (0.21, 1.42)	1.90 (0.61, 5.97)
	Literacy, High school level [c]	1.14 (0.7, 1.87)	1.18 (0.67, 2.1)	1.32 (0.8, 2.2)	1.27 (0.62, 2.6)
	Gay, Bisexual, Other Sexual Orientation	0.63 (0.37, 1.09)	0.59 (0.32, 1.11)	0.86 (0.52, 1.44)	0.82 (0.34, 1.98)
	Any traumatic abuse, ever [d]	1.79 (0.88, 3.61)	1.78 (0.9, 3.49)	1.47 (0.77, 2.81)	2.13 (0.94, 4.86)
	HIV STATUS VARIABLES				
	Any opportunistic conditions [e]	1.29 (0.79, 2.09)	0.65 (0.39, 1.07)	0.77 (0.5, 1.17)	0.56 (0.25, 1.28)
	HIV Quality of Life Scale [f]	0.98 (0.93, 1.03)	1.03 (0.98, 1.08)	1.02 (0.97, 1.07)	1 (0.93, 1.08)
	CD4 Count [g]	**0.91 (0.84, 0.99)** *	0.99 (0.92, 1.06)	1 (0.93, 1.07)	1 (0.91, 1.11)
	HCV antibody present	**2.02 (1.22, 3.33)** **	**2.26 (1.27, 4)**	**3.2 (1.88, 5.43)** ***	1.18 (0.64, 2.17)
Enabling Resources: Traditional Domain	Unemployed [e]	0.8 (0.45, 1.41)	1.28 (0.71, 2.3)	1.16 (0.69, 1.96)	**2.55 (1.09, 5.96)** *
	Social support uses alcohol or drugs	1.38 (0.87, 2.19)	**0.46 (0.29, 0.71)**	**0.57 (0.39, 0.85)** **	0.86 (0.5, 1.49)
	Social support helps with sobriety	1.1 (0.61, 2.01)	**2.15 (1.05, 4.41)**	1.58 (0.85, 2.96)	**5.21 (1.34, 20.32)** *
	Lives without kids	1.63 (0.62, 4.24)	**15.58 (2.13, 114.16)**	**2.22 (1.07, 4.61)** *	1.19 (0.4, 3.55)
	Currently taking anti-HIV medications	0.75 (0.48, 1.16)	0.98 (0.61, 1.58)	0.93 (0.61, 1.41)	0.7 (0.38, 1.26)

Variable	Detox Adjusted OR (95% CI)	Residential Adjusted OR (95% CI)	Outpatient Adjusted OR (95% CI)	Other treatment Adjusted OR (95% CI)
	(N=1,153)	(N=1,153)	(N=1,153)	(N=1,153)
Enabling Resources: Vulnerable Domain				
Received disability [e]	1.31 (0.65, 2.64)	0.7 (0.36, 1.4)	1.22 (0.63, 2.34)	1.64 (0.64, 4.18)
Homeless [e]	**3.29 (2.00, 5.41)** ***	**2.05 (1.26, 3.33)**	**1.84 (1.15, 2.97)** *	1.71 (0.93, 3.15)
Need/ Severity				
Alcohol Diagnosis [e, h]	0.78 (0.38, 1.58)	1.2 (0.58, 2.46)	0.49 (0.24, 1)	0.63 (0.23, 1.73)
Drug dependence diagnosis	**3.31 (2.00, 5.49)** ***	**2.26 (1.42, 3.59)**	**1.7 (1.13, 2.57)** *	1.35 (0.78, 2.33)
Depressive symptoms [i]	**2.76 (1.58, 4.82)** ***	1.35 (0.72, 2.52)	1.56 (0.96, 2.54)	0.94 (0.51, 1.74)
In jail [c]	1.5 (0.76, 2.93)	1.5 (0.8, 2.81)	1.13 (0.61, 2.08)	0.94 (0.44, 2.03)

*
p<.05

**
p<.01

***
p<.001

¥ Unit of analysis is person-observation period. These are observations not patients.

[a] Age is a dichotomous variable at median (44.5 years).

[b] High school graduate is 12 or more years of education)

[c] Literacy score > 60 (Davis et al., 1991).

[d] History of sexual or physical traumatic abuse.

[e] Past 6 months; time varying.

[f] Justice et al. (2001) and Kilbourne et al. (2002).

[g] CD4 count a dichotomous variable at median (407.5 cells/mm3).

[h] Alcohol diagnosis using Composite International Diagnositc Interview (CIDI) (Kessler et al., 1998).

[i] Measure of depressive symptoms where a CESD score 16 indicate depressive symptoms.