Substance Use Stigma and Antiretroviral Therapy Adherence Among a Drug-Using Population Living with HIV

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Abstract

Among people living with HIV (PLWH), HIV-related stigma predicts nonadherence to antiretroviral therapy (ART); however, the role of stigma associated with drug use is largely unknown. We examined the association between substance use (SU) stigma and optimal ART adherence in a sample of 172 self-reported HIV-infected drug users. Participants completed surveys on SU, stigma, and ART adherence. The three substance classes with the greatest number of participants exhibiting moderate/high-risk scores were for cocaine/crack cocaine (66.28%), cannabis (64.53%), and hazardous alcohol consumption (65.70%). Multivariable logistic regression was conducted to investigate associations between levels of SU stigma and optimal ART adherence, adjusting for sociodemographic characteristics, severity of illicit drug use (alcohol, smoking and substance involvement screening test) and alcohol use severity (Alcohol Use Disorders Identification Test-C), HIV-related stigma, and social support. The odds of optimal adherence among participants experiencing moderate [Adjusted Odds Ratio (AOR)=0.36, $p=0.039$] and very high (AOR=0.25, $p=0.010$) levels of anticipated SU stigma were significantly lower than participants experiencing low levels of anticipated SU stigma. No other stigma subscales were significant predictors of ART adherence. Interventions aiming to improve ART adherence among drug-using PLWH need to address anticipated SU stigma.

Keywords: stigma, drug use, substance-related disorders, ART adherence

Introduction

PEOPLE LIVING WITH HIV (PLWH) who use drugs are the population consistently least likely to maintain adherence to antiretroviral therapy (ART) and reach viral suppression.^{1–3} PLWH who use drugs may face intersectional stigmas, including those related to HIV and substance use (SU) disorders (SU stigma).^{4,5} Stigma is increasingly recognized as a fundamental cause of population health, as it acts to reduce several kinds of social and health-related capital.^{6,7} With the growing drug use epidemic in the United States, researchers have begun to call for evidence-based interventions to reduce the impact of SU stigma on the health of drug users.^{8–10}

Goffman defined stigma in a broad sense as an attribute that is deeply discrediting and reduces its bearer from a whole and usual person to one of tainted social status.¹¹ Key pop-

ulations disproportionately affected by the HIV epidemic may face multiple stigmas: stigma related to HIV infection and stigma related to other characteristics or behaviors (e.g., sex work, drug use, minority sexual or gender status). Stigma can manifest through several distinct dimensions (e.g., enacted stigma, perceived community stigma, anticipated stigma, and internalized stigma).¹² Enacted stigma refers to direct experiences of prejudice, stereotypes, or discrimination. Perceived community stigma refers to a person's perception of the extent and intensity of stigmatizing attitudes that exist in the community. Anticipated stigma refers to the degree to which people expect that they will experience enacted stigma or discrimination based on their stigmatized status. Internalized stigma refers to the internalization of community prejudice and stereotypes and the application of these to one's self.

A plethora of research describes substance-related disorders as more stigmatized than other health conditions. More

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so than mental illness, substance-related disorders are viewed as a disease of morality, attributable to a lack of willpower, immoral lifestyles, or a general weakness of character.¹³ Despite advancements in understanding of the causes and treatment of substance-related disorders, the stigma associated with drug involvement remains.^{13,14} A significant body of research emphasizes the important contribution of SU stigma to negative health outcomes.^{15,16} For example, it is known to negatively affect access to SU treatment services and their utilization,^{17–19} as well as harm reduction services.^{20–22} Further, SU stigma has been shown to predict future drug use,^{23,24} HIV risk behaviors,²⁵ and attrition from SU treatment programs.²⁶

While much is known about the role of HIV-related stigma as a barrier to ART adherence,^{27–29} little research exists examining the role of SU stigma and ART adherence behaviors. While HIV-related stigma has garnered significant research attention and research related to SU stigma is burgeoning,³⁰ research on SU stigma related to drug use *among* PLWH is scant. Because of the significant stigma surrounding drug abuse and its known detrimental effects on health behaviors, there is reason to believe that SU stigma may negatively impact ART adherence, although this has not yet been documented. To address this gap in the literature, we investigate the role of SU stigma on ART adherence among drug-using PLWH. Specifically, we hypothesize that higher levels of SU stigma will be related to lower odds of optimal ART adherence.

Methods

Data collection

Between February 2014 and January 2015, 205 drug-using PLWH were referred for eligibility screening through recruitment by referral from clinic staff and snowball sampling. Participants were eligible for inclusion if they self-reported all of the following during telephone screening: (1) older than 18 years, (2) HIV infected, (3) use of illicit drugs or binge drinking in the prior 6 months, and (4) receipt of HIV care from the university-affiliated outpatient HIV clinic. One hundred eighty-eight drug-using PLWH were deemed eligible based on the above criteria. Among those eligible to participate, 172 completed the study questionnaire (response rate = 91.49%) covering a wide range of topics related to drug use, HIV care, stigma, and psychosocial resources. Surveys were administered through a self-administered questionnaire administered on a tablet computer (iPad) and took ~1 h to complete, on average. Ethical approval for this study was provided by the Institutional Review Board (IRB) at the University of Alabama at Birmingham.

Measures

ART adherence. To assess adherence, a single-item self-report measure was administered as part of the iPad questionnaire.³¹ Each participant was asked “In the last 30 days, how good a job did you do at taking your HIV medicines in the way you were supposed to?” Participants responded using a six-point scale ranging from 1 (very poor) to 6 (excellent). Four participants did not answer this question. Self-reported adherence scores were not normally distributed, with 68 reporting less than excellent adherence. Due to the

non-normal distribution and prior research that has consistently demonstrated the negative predictive value of any self-reported nonadherence (i.e., less than excellent adherence),³² this item was dichotomized as optimal adherence (excellent adherence: $n=68$) and suboptimal adherence (anything less than excellent: $n=100$).

SU stigma. The Substance Abuse Self-Stigma Scale is a 40-item scale designed to measure social stigma related to drug involvement and includes four subscales.³³ Two subscales measure types of stigma, the Self-Devaluation (internalized SU stigma) subscale and the Fear of Enacted SU-Related Stigma (anticipated SU stigma) subscale, and two measure negative stigma coping behaviors, the Values Disengagement subscale and SU-Stigma Avoidance subscale.

Internalized SU stigma. The Self-Devaluation subscale (Cronbach’s $\alpha < 0.94$) was used to measure internalized SU stigma. This subscale consists of eight items and uses a five-point Likert-type rating system (never or almost never, rarely, sometimes, often, and very often), with higher values indicating greater internalized SU stigma. Questions in this subscale measure internalized stigma related to drug use and include such items as “I feel ashamed of myself” and “I have the thought that I deserve the bad things that have happened to me.”

Anticipated SU stigma. We used the Fear of Enacted Stigma subscale ($\alpha = 0.907$) to measure anticipated SU stigma.³³ This subscale consists of eight items describing possible ways people may react to someone with a history of drug involvement. Participants were asked to indicate how many people they think would react to them as described, using a five-point Likert-type rating system. Response categories included few people (0–20%), some people (20–40%), many people (40–60%), most people (60–80%), or almost everyone (80–100%). Questions in this subscale include items such as “If someone were to find out about my history of SU, they would doubt my character” and “A job interviewer wouldn’t hire me if I mentioned my substance history in a job interview.” Higher values indicate greater anticipated SU stigma.

Stigma avoidance. The Stigma Avoidance subscale (Cronbach’s $\alpha < 0.87$; 15 items) measures the avoidance of negative emotions associated with stigma through avoiding situations in which one may anticipate experiencing stigma. Participants were presented with 15 statements and were asked to indicate how often given statements are true to them using a five-point Likert-type rating system (never or almost never true, rarely true, sometimes true, often true, and always or almost always true). Sample statements include “I put a lot of effort into hiding my substance use history” and “I avoid situations that make me feel different.” Higher values indicate greater SU stigma avoidance.

Values disengagement. The Values Disengagement subscale (Cronbach’s $\alpha < 0.84$; 10 items) measures attempts at avoiding negative emotions associated with stigma by withdrawing from situations they fear judgment, or that they “confirm” a stereotype. This scale includes 10 items and participants are asked to indicate how often given statements

are true to them using the same five-point Likert-type as described above. Questions in the Values Disengagement subscale include “I pursue important goals in life, even when I fear I might not follow through,” “Even if I knew the employer didn’t like to hire people in recovery, “I would still apply for a job if it interested me,” and “I do things that are good for me, even if I feel like I don’t deserve it.” Items in the Values Disengagement scale are reverse coded such that higher values indicate greater values disengagement.

Data transformation. We created a mean stigma score of each SU stigma subscale by taking the mean of the responses for the items for participants who had nonmissing data for at least 80% of the scale items. Mean stigma scores were then normalized to a 0–100 scale. Scores were then used to create categorical variables in quartiles based on the distribution of scores in the overall respondent group per scale distribution. Thus, SU stigma subscale scores are broken into four categories representing scores below the 25th percentile (low SU stigma), between the 25th and 50th percentiles (moderate SU stigma), between the 50th and 75th percentiles (high SU stigma), and above the 75th percentile (very high SU stigma).

Control variables

HIV-related stigma. We assessed participants’ perceptions and experiences of HIV-related stigma using the HIV Stigma Scale.³⁴ This scale contains 40 items that are rated on a scale of 1 (strongly disagree) to 4 (strongly agree). We created a mean HIV stigma score by calculating the mean of responses for participants who had nonmissing data for at least 30 of the 40 HIV Stigma Scale items. Mean HIV stigma scores were then transformed to the original scale to create an overall measure of HIV-related stigma ranging from 40 to 160, with higher scores indicating greater levels of HIV-related stigma.

Drug use. We measured SU using the Alcohol, Smoking and Substance Involvement Screening Test, version 3 (ASSIST v3).³⁵ The ASSIST v3 is designed to screen for the presence and severity of SU. Illicit substances assessed include cannabis, cocaine/crack, amphetamine-type stimulants, inhalants, hallucinogens, and nonprescription use of sedatives and opioids. For each specific illicit substance, eight questions are asked. The first item elicits information about lifetime use of substances and the second item asks about frequency of use during the prior 3 months. Items 3 through 7 elicit information related to the diagnostic criteria of substance dependence and the last item (item 8) elicits information about injection drug use. For this study, several different domains were derived from the ASSIST v3 responses.

Global continuum of illicit drug risk. The global continuum of illicit drug risk (ASSIST-GCIDR) was calculated by summing response weights of items 1 through 8 across all illicit substance classes (range, 0–273) and provides a measure of overall SU severity (Cronbach’s $\alpha=0.89$).

Specific substance involvement and risk. The “Specific Substance Involvement” (SSI) score was calculated by summing response weights of items 2 through 8 for each

illicit substance (range, 0–39). Each scale exhibited good reliability (Cronbach’s alphas ranging from 0.83 to 0.93), with the exception of the SSI inhalant scale (Cronbach’s $\alpha=0.391$). Then, we followed recommended guidelines^{35,36} for the creation a “moderate/high risk” (SSI score of 4–39) for each illicit substance.

Specific substance recent use. For each illicit substance, item 2 elicits the frequency of use during the past 30 days (never, once or twice, monthly, weekly, daily, or almost daily). Responses to this item were dichotomized to reflect any use during the last 90 days (never vs. at least once) for each illicit substance.

Injection drug use. Item 8 asked participants if they have ever used any drug by injection. Response options included “no never,” “yes, but not in the last 3 months,” and “yes, in the last 3 months.” This item was used to create a measure of lifetime injection drug use (no never vs. yes) and a measure of recent injection drug use (no recent injection use vs. injection drug use in the last 3 months).

Alcohol use

Alcohol use severity was measured using the Alcohol Use Disorders Identification Test (AUDIT-C).³⁷ The AUDIT-C is a three-item alcohol-screening tool measuring frequency of alcohol consumption, number of drinks per drinking day, and frequency of five or more drinks per occasion. Two measures of alcohol use were derived from AUDIT-C scores.

Alcohol use severity. We generated a continuous measure of alcohol use severity by summing the three AUDIT-C items. Alcohol use severity scores range from 0 to 12 (Cronbach’s $\alpha=0.76$).

Hazardous drinking. We generated a dichotomous measure of hazardous drinking following the recommended guidelines (AUDIT-C score ≥ 4 for men or ≥ 3 for women) for identification of hazardous drinking.

Social support

We controlled for social support because previous research from the HIV stigma literature indicates that social support may be an important buffer between stigma and ART adherence.³⁸ We used the four subscales of the Medical Outcomes Study (MOS) Social Support Survey to measure social support³⁹ consisting of the following: (1) emotional/informational (E/I) support; (2) tangible support; (3) affectionate support; and (4) positive social interaction (PSI support). A mean score was created for each subscale by taking the mean of the responses for the items of participants who had no more than one missing item per subscale. Higher scores indicate higher social support in each given subscale. Cronbach’s alphas were E/I support=0.96; tangible support=0.85; PSI=0.92; and affectionate support=0.90.

In addition, we controlled for the following socio-demographic characteristics: age (continuous), gender (dichotomous: males/nonmales), and education [dichotomous: less than a high school education/high school education or General Equivalency Diploma (GED) and greater].

Statistical analyses

Descriptive statistics were computed, consisting of percentages, proportions, means, and standard error estimates for the independent and dependent variables in the study. Bivariate analyses included statistical tests of differences between participants with optimal and without optimal ART adherence for levels of SU stigma subscales of anticipated stigma, internalized stigma, values disengagement, and stigma avoidance as well as for covariates of age, race, education, SU severity (ASSIST-GCIDER), alcohol use severity (AUDIT-C), and scores on social support subscales. We used the Kruskal-Wallis rank sum test to investigate bivariate differences in continuous variables and optimal adherence to ART.^{40,41} We used chi-square tests to identify bivariate differences between dichotomous and categorical variables. Multivariable logistic regressions were conducted to investigate statistical associations between exposure to SU stigmas and optimal adherence after adjusting for potential confounders of HIV-related stigma, age, race, sex, education, SU severity (ASSIST-GCIDER), alcohol use severity (AUDIT-C), and social support.⁴² All statistical analyses were conducted using STATA version 14.⁴³

Results

Table 1 presents descriptive statistics of the sample in terms of illicit SU and alcohol use. The mean ASSIST-GCIDER score was 36.91 (SE=2.40). The two drug classes with the greatest number of participants exhibiting moderate/high-risk scores were cocaine/crack cocaine ($n=114$, 66.28%) and cannabis ($n=111$, 64.53%). In addition, 19.77% of participants exhibited moderate/high-risk use for amphetamine-type stimulants, 18.02% for nonmedical sedative use, and 13.95% for nonmedical use of opioids. Similar patterns were observed concerning recent use, with cannabis ($n=113$, 65.70%) and cocaine/crack cocaine ($n=82$, 47.67%) being the most commonly reported drugs used in the last 90 days, followed by sedatives (18.6%), amphetamine-type stimulants (13.37%), and opioids (12.79%). Almost half (49.42%) of our sample reported poly-illicit drug (use of two or more illicit drugs) use in the past 90 days, 19.19% reported ever-injecting illicit drugs, and 4.65% reported having injected illicit drugs in the last 30 days.

The overall average AUDIT-C score, measuring alcohol use severity, was 4.10 (SE=0.24). The average AUDIT-C score was above the recommended cutoff of ≥ 4 for men ($M=4.36$, SE=0.32) and ≥ 3 for women ($M=3.60$, SE=0.35). Of the 172 participants in the sample, 113 (65.7%) of the sample met the criteria for hazardous drinking (66.96% of males and 63.16% of females). One hundred percent of hazardous drinkers reported the use of one or more illicit drugs in the past 90 days. Among hazardous drinkers, 89.4% exhibited moderate/high-risk SSI scores for cannabis use and 66.4% exhibited moderate/high-risk SSI scores for cocaine/crack cocaine use. An equal percent (18.6%) of hazardous drinkers in our sample exhibited moderate/high-risk SSI scores for the use of amphetamine-type stimulants and the nonmedical use of sedatives, and 12.4% exhibited moderate/high risk for non-medical use of opioids.

Table 2 presents descriptive statistics and bivariate relationships between SU stigmas, control variables, and optimal adherence. The mean age of the sample was 45 years (SE=0.77) and more than three-quarters identified as African

American (78.36%, $n=134$). Our sample was predominantly male (66.86%) and more than a quarter of the sample reported having less than a high school education (27.49%, $n=47$). The mean HIV stigma score was 104.53 (SE=2.00). Mean social support scores were tangible support=3.50 (SE=0.09), PSI support=3.59 (SE=0.09), E/I support=3.74 (SE=0.09), and affectionate support=3.73 (SE=0.10).

Four participants did not respond to the question designed to measure adherence to ART medications. Of those who responded, 59.52% reported less than optimal adherence. The bivariate association between anticipated SU stigma and optimal ART adherence approached significance ($p=0.079$). Specifically, more than a quarter of participants who did not achieve optimal ART adherence were in the very high anticipated SU stigma group (27%, $n=27$) compared with 17.65% ($n=12$) in the optimal ART adherence group. No other stigma subscales approached significance. Alcohol severity scores were significantly lower among participants with optimal ART adherence compared with participants with suboptimal adherence ($M=3.59$ vs. $M=4.51$, $p=0.035$).

Multivariate Analyses

Table 3 presents results from logistic regression analyses of anticipated SU stigma and optimal adherence to ART medication, after adjusting for the covariates of socio-demographic characteristics, HIV-related stigma, alcohol use severity (AUDIT-C), SU severity (ASSIST-GCIDER), and social support. The adjusted odds of optimal ART adherence among participants experiencing moderate [Adjusted Odds Ratio (AOR)=0.36, 95% confidence interval (CI)=0.14, 0.95, $p=0.039$] and very high (AOR=0.25, 95% CI=0.09, .72, $p=0.010$) levels of anticipated SU stigma were significantly lower than among participants experiencing low levels of anticipated SU stigma. These results support our hypothesis that higher levels of anticipated SU stigma are associated with lower odds of optimal ART adherence. Regarding control variables, only one measure of social support evidenced a significant association with optimal adherence. Specifically, we observed a significant association between PSI and lower odds of optimal adherence to ART medication (AOR=0.38, 95% CI=0.17, 0.83, $p=0.015$). Multivariate regression analyses did not detect significant results between the other SU stigma subscales (internalized stigma, stigma avoidance, and value disengagement) and optimal adherence. Tables containing nonsignificant multivariate logistic regression results are located in Appendix Tables A1–A3.

Discussion

HIV-related stigma is known to influence ART adherence.³⁸ However, in the United States, HIV is concentrated among people who experience other types of stigma. Other types of stigma experienced by PLWH may also have a negative impact on ART adherence. Results of this study contribute to a greater understanding of the association between stigma related to drug use and ART adherence among PLWH. Among our sample of substance-using PLWH, anticipated SU stigma was associated with suboptimal ART adherence, even when controlling for the influence of HIV-related stigma. In addition to the relationship between stigma and adherence, we also observed a significant negative association between social support and optimal ART adherence

TABLE 1. DESCRIPTIVE CHARACTERISTICS OF ILLICIT SUBSTANCE USE AND ALCOHOL USE (N=172)

	N (%)		N (%)
GCIDR (ASSIST-GCIDR) ^a	36.91 (2.40)	Recent (90 days) substance(s) used	
		Cannabis	113 (65.70)
SSI (ASSIST- SSI) Scores		Cocaine/crack	82 (47.67)
Cocaine/crack ASSIST- SSI ^a	13.54 (0.97)	Sedatives	32 (18.60)
Moderate/high risk (ASSIST-SSI ≥4)	114 (66.28)	Amphetamine-type stimulants	23 (13.37)
		Opioids	22 (12.79)
Amphetamine-type stimulants ASSIST- SSI ^a	3.21 (0.60)	Other illicit substances ^b	7 (4.07)
Moderate/high risk (ASSIST-SSI ≥4)	34 (19.77)	Poly-illicit drug use ^c	85 (49.42)
Cannabis ASSIST- SSI ^a	10.44 (0.78)		
Moderate/high risk (ASSIST-SSI ≥4)	111 (64.53)	Alcohol use (AUDIT-C)	
		Overall alcohol use severity ^a	4.10 (0.24)
Inhalants ASSIST- SSI ^a	0.06 (0.05)	Male alcohol use severity ^a	4.36 (0.32)
Moderate/high risk (ASSIST- SSI ≥4)	1 (0.58)	Female alcohol use severity ^a	3.60 (0.35)
		Overall hazardous alcohol consumption (male ≥4; female ≥3)	113 (65.70)
Sedatives and sleeping pills ASSIST- SSI ^a	3.30 (0.61)	Male hazardous alcohol consumption (AUDIT-C ≥4)	77 (66.96)
Moderate/high risk (ASSIST-SSI ≥4)	31 (18.02)	Female hazardous alcohol consumption (AUDIT-C ≥3)	36 (63.16)
Hallucinogen ASSIST-SSI ^a (2 missing)	0.77 (0.29)		
Moderate/high risk (ASSIST-SSI ≥4)	8 (4.71)	SU and risk among hazardous drinkers ^d	
		Hazardous drinking + any recent illicit drug ^c	113 (100.00)
Opioid ASSIST- SSI ^a	2.73 (0.58)	Hazardous alcohol consumption + cannabis risk ^e	101 (89.40)
Moderate/high risk (ASSIST-SSI ≥4)	24 (13.95)	Hazardous alcohol consumption + cocaine/crack risk ^e	75 (66.40)
		Hazardous alcohol consumption + sedative risk ^e	21 (18.60)
Injection drug use		Hazardous alcohol consumption + amphetamine-type stimulant risk ^e	21 (18.60)
Ever-injected drugs	33 (19.19)	Hazardous alcohol consumption + opioid risk ^e	14 (12.40)
Recently injected drugs ^f	8 (4.65)	Hazardous alcohol consumption + other illicit substance risk ^e	6 (5.30)

^aM(SE) presented for continuous variables.^bInhalants and hallucinogens.^cUse of two or more illicit substances in the past 90 days.^dPercent values presented use of the total number of hazardous drinkers (*n*=113) as determined by AUDIT-C cutoffs (males ≥4; females ≥3).^eSubstance-specific risk represents moderate/high risk determined by ASSIST SSI scores ≥4.^fDuring the past 30 days.

ASSIST, alcohol, smoking and substance involvement screening test; AUDIT-C, Alcohol Use Disorders Identification Test; GCIDR, global continuum of illicit drug risk; SSI, specific substance involvement; SU, substance use.

in the adjusted analyses. This finding contrasts with a large body of research showing greater social support is associated with better ART adherence.^{44–46} While not statistically significant, other forms of social support measured in our study were positively related to greater odds of adherence. Future empirical inquiry examining the mediational relationship between different types of social support and SU stigma could determine if the additional resources provided by social support attenuate the deleterious effects of SU stigma on ART adherence.

Our findings support and extend past research documenting a link between the SU stigma and negative health outcomes among PLWH in two ways. First, we demonstrated the

deleterious effects of a different dimension of SU stigma. Previous work by Earnshaw et al.⁴ and by Calabrese et al.⁵ focused on the impact of the interaction between *internalized* stigmas among drug-using PLWH, whereas our investigation focused on *anticipated* SU stigma. The examination of this unique dimension of stigma is important to our understanding of the role stigmas play in negative health outcomes as research suggests that different dimensions of stigma may affect the health of PLWH differently.^{47,48} Second, prior research focused on HIV and drug stigmas relative to mental and physical health status and health service utilization.^{4,5} Our study demonstrated the pernicious effects of SU stigma on a different domain of health outcome—ART adherence

TABLE 2. DESCRIPTIVE STATISTICS AND BIVARIATE RELATIONSHIPS BETWEEN SUBSTANCE USE STIGMA SUBSCALES, CONTROL VARIABLES, AND OPTIMAL ADHERENCE (N=172)

	Overall (N=172) N (%)	Adherence (N=168)		p ^a
		Suboptimal n (%)	Optimal n (%)	
Anticipated SU stigma		100 (59.52)	68 (40.48)	0.079
Low	43 (25.00)	20 (20.00)	22 (32.35)	
Moderate	44 (25.58)	27 (27.00)	16 (23.53)	
High	45 (26.16)	26 (26.00)	18 (26.47)	
Very high	40 (23.26)	27 (27.00)	12 (17.65)	
Internalized SU stigma				0.140
Low	43 (25.00)	24 (24.00)	19 (27.94)	
Moderate	40 (23.26)	20 (20.00)	17 (25.00)	
High	45 (26.16)	25 (25.00)	20 (29.41)	
Very high	44 (25.58)	31 (31.00)	12 (17.65)	
SU-related values disengagement				0.236
Low	43 (25.00)	28 (28.00)	14 (20.59)	
Moderate	48 (27.91)	31 (31.00)	17 (25.00)	
High	39 (22.67)	17 (17.00)	20 (29.41)	
Very high	42 (24.42)	24 (24.00)	17 (25.00)	
SU-related stigma avoidance				0.103
Low	47 (27.33)	31 (31.00)	16 (23.53)	
Moderate	43 (25.00)	27 (27.00)	15 (22.06)	
High	43 (25.00)	23 (23.00)	18 (26.47)	
Very high	39 (22.67)	19 (19.00)	19 (27.94)	
Control variables				
Age ^b (5 missing)	44.93 (0.77)	45.08 (1.01)	44.85 (1.24)	0.987
Black (1 missing)	134 (78.36)	77 (77.78)	53 (77.94)	0.980
<High school (1 missing)	47 (27.49)	25 (25.25)	22 (32.35)	0.316
Male	115 (66.86)	67 (67.00)	45 (66.18)	0.657
HIV-related stigma ^b	104.53 (2.00)	103.43 (2.61)	105.75 (3.26)	0.531
Alcohol use severity (AUDIT-C) ^b	4.10 (0.24)	4.51 (0.32)	3.59 (0.39)	0.035*
SU severity (ASSIST-GCIDER) ^b	36.91 (2.40)	38.14 (3.35)	36.18 (3.53)	0.976
Recent drug use ^c				
Cannabis	113 (65.70)	61 (61.00)	49 (72.06)	0.139
Cocaine/crack	82 (47.67)	50 (50.00)	31 (45.59)	0.574
Sedatives	32 (18.60)	22 (22.00)	9 (13.24)	0.151
Amphetamine-type stimulants	23 (13.37)	13 (13.00)	9 (13.24)	0.965
Opiates	22 (12.79)	15 (15.00)	7 (10.29)	0.375
Other ^d	7 (4.07)	4 (4.00)	3 (4.41)	0.896
Poly-illicit drug use ^e	85 (49.42)	47 (47.00)	37 (54.41)	0.346
Injection drug use (ever)	33 (19.19)	16 (16.00)	17 (25.37)	0.136
Social support ^b				
Tangible	3.50 (0.09)	3.41 (0.12)	3.65 (0.15)	0.165
PSI	3.59 (0.09)	3.62 (0.11)	3.60 (0.17)	0.561
E/I	3.74 (0.09)	3.70 (0.11)	3.83 (0.16)	0.195
Affectionate	3.73 (0.10)	3.66 (0.12)	3.86 (0.16)	0.127

^ap-Value for overall difference between groups (continuous variables: Kruskal–Wallis test; categorical variables: chi-square test).

^bM(SE) presented for continuous variables.

^cDrug use in the past 90 days.

^dHallucinogens and inhalants.

^eUse of two or more illicit substances in the past 90 days.

*p ≤ 0.05.

ASSIST, alcohol, smoking and substance involvement screening test; AUDIT-C, Alcohol Use Disorders Identification Test; E/I, emotional/informational; GCIDER, global continuum of illicit drug risk; PSI, positive social interaction; SU, substance use.

Statistically significant findings are in bold.

behaviors. Adherence to ART is key to achieving virologic suppression and improving health outcomes among PLWH. These results are important as this is the first study to our knowledge to explore the relationship between SU-related stigma and ART adherence.

One possible pathway through which anticipated SU stigma may influence ART adherence is through its influence on the patient/provider relationship. Prior work has highlighted that health care providers generally hold negative attitudes toward patients with substance-related disorders and

TABLE 3. ADJUSTED LOGISTIC REGRESSIONS OF ANTICIPATED SUBSTANCE USE STIGMA AND OPTIMAL ADHERENCE AFTER ADJUSTING FOR POTENTIAL CONFOUNDERS (N=163)

	AOR	95% CI	p
Anticipated SU stigma ^a			
Moderate	0.36*	(0.14–0.95)	0.039
High	0.47	(0.18–1.22)	0.121
Very high	0.25**	(0.09–0.72)	0.010
Control variables			
Age	1.00	(0.96–1.03)	0.892
Race (1 = black)	0.75	(0.32–1.73)	0.497
Sex (1 = male)	1.11	(0.49–2.47)	0.806
Education	1.67	(0.76–3.67)	0.200
(1 = < high school)			
HIV-related stigma	1.01	(0.99–1.02)	0.263
SU severity	1.00	(0.99–1.01)	0.466
(ASSIST-GCIDER)			
Alcohol use severity	0.89	(0.79–1.00)	0.056
(AUDIT-C)			
Social support			
Tangible	1.62	(0.96–2.75)	0.069
PSI	0.38*	(0.17–0.83)	0.015
E/I	1.15	(0.58–2.25)	0.690
Affectionate	1.53	(0.84–2.77)	0.164

^aLow = reference.

* $p \leq 0.05$; ** $p \leq 0.01$.

AOR, Adjusted Odds Ratio; ASSIST, alcohol, smoking and substance involvement screening test; AUDIT-C, Alcohol Use Disorders Identification Test; 95% CI, 95% confidence interval; E/I, emotional/informational; GCIDER, global continuum of illicit drug risk; PSI, positive social interaction; SU, substance use.

Statistically significant findings are in bold.

that such attitudes may result in suboptimal health care delivery.^{49–51} Provider-perpetuated SU stigma experienced within the HIV care environment can be particularly detrimental to ART uptake and adherence.^{51–53} Even in the absence of enacted provider-perpetuated stigma, significant SU stigma exists on the societal level.^{54,55} Perceptions and experiences of SU stigma outside the clinical interaction may lead to internalized and anticipated SU stigma. Internalized and anticipated SU stigma may then influence the ways in which patients interact with their providers. Specifically, patient may be less willing to engage in HIV care or be less willing to discuss substance-related barriers to ART adherence.^{5,56} One such barrier to adherence is beliefs about interactive toxicity. Interactive toxicity beliefs, beliefs that ART should not be mixed with alcohol or drugs and that adherence to ART should be interrupted when engaged in drug use, are common among substance-using PLWH and often result in intentional nonadherence.^{57,58} The strained patient/provider relationship that results from anticipated SU-related stigma can result in missed opportunities to dispel such beliefs and to work with patients to identify solutions to other substance-related barriers to adherence.

There is a need for providers to recognize the ways in which stigma is produced and reinforced, even if it is not directly enacted in a clinical encounter. Further, health care providers should be educated on how stigma may impact the patient/provider relationship, engagement in care, and ART adherence. Structural competency is an emerging health care paradigm that encourages health care professionals to rec-

ognize, analyze, and intervene on the structural factors that produce health disparities.⁵⁹ In recent years, structural competency education has gained popularity and acceptance in US medical schools.^{60–62} Structural competency education provides clinicians with substantive knowledge about the structural determinants of health, including stigma and discrimination, and a theoretical framework to use in clinical practice.⁶³ To complement clinical and preclinical education curriculums in structural competency, Bourgois et al.⁶⁴ have developed a quick screening structural vulnerability assessment tool to assist health care practitioners in approaching patient care and treatment planning through a lens of structural competency. The assessment tool contains a stigma and discrimination domain that promotes empathetic awareness and encourages clinicians to participate in critical self-reflection on the stigma experienced by marginalized patient populations. Education in structural competency and the adaptation of the structural vulnerability assessment tool for use with substance-using patients living with HIV may improve provider-level ability to recognize and respond to stigma-related barriers to ART adherence.

Our study has limitations that future work may expand on. Due to the cross-sectional nature of the study design, causal order between study constructs cannot be determined. A longitudinal study that investigates the negative effects of anticipated SU stigma on ART adherence is warranted. Further, our sample size was relatively small and limited to patients with a history of SU attending a university-affiliated outpatient HIV clinic in the southeastern United States. Future research is needed to assess generalizability of these findings to other geographical regions. Moreover, although we controlled for overall HIV-related stigma, we were unable to test for the intersecting effects of SU stigma and HIV stigma on ART adherence. This is a major limitation as the authors recognize the intersectional nature of marginalized statuses. In fact, the abovementioned investigations of internalized stigma conducted by Earnshaw et al.⁴ and by Calabrese et al.⁵ found that the relationships between internalized HIV stigma and negative health-related outcomes were stronger at high levels of internalized SU stigma. This suggests that additional research is needed to determine the possibility of interactive effects of anticipated HIV and SU stigmas on ART adherence. Further, we recognize that many of our participants lived with other marginalized statuses that were not captured by our study instruments. Future research will need a larger sample and more nuanced measures of intersectional stigmas to examine how SU stigma may interact with other marginalized statuses to influence ART adherence.

While types of drugs used by our sample mirror recent prevalence estimates for substance-specific disorders among PLWH in the United States,^{65,66} different illicit drugs have become more prominent among certain populations living with HIV. Specifically, there has been an increase in the use of “club drugs” [methamphetamine, gamma hydroxybutyrate/gamma butyrolactone (GHB/GBL), mephedrone, cocaine, and ketamine] among men who have sex with men (MSM) living with HIV.⁶⁷ Further, the United States is currently experiencing an opioid epidemic characterized by increases in prescription and nonprescription opioid misuse and increased initiation to injection drug use.^{68–70} Given these recent trends, future studies may find it beneficial to focus more exclusively on samples with histories of club drug use, opioid use, and/or injection drug use.

Relatedly, given the sample size of our study, it was not possible to include ASSIST-SSI scores for each substance and the ASSIST-GCIDER in our multivariable models, as this would have introduced high levels of collinearity. The overall ASSIST-GCIDER was included in the model as a general measure of risky illicit drug use because it represents risk across all illicit drugs the participant reports, thereby capturing poly-illicit drug use. Future studies, with larger sample sizes, might examine stigma across illicit substances in a more granular way to replicate these findings and to determine if the association between SU stigma and optimal adherence varies across SSI.

Notwithstanding the abovementioned limitations, this study contributes to a growing body of literature that suggests an important relationship between SU stigma and psychosocial barriers and facilitators of better HIV-related outcomes. The finding that anticipated SU stigma is associated with suboptimal ART adherence, even when controlling for the influence of HIV-related stigma, has significant implications for clinical practice with substance-using PLWH. While clinicians and researchers have made concerted efforts to address the impact of HIV-related stigma on medication adherence, our findings suggest a need to expand stigma reduction efforts to target SU stigma for substance-using PLWH. The clinical encounter between HIV care providers and substance-using patients may be an ideal target for interventions designed to reduce the impact of SU stigma on ART adherence. Training HIV care providers in “structural competency” appears to be a promising avenue to help clinicians recognize and respond to stigma-related barriers to ART adherence. HIV care practitioners can counter the negative effects of anticipated SU stigma on ART adherence by fostering open communication within the patient/provider relationship. Recognizing the influence that anticipated SU stigma may have on patient communication, providers should initiate discussions of drug use and related barriers to adherence, while adopting accurate and nonjudgmental language. Providing stigma-free HIV care is key to developing patient-centered strategies of maximizing ART adherence.

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APPENDIX TABLE A1. ADJUSTED LOGISTIC REGRESSIONS OF INTERNALIZED SUBSTANCE USE STIGMA AND OPTIMAL ADHERENCE AFTER ADJUSTING FOR POTENTIAL CONFOUNDERS

	<i>AOR</i>	<i>95% CI</i>	<i>p</i>
SU-related self-devaluation ^a			
Moderate	0.96	(0.37–2.53)	0.939
High	0.92	(0.37–2.28)	0.861
Very high	0.43	(0.16–1.17)	0.098
Control variables			
Age	0.99	(0.96–1.03)	0.825
Race (1 = black)	0.79	(0.34–1.82)	0.581
Sex (1 = male)	1.08	(0.49–2.39)	0.855
Education (1 = < high school)	1.75	(0.80–3.83)	0.160
HIV-related stigma	1.01	(0.99–1.02)	0.373
SU severity (ASSIST-GCIDR)	1.00	(0.99–1.02)	0.642
Alcohol use severity (AUDIT-C)	0.91	(0.81–1.01)	0.099
Social support			
Tangible	1.70*	(1.01–2.82)	0.043
PSI	0.41*	(0.19–0.89)	0.024
E/I	1.26	(0.64–2.50)	0.500
Affectionate	1.30	(0.72–2.33)	0.384

^aLow = reference.**p* ≤ 0.05.

AOR, Adjusted Odds Ratio; ASSIST, alcohol, smoking and substance involvement screening test; AUDIT-C, Alcohol Use Disorders Identification Test; 95% CI, 95% confidence interval; E/I, emotional/informational; GCIDR, global continuum of illicit drug risk; PSI, positive social interaction; SU, substance use.

Statistically significant findings are in bold.

APPENDIX TABLE A2. ADJUSTED LOGISTIC REGRESSIONS OF VALUES DISENGAGEMENT STIGMA, SOCIAL SUPPORT, AND OPTIMAL ADHERENCE AFTER ADJUSTING FOR POTENTIAL CONFOUNDERS

	<i>AOR</i>	<i>95% CI</i>	<i>p</i>
SU-related values disengagement ^a			
Moderate	1.24	(0.47–3.29)	0.655
High	2.21	(0.81–6.07)	0.121
Very high	1.81	(0.68–4.83)	0.233
Control variables			
Age	0.99	(0.96–1.04)	0.972
Race (1 = black)	0.91	(0.39–2.08)	0.817
Sex (1 = male)	1.00	(0.46–2.20)	0.993
Education (1 = < high school)	1.52	(0.70–3.29)	0.286
HIV-related stigma	1.00	(0.99–1.01)	0.525
SU severity (ASSIST-GCIDR)	1.00	(0.99–1.01)	0.738
Alcohol use severity (AUDIT-C)	0.89*	(0.79–0.99)	0.041
Social support			
Tangible	1.62	(0.96–2.72)	0.069
PSI	0.44*	(0.20–0.96)	0.041
E/I	1.20	(0.61–2.36)	0.600
Affectionate	1.33	(0.73–2.41)	0.347

^aLow = reference.**p* < 0.05.

AOR, Adjusted Odds Ratio; ASSIST, alcohol, smoking and substance involvement screening test; AUDIT-C, Alcohol Use Disorders Identification Test; 95% CI, 95% confidence interval; E/I, emotional/informational; GCIDR, global continuum of illicit drug risk; PSI, positive social interaction; SU, substance use.

Statistically significant findings are in bold.

APPENDIX TABLE A3. ADJUSTED LOGISTIC REGRESSIONS OF FEAR OF STIGMA AVOIDANCE, SOCIAL SUPPORT, AND OPTIMAL ADHERENCE AFTER ADJUSTING FOR POTENTIAL CONFOUNDERS

	<i>AOR</i>	<i>95% CI</i>	<i>p</i>
SU-related stigma avoidance ^a			
Moderate	1.20	(0.45–3.24)	0.712
High	1.36	(0.49–3.75)	0.557
Very high	2.50	(0.82–7.63)	0.107
Control variables			
Age	1.00	(0.97–1.04)	0.786
Race (1 = black)	0.84	(0.37–1.91)	0.683
Sex (1 = male)	1.02	(0.46–2.27)	0.893
Education (1 = < high school)	1.66	(0.77–3.59)	0.200
HIV-related stigma	1.00	(0.99–1.01)	0.993
SU severity (ASSIST-GCIDR)	0.99	(0.98–1.00)	0.347
Alcohol use severity (AUDIT-C)	0.89*	(0.79–0.99)	0.037
Social support			
Tangible	1.62	(0.96–2.72)	0.071
PSI	0.41*	(0.19–0.90)	0.026
E/I	1.24	(0.63–2.44)	0.524
Affectionate	1.43	(0.80–2.58)	0.228

^aLow = reference.**p* ≤ 0.05.

AOR, Adjusted Odds Ratio; ASSIST, alcohol, smoking and substance involvement screening test; AUDIT-C, Alcohol Use Disorders Identification Test; 95% CI, 95% confidence interval; E/I, emotional/informational; GCIDR, global continuum of illicit drug risk; PSI, positive social interaction; SU, substance use.

Statistically significant findings are in bold.