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A cross-sectional study examining associations between substance use frequency, problematic use and STIs among youth living with HIV

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ABSTRACT

Objectives This study sought to examine the prevalence of STIs and whether substance use frequency and/or problematic use—specifically alcohol, marijuana and other drugs—was associated with having an STI diagnosis among youth living with HIV (YLWH)

Methods A sample of 823 YLWH were recruited at 14 adolescent HIV clinics through the Adolescent Medicine Trials Network for HIV Interventions. Study staff abstracted STI data from medical records for up to 26 weeks prior to participants' completing a cross-sectional survey including the ASSIST (Alcohol, Smoking and Substance Involvement Screening Test), which measures substance use frequency and consequences.

Results Almost one-third of youth had been diagnosed with an STI (30.5%) at the time of their baseline assessment. In multivariable analyses, those who engaged in weekly or greater marijuana use (adjusted OR (AOR)=10.66, 95% CI: 4.39 to 25.87, P<0.001) had an increased odds of being diagnosed with an STI. Additionally, youth who met alcohol use criteria for moderate (AOR=5.23, 95% CI: 2.50 to 10.93, P<0.001) and high risk (AOR=6.53, 95% CI: 1.20 to 35.68, P<0.05) alcohol use had an increased odds of being diagnosed with an STI compared with low-risk alcohol users.

Conclusions Study findings underscore the need to investigate the role of greater frequency of marijuana use and problematic alcohol use in STI incidence among YLWH. Given the associations between both substance use frequency and problematic use in STI diagnoses among YLWH seen in HIV care settings, clinicians should use validated substance use screening tools which capture both frequencies and consequences in order to identify YLWH who may need further evaluation and treatment.

INTRODUCTION

STIs have the potential to amplify acquisition and infectiousness of HIV.[1] While accumulating evidence demonstrates that adherence to antiretroviral therapy (ART) nearly eliminates onward HIV transmission,[2–5] some evidence suggests that the effectiveness of ART as an HIV prevention strategy may be lessened in the presence of an inflammatory STI.[6–8] Thus, understanding the prevalence of and factors associated with STI incidence among youth living with HIV (YLWH) is an important public health concern to guide HIV prevention interventions and programmes.

There is broad consensus that HIV transmission risk, including STI incidence, may be increased by substance use behaviours.[9–11] Substance use, including marijuana, alcohol and other drug use, peaks in young adulthood and is especially high among young males.[11] Substance use, such as marijuana and alcohol use, has been shown to predict subsequent substance use problems, sexual risk behaviour and STI acquisition in adolescent populations.[12 13] Alcohol and other substance use may impair young people's decision making and lower inhibitions, which may increase the likelihood of engaging in high-risk sexual behaviours.[14] Although studies suggest that alcohol, marijuana and other drug use are as prevalent among YLWH as in the general population,[15] substance use may have more detrimental effects for YLWH.[16] For example, evidence suggests that YLWH may experience structural and social vulnerabilities such as homelessness and incarceration, which may make them more vulnerable to engaging in substance use behaviours.[16] To date, there is limited research examining whether greater frequencies of substance use behaviours or problematic use place YLWH at risk for STIs.

Given the recommendations for substance use screening in HIV care settings, there is a need for research to examine whether brief measures that solely capture frequency of substance use behaviours or screeners that assess problematic use are associated with STI diagnoses among YLWH to guide the implementation of screening and treatment. As such, the aim of this study was to examine the relative associations between the frequency of alcohol, marijuana, and other drug use and indicators of problematic substance use in STI diagnoses to inform future research and programming.

METHODS

Between February 2015 and February 2016, participants were recruited from 14 different adolescent medical clinics located throughout the USA (Los Angeles, California; Washington, DC; Baltimore, Maryland; Boston, Massachusetts; Chicago,Illinois; Philadelphia, Pennsylvania; New York City,

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New York; NewOrleans, Louisiana; Memphis, Tennessee; Miami, Florida; Tampa, Florida; Detroit, Michigan; Denver, Colorado; and Houston, Texas) to participate in a study. The details of the study have been published elsewhere.[17] Adolescents were approached at one of their scheduled clinic visits by trained clinic research staff. To be eligible, youth had to be (1) between 13 and 24 years of age; (2) living with HIV/AIDS; (3) aware that they were HIV positive; (4) engaged in HIV care in one of the Adolescent Trial Network for HIV/AIDS Intervention (ATN) adolescent medicine clinical sites or affiliates; (5) behaviourally infected with HIV; (6) able to understand written and/or spoken English; and (7) have medical records that could be accessed by research staff. The study was approved by the institutional review boards (IRB) at each participating site and protocol team members.

After the initial screening process, informed consent or youth assent was obtained from those who agreed to participate. There were two sites that did not allow waiver of parental permission for those under age 18 for this study. Therefore, at these two sites for those under the age 18, youth provided assent and parental permission was required. All of the other sites allowed a waiver of parental permission and youth provided informed consent. In total, 1038 youth were approached to participate in the study. Of these youth, 73 declined to participant, 17 could not be contacted and an additional 24 youth were in various stages of recruitment when the study was closed. Additionally, 101 youth were enrolled in the study but had <6 months of follow-up STI data when the study was closed. Thus, the final analytic sample consistent of 823 youth who were eligible and participated in the study, which included completing a one-time audio computer-assisted self-interview (ACASI) that included multiple psychosocial and behavioural measures and had at least 6 months of follow-up medical chart abstract data. Participants received an incentive with amount determined by each site's IRB for their time and effort completing the assessment. Research staff then abstracted STI diagnoses from each participant's medical record for the 26 weeks prior to their enrolment and ACASI date. STI information in the medical chart included laboratory notes, verbal report by a clinician or verbal report by the participant.

MEASURES
Sociodemographic variables
Participants self-reported their age, race/ethnicity, history of incarceration and living situation. Participants were also asked their sex assigned at birth (male vs female), and gender identity (male, female or transgender). Transgender participants were coded as those who reported a sex assigned at birth that did not match their gender identity or those who identified their gender identity as transgender. Based on this classification, there were three groups of participants: (1) cisgender male, (2) cisgender female and (3) transgender women. There were no transgender men in this sample.

Alcohol, Smoking and Substance Involvement Screening Test
Participants completed the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) to assess alcohol, marijuana and other drug use. The ASSIST developed as a substance use screening tool for individuals 18 and above and has been used in several studies of YLWH aged 15 to 24 years.[18–22] The ASSIST includes frequency of use in the prior 3 months for alcohol, cannabis, cocaine, amphetamines, inhalants, sedatives, hallucinogens, opioids and other drugs, with frequency categories of 'never', 'once or twice', 'monthly', 'weekly' and 'daily'. Consistent with other studies of YLWH and the distribution of

the frequencies,[16] we created three indicators of substance use behaviour: (1) alcohol use (1=daily/almost daily or weekly vs 0=one or more times per month or never); (2) marijuana use (1=daily/almost daily or weekly vs 0=one or more times per month or never); and (3) endorsement of any past 3 months other drug use (ie, crack, cocaine, amphetamine, inhalants, opioids, sedatives, hallucinogens; 1=yes vs 0=no) because of the few participants who reported any weekly or more other drug use (ie, 2.8%, n=23 endorsed weekly use and 1.2%, n=10) reported daily or almost daily use). The ASSIST also comprises seven questions for each drug category, and an additional question on injecting any drug. It identifies the substances used, frequency of use and substance-related harm over the past 3 months (eg, 'has use led to health, social, legal or financial problems?'; 'Has a friend or relative or anyone else ever expressed concern about your use?'). Using the ASSIST manual scoring guidelines, we created a risk score by summing 3-month frequency and harm items for each substance, which we then categorised as low, moderate or high risk. Marijuana risk scores were calculated as low risk (0–3), moderate risk (4–26) and high risk (27 or higher), and alcohol risk scores were calculated as low risk (0–10), moderate risk (11–26) and high risk (27 or higher). Given the small number of participants who reported other drug use, we created a series of moderate and high-risk variables for each non-marijuana drug use and then created a single dichotomous moderate and high-risk variable for any participants who met criteria for moderate (11–26) and high risk (27 or higher) based on any non-marijuana drugs.

Sexually transmitted infections
As described above, research staff abstracted information from each participant's medical record regarding any diagnosis of chlamydia, gonorrhoea and syphilis. The majority of STI results were based on laboratory reports (91.7%), with 10.1% based on clinician notes and <1% based on a verbal report from the participant. We created a dichotomous variable of any STI diagnosis (1=yes vs 0=no).

STATISTICAL ANALYSES
First, we examined descriptive statistics for sociodemographic, substance use and STI variables. Second, we conducted bivariate analyses to examine whether there were differences in sociodemographic and substance use variables by STI diagnosis using independent t tests for continuous variables and χ^2 tests for categorical variables. In the case where there was sparse data (ie, cell sizes were <5), we used Fisher's exact tests to obtain exact P values; however, we still report findings from the χ^2 test statistics. Finally, we fit a multivariable generalized estimating equation (GEE) model to examine associations between substance use risk, substance use behaviours, sociodemographic variables and STI diagnoses while accounting for the multisite nature of the study design. GEE models obtain more accurate estimates by treating dependency between participants within study site as a nuisance parameter and provide more precise estimates by statistically adjusting for this dependency.[22] All analyses were conducted in SPSS V.24 with a specified P value of 0.05.

RESULTS
Sample characteristics
Table 1 presents the characteristics of the study sample by STI diagnosis. Almost one-third of youth had been diagnosed with an STI (30.5%) 26 weeks prior to the baseline visit. Participants ranged in age from 16 to 24 years (mean=21.48, SD=2.01). The majority of the sample were members of racial/ethnic

Table 1 Sample characteristics by STI diagnosis (n=823)

| | Total n=823 | STI diagnosis * | | |
| | | Yes (n=251, 30.5%) | No (n=572, 69.5%) | |
	N (%)	N (%)	N (%)	Test statistic
Gender identity				$\chi^2(2)$=21.17, P<0.001
Female	155 (18.8)	24 (15.5)	131 (84.5)	
Male	641 (77.9)	220 (34.3)	421 (65.7)	
Transgender	27 (3.3)	7 (25.9)	20 (74.1)	
Race/ethnicity				P=0.708
White, non-Hispanic	30 (3.6)	8 (26.7)	22 (73.3)	
Black, non-Hispanic	601 (73.0)	186 (30.9)	415 (69.1)	
Hispanic/Latino	149 (18.1)	43 (28.9)	106 (71.1)	
Other, non-Hispanic	40 (4.9)	14 (35.0)	26 (65.0)	
Current unstable housing				P=*0.419*
Yes	72 (8.8)	25 (34.7)	47 (65.3)	
No	750 (91.2)	226 (30.1)	524 (69.9)	
Incarceration, lifetime				P=0.591
Never	498 (60.7)	152 (30.5)	346 (69.5)	
One time	156 (19.0)	53 (34.0)	103 (66.0)	
Two to five times	125 (15.2)	33 (26.4)	92 (73.6)	
Six or more times	41 (5.0)	12 (29.3)	29 (70.7)	
Alcohol use, past 3 months				P=*0.137*
Daily/almost daily	33 (4.0)	12 (36.4)	21 (63.6)	
Weekly	169 (20.6)	55 (32.5)	114 (67.5)	
Monthly	461 (56.2)	147 (31.9)	314 (68.1)	
Never	157 (19.1)	36 (22.9)	121 (77.1)	
Alcohol risk score				$\chi^2(2)$=8.60, P=0.014
Low risk	594 (72.4)	164 (27.6)	430 (72.4)	
Moderate risk	197 (24.0)	74 (37.6)	123 (62.4)	
High risk	29 (3.5)	12 (41.4)	17 (58.6)	
Marijuana use, past 3 months				$\chi^2(3)$=17.12, P=0.001
Daily/almost daily	257 (31.5)	98 (38.1)	159 (61.9)	
Weekly	80 (9.8)	31 (38.8)	49 (61.3)	
Monthly	168 (20.6)	48 (28.6)	120 (71.4)	
Never	311 (38.1)	73 (23.5)	238 (76.5)	
Marijuana risk score				$X^{22}(2)$=18.04, P<0.001
Low risk	327 (40.0)	80 (24.5)	247 (75.5)	
Moderate risk	425 (52.0)	137 (32.2)	288 (67.8)	
High risk	66 (8.1)	33 (50.0)	33 (50.0)	
Other drug use, past 3 months†				$\chi^2(1)$=4.20, P=0.041
Yes	192 (23.3)	70 (36.5)	122 (63.5)	
No	631 (76.7)	181 (28.7)	450 (71.3)	
Other drug high risk score‡				P=0.205
Low risk	760 (92.3)	226 (29.7)	534 (70.3)	
Moderate risk	15 (1.8)	7 (46.7)	8 (53.3)	
High risk	48 (5.8)	18 (37.5)	30 (62.5)	
	M (SD)	M (SD)	M (SD)	
Age	21.48 (2.01)	21.26 (2.04)	21.58 (1.99)	t(821)=−2.11, P=0.036

*The second and third columns present the percentage of each group (STI yes vs no) that had a given characteristic.

†Other drug use=any report of monthly or greater cocaine, inhalants, sedatives, hallucinogens, opioids or methamphetamine.

‡Other drug high risk score=composite of any other drug moderate risk (11–26) or high risk (27 or greater).

minority groups and self-reported a male gender identity. With regard to sociostructural factors, nearly one in ten participants reported unstable housing or homelessness and over one-third of the sample reported a history of criminal justice involvement. The majority of the sample reported at least monthly or greater alcohol use and over one-quarter of the sample met criteria for moderate to high-risk alcohol use. Nearly one-third of the sample reported daily or almost daily marijuana use, with almost an additional third reporting monthly or greater marijuana use. Over half of the sample met criteria for moderate or high-risk marijuana use. Approximately one-quarter of participants reported any other drug use in the past 3 months.

Table 2 Generalized estimating equation (GEE) model predicting STI diagnosis

	Adjusted OR (95% CI)
Age	1.15 (0.99 to 1.32)
Gender identity (referent female)	
Male	6.50 (2.97 to 14.22)***
Transgender	1.61 (0.36 to 7.24)
Ever incarcerated (referent never incarcerated)	0.67 (0.35 to 1.28)
Weekly or greater alcohol use†	0.94 (0.47 to 1.88)
Weekly or greater marijuana use†	10.66 (4.39 to 25.87)***
Monthly or greater other drug use‡	0.79 (0.39 to 1.62)
Alcohol risk score (referent low risk)	
Moderate	5.23 (2.50 to 10.93)***
High	6.53 (1.20 to 35.68)*
Marijuana risk score (referent low risk)	
Moderate	0.50 (0.21 to 1.17)
High	2.41 (0.48 to 12.12)

*P<0.05.
***P<0.001.
Note, GEE model adjusts for sites.
†Alcohol and marijuana use is reporting weekly or daily/almost daily use compared with monthly or no use.
‡Other drug use is reporting at least monthly or more use of cocaine, inhalants, sedatives, hallucinogens, opioids or methamphetamine compared with no use. Other drug risk scores were not included given the small number of participants who reported any use and risk was not associated with STIs in bivariate analyses.

As shown in table 1, a greater proportion of males were diagnosed with an STI compared with female participants. A higher proportion of participants who met criteria for high-risk alcohol use and marijuana use were diagnosed with an STI compared with those who were low risk. Those who reported daily/almost daily and weekly marijuana use were more likely to be diagnosed with STI compared with those who reported no marijuana use. Similarly, youth who reported using other drugs and were younger in age were significantly more likely to be diagnosed with STI.

Table 2 presents the multivariable model examining whether the frequency of substance use behaviours or substance use risk was associated with being diagnosed with STI over 26 weeks. Males compared with females had an increased odds of being diagnosed with an STI (adjusted OR (AOR)=6.50, 95% CI: 2.97 to 14.22, P<0.001). Youth who reported weekly or greater marijuana use (AOR=10.66, 95% CI: 4.39 to 25.87, P<0.001) compared with those who reported monthly or no marijuana had an increased odds of being diagnosed with an STI compared with no drug use. Additionally, youth who met criteria for moderate (AOR=5.23, 95% CI: 2.50 to 10.93, P<0.001) and high-risk (AOR=6.53, 95% CI: 1.20 to 35.68, P<0.05) alcohol use had an increased odds of being diagnosed with an STI compared with low-risk alcohol users.

DISCUSSION

In this sample of YLWH, we found a high incidence of STI diagnoses with estimates similar to those found in samples of adults living with HIV.[21] Routine STI screening has been recommended for all sexually active individuals, including adolescents,[18 21 23] and has been implemented in many HIV clinics in the USA. Consistent with prior studies,[16] study findings underscore the necessity of routine STI screening and testing in primary care setting for YLWH, particularly for youth who use psychoactive substances.

After adjusting for sociodemographic factors and study site, both substance use frequency and problematic use remained a significant predictor of being diagnosed with an STI. More frequent use of marijuana (weekly or greater) was associated with higher likelihood of STI in the past 6 months. Notably, youth who met criteria for moderate and high-risk alcohol use had an increased odds of STI period prevalence. Given that some level of alcohol use is common in this age group and in our sample, indications of adverse consequences from alcohol use as assessed by the ASSIST may be a better indicator of risk for STIs than use itself. Since screening for problematic alcohol use is recommended for primary care, reports of adverse consequences in this population should raise suspicion for STIs and serve as an additional indicator for STI screening.

Substance use, specifically marijuana use, typically emerges in adolescence and progresses into young adults,[24] and studies have found that youth initiate marijuana use to cope with stressors, including living with limited resources.[25] Consistent with prior research with YLWH, we found that daily/almost daily marijuana use was highly prevalent in this sample.[25] Although there may be overlap in youth who use marijuana for recreational versus medicinal purposes, research has also shown that marijuana use plays a role in symptom and stress management among YLWH.[26] Given the associations between daily chronic marijuana use and pulmonary disease[27] and cognitive dysfunction[28] in adult populations, these findings corroborate recent calls for further study into the longer-term effects of marijuana use on YLWH[25 26] and highlight the necessity of assessing frequency and indicators of problematic use in clinical settings.

LIMITATIONS

Study findings must be interpreted within the context of their limitations. Although ACASI technology was used to reduce social desirability bias, substance use data were based on self-report and there may be social desirability and recall bias. However, previous studies have found strong associations between self-report and substance use.[21] We were only able to collect substance use information at one time point, which limits our ability to determine whether substance use is causally related to STI diagnoses. The time frame for reporting substance use was within the past 3 months and does not completely cover the entirety of STI medical record abstraction. While the sociodemographic characteristics of the sample are similar to other national samples of YLWH, this is a sample of youth who knew their HIV status and were engaged in HIV care, which limits generalisability to youth who may not know their HIV status or be linked to HIV care services. Although the ASSIST has been used in studies with YLWH to identify problematic use,[17–21] the cut-off scores for problematic use were developed and validated with individuals 18 years of age and older. Thus, future research is warranted to provide validation for the cut-off scores for youth under the age of 18. Additionally, we did not collect self-report sexual orientation identity data, which limits our ability to determine whether these findings may be stronger among young gay, bisexual and other men who have sex with men compared with cisgender women and their cisgender male heterosexual counterparts.

CONCLUSIONS

Despite the study limitations, this study provides new information into the relationships between substance use risk, frequency behaviours and STI incidence among YLWH. Given the complex associations between substance use and STI diagnoses among YLWH seen in HIV care settings, clinicians should use validated screening tools which capture both frequency and potential risk

and implement brief interventions for problematic substance use to recognise YLWH who may be in need of further treatment. Furthermore, these findings underscore the importance of additional research on the effects of marijuana use among YLWH to develop appropriate interventions for reducing STI incidence and HIV transmission.

Key messages

► Nearly one-third of youth living with HIV were diagnosed with chlamydia, gonorrhoea or syphilis over the 26-week period prior to completing a cross-sectional survey.
► Marijuana, alcohol use and other drug use were each independently and significantly associated with having an STI diagnosis.
► Findings underscore the importance of routine STI and substance use screening and treatment in HIV care.

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