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Associations Between Cannabis Use, Sexual Behavior, and STIs/HIV in a Cohort of Young Men Who Have Sex with Men

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SUMMARY

In a longitudinal Los Angeles study of men who have sex with men there were fewer sexually transmitted infections when men reported exclusive cannabis use.

Abstract

Background: Among men who have sex with men (MSM) the relationship between sexually transmitted infections (STIs) and cannabis use is not well established. We assessed cannabis use, sexual behavior, and STIs including HIV in a diverse cohort of young MSM.

Methods: In Los Angeles the mSTUDY cohort conducted visits every 6 months with 512 MSM between 2014 and 2017 collecting demographics, sexual behaviors, and reports of frequency of substance use. Each visit conducted testing for gonorrhea, chlamydia and syphilis via blood, urine, and pharyngeal and rectal swabs by PCR, HIV was assessed using rapid tests for HIV negatives and viral load for HIV positives. We analyzed the relationship between cannabis use, sexual behaviors and STIs/HIV across 1,535 visits.

Results: Significantly fewer participants tested positive for STIs at visits when reporting the previous 6 months use of only cannabis (11.7%) compared to no drugs (16.3%) or other drugs (20.0%), ($p=0.01$). Fewer MSM reporting only cannabis use than no or other drug use had been incarcerated, had incarcerated partners, experienced interpersonal violence, and were HIV

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positive. In multivariable analyses visits with positive STIs were associated with other drug use (adjusted odds ratio (AOR) 1.69, 95% CI (1.03–2.78)) but not use of cannabis only or no drug use after controlling for age, HIV status, new sex partners, and number of sex partners.

Conclusions: When MSM reported using cannabis exclusively fewer STIs were detected and lower risk sexual engagements reported than when MSM reported no drug or other drug use.

INTRODUCTION

In the United States, incidence of HIV among young African American, and Hispanic/Latino men who have sex with men (MSM) has risen or remained high, despite an overall decline in HIV incidence among young MSM¹ and drug use persists as a risk factor. Yet drugs vary in the strength of associations with HIV-related sexual transmission behaviors. Methamphetamine (meth), cocaine and “party drugs” have well documented strong associations with HIV transmission^{2,3} and sexual behaviors.^{4–6} Alcohol use also disinhibits sexual behavior, resulting in frequent exposure to sexually transmitted infections (STIs) including HIV^{7,8} for individuals under its influence. While heroin and other highly addictive opioids may not directly drive sexual behavior, the need for opioids and motivation to avoid withdrawal can lead to high risk sexual behavior in exchange for drugs or money to buy drugs.⁹ Drugs known as “party drugs” – such as ecstasy (3,4-methylenedioxy-methamphetamine (MDMA)), poppers and ketamine – are often used in highly sexually active contexts like sex parties, bath houses, or raves¹⁰ facilitating prolonged sex in these settings, and thereby increasing exposure to STIs. However, the effect of cannabis (marijuana) use on sexual behavior and STI/HIV outcomes in MSM is less established.

Evidence to date on cannabis use among MSM has focused its association with other behaviors. Two large cross-sectional studies of MSM have found an association between using cannabis and increased odds of condomless sex, but in both analyses stronger associations with sexual risk were observed for other drugs (methamphetamine, party drugs, cocaine, alcohol, erectile dysfunction drugs).^{10,11} The high prevalence of polydrug use in these studies, and among MSM in general, make it difficult to ascertain whether the observed association is attributable to cannabis versus polydrug use. A small study of black MSM that reports after adjusting for other drug use, using cannabis as a sex drug – but not using cannabis in general – was associated with increased odds of behaviors including condomless sex and group sex.¹² Despite these behavioral associations, sex while intoxicated (stoned) with cannabis has not been demonstrated to be associated with greater incidence of biological outcomes such as HIV or other STIs among MSM. In considerably older studies, before widespread legalized medical and recreational use, frequent or heavy cannabis use was associated with STI in studies of predominantly heterosexual youth.^{13–15} Little research on cannabis and sexual behavior in MSM has included biomedical outcomes (STI test results), nor has assessed frequency of cannabis use. Considering the rapidly changing marijuana laws allowing legal recreational use and expanded medical use in more states, research that can isolate the use of cannabis from polydrug use on biomedical outcomes are needed to establish appropriate public health policy and clarify the role of cannabis in HIV transmission dynamics. Therefore, we sought to better characterize the

effect of cannabis use in the context of other substance use in a cohort of MSM in Los Angeles and establish the behavioral context of cannabis use and laboratory confirmed STIs.

MATERIALS AND METHODS

The mSTUDY (NIDA U01 DA036267) is a research platform in Los Angeles that in 2014 started enrolling a cohort of mostly Black/African American and Latino/Hispanic MSM. Half of enrolled cohort participants were selected for active substance use and HIV positive status. HIV positive participants were recruited from the sexual health clinic and HIV clinic in a community based organization providing a broad spectrum of services for the lesbian, gay, bisexual, and transgender community, the Los Angeles LGBT Center. HIV negative participants were recruited from community based university research clinic The UCLA Vine Street Clinic (for HIV negative men) using online advertisements such as GRINDR and Craig's List and flyers at substance use treatment sites and other community settings. All participants in the mSTUDY completing visits between August 2014 and December 2017 were eligible and included in this analysis. Inclusion criteria for the cohort were as follows: (1) between age 18 years and 45 years of age, (2) born male, (3) if HIV-negative, reporting condomless anal intercourse with a male partner in the past 6 months, (4) capable of providing informed consent, and (5) willing/able to return to the study every 6 months to complete study-related activities including questionnaires, clinical assessments, and biological specimen collection.

Study procedures and data collection

After providing written informed consent, study participants completed a computer-based questionnaire. The questionnaire collected information on demographics, HIV risk behaviors, and substance use by the type of drug – cannabis (marijuana), methamphetamine, cocaine powder, crack cocaine, ecstasy, heroin, poppers, other drugs and prescription pain medications. Self-report responses assessed specific drug use (e.g., methamphetamine, cocaine, etc.) during the previous six months (i.e., *In the last 6 months, how often did you use...?*) using a 6-point scale (1 = daily, 2 = weekly, 3 = monthly, 4 = less often, 5 = never, 6 = once). Use before last time had anal sex was also assessed for each substance. Data were dichotomized into “yes” or “no” to denote specific substances used in the preceding 6 months if any level of use was reported. For this analysis the reports of 512 participants across 1,535 visits were categorized into three groups: visits where no substance use was reported in the past 6 months (n=400), visits where cannabis use but no other substances was reported in the past 6 months (n=205), and those reporting other substance use in the last 6 months (n=930). Binge drinking (i.e. *During the past 6 months, how often did you have 6 or more drinks on one occasion?*) was assessed using the Alcohol Use Disorder Identification Test-Consumption (AUDIT-C) and dichotomized based on any reports of binge drinking¹⁶.

Sexual risk behaviors and contexts

For this analysis, reports of behaviors representing high exposure to STIs/HIV and substance use in the six months prior to the visit included number of different sexual partners, number of times had receptive anal intercourse (RAI) (reported for past month), number of new partners, transgender anal sex partners, and having concurrent (overlapping) sexual partners.

Other variables related to risky sexual contexts included: experienced intimate partner violence (IPV) (defined as being hit, kicked, or slapped by a lover, boyfriend/girlfriend when that person meant to hurt you physically in the last 12 months – a question from the Abuse Assessment screen¹⁷), performed transactional sex (received drugs, money or shelter for sexual activity) in last 3 months, and used pre-exposure prophylaxis (PrEP) (among those who were HIV negative). Employment, homelessness (not having a regular place to stay in the past 6 months), and history of incarceration were also considered. Finally, the following partner risk variables reported by the respondent were included: last partner's HIV status, incarceration history, practicing transactional sex, having concurrent partners, binge drinking, using marijuana, using methamphetamine, and being age discordant with the respondent.

At each study visit participants provided bio-specimens for immediate testing as well as repository storage. STI testing was conducted on urine, rectal swabs, and pharyngeal swabs for chlamydia and gonorrhea testing, blood for syphilis and HIV testing (for HIV-negatives) and HIV-1 RNA levels (for HIV-positives). Infectious syphilis was defined following the Centers for Disease Control and Prevention determination acquired for all participants with positive test results from our local health department. All participants were scheduled to return every 6 months. The study questionnaire and laboratory tests were repeated at the follow-up visits. Any positive laboratory test results for chlamydia or gonorrhea or any syphilis positive test identified as infectious syphilis (primary, secondary, or early latent syphilis) was considered as an STI outcome variable.

Analytic Strategy

Descriptive statistics including means, range, and frequency distributions were performed on fixed effect variables for baseline visits for participant characteristics; for time varying variables (the behaviors and substance use) these were performed by total visits combining data across participants. Participants were grouped into analytic categories based on their reported use of drugs over the past 6 months at each visit. Groups were no drug use, cannabis use only, and use of drugs other than and including cannabis (methamphetamine, cocaine, MDMA, heroin, opioids). Differences between participants/visits by drug use groups were evaluated with chi-square methods tests. Across visit estimates were adjusted for the effect of the subject (i.e., repeated measures), and F-statistic for type 3 test of fixed effects was calculated (also adjusting for subject effects). Because clients could have repeated visits over the study period, we used hierarchical regression models with generalized estimating equations (GEE) in order to account for the within subject correlations.^{18,19} We fit models with random intercepts and time effects to accommodate the repeated measures gathered from each participant and to allow participant-specific changes in the responses over time. This allowed us to investigate the association between report of drug use as noted at each visit and other fixed effect variables such as race/ethnicity as well as time-varying repeated measures such as number of sex partners or STI co-infections (i.e. outcome) at each visit. Variables tested for inclusion in the multivariable models were based on meeting criteria for statistical significance in univariate analyses (confidence interval for Odds Ratio not widely spanning zero) or specified *a priori* as risk factors based on the existing literature. All analyses were conducted using SAS version 9.4 (Cary, NC).

Ethics

The study was approved by the Institutional Review Board at the University of California Los Angeles (IRB #13–001749).

RESULTS

Characteristics of study population

Between August 2014 and December 2017, 512 MSM were enrolled in the mSTUDY with as much as 3.2 years of follow-up data, representing a total of 1,535 visits. This includes per participant a mean of 1.5 visits, median 2 visits, IQR 1–3 visits, range of 1–7 visits; additionally over half of participants had 2 follow up visits (278/512 = 54%). Based on enrollment criteria, half of the study participants (n=258) were HIV-positive. At baseline the average age of participants was 31.4 years with 45% identifying as Hispanic/Latino, followed by 40% as Black/African American (Table 1). Nearly half reported being unemployed (46%, n=228), 35.2% (n=180) reported experiencing unstable housing in the 6 months prior to study enrollment, and 39% (n=198) reported a history of incarceration.

Substance Use

At over half the visits participants reported using multiple drugs (60.5%, n=930), use of only cannabis was reported at 13.4% (n=205), and no drug use (excluding alcohol and tobacco) was reported at 26% (n=400) (Figure 1). There were no differences in drugs used at visits by race/ethnicity (Table 1). Those reporting using only cannabis at a visit were significantly younger than either those reporting no drug use or other drug use, but for other demographic characteristics cannabis-only users were similar to the non-drug-users. Both those reporting cannabis-only and no-drug-use at visits were different than the other drug users in terms of fewer being unemployed and unstably housed. The difference was most pronounced for incarceration, with the fewest cannabis-only users reporting a history of incarceration, followed by non-drug-users, and then other-drug-users (25%, versus 31% and 44%, $p<0.01$).

Overall, binge drinking in the past six months was reported in about half of all visits, and it was reported in the past month in one third of visits (Figure 1). At more visits when men reported cannabis-only or other drug use, they also reported binge drinking, compared to visits where no substance use was reported (57% and 58% compared to 29% respectively, $p<0.01$). Binge-drinking was reported at 7.8% of all visits (30% of the total non-drug-users visits), clarifying that most of these men were not drinking alcohol instead of using drugs. Finally, cigarette smoking was reported at almost three times more visits with other drug use than those with no substance use and cannabis use.

Sexual Practices and Contexts

For the measures of sexual frequency and behaviors, when only cannabis use was reported, behaviors were similar to the non-drug-use group. During those six month periods, both groups reported practice of significantly fewer exposures and risks than users of other substances. Notably, the median of number of sexual partners in the past 6 months was 2 (interquartile range (IQR):1–5) compared to 4 (IQR: 1–10) for other-drug-using visits ($p<0.01$). Additionally, the number of times reporting RAI in the past month was half for

cannabis-only and non-drug-using visits compared to visits where participants reported other drug use (median 1 versus 2 and IQRs from 0–3 versus 1–15). The proportion reporting new sexual partners and/or concurrent sexual partners was about 20 percentage points lower among cannabis-only and non-drug-using visits compared to visits with other drug use (Table 1).

Where sexual behavior for participants only using cannabis during the reporting period was most clearly different was regarding their networks and other risks. Significantly fewer experienced intimate partner violence (only 3.9%) than either non-drug-using (10.9%) or drug using (21.1%, $p < 0.01$). Reported practice of transactional sex by cannabis only using participants was very low (3.5%). This was half that of non-drug-users (7.3%) and seven times less than other drug users (24.4%) $p < 0.01$. There were few sexual partner behaviors as reported by the participants that suggested concordance by drug use except for the visits when the participants reported other drug use they had more last partners who they reported using methamphetamines. Of interest was that the reported partner history of incarceration mirrored that of the respondent; in visits when the respondent used only cannabis they had fewest partners with history of incarceration than in visits with no drug use or other drug use (Table 1).

HIV and Drug Use

Fewer participants reporting only cannabis use were HIV positive than non-drug-using and other-drug-using men (29.8%, 49.2%, versus 73.6%, $p = 0.04$). But there was no difference among the HIV positive MSM in drug use pattern by HIV viral load. Among HIV negative MSM there was no difference in use of PrEP by drug use pattern.

Sexually Transmitted Infections

Significantly fewer participants tested positive for any STIs at visits when they reported in the previous 6 months only using cannabis (11.7%) compared to no drugs (16.3%) or other drugs (20.0%), ($p = 0.01$). The difference by these groups of visits was significant and the same for each STI (chlamydia, gonorrhea and active syphilis) as well as for any STI infection (Table 1). There is a suggestion of an inverse dose response relationship. Significantly fewer STIs were detected at visits where frequent cannabis use (weekly or more often) was reported (about a fourth as many as for the less frequent monthly or less users). This contrasts with other drugs where more frequent drug use is associated with more STIs detected (Figure 2). In unadjusted analyses there were no associations between any reported partner behaviors or characteristics with participant STI status.

In multivariable analysis factors independently associated with a positive STI test included age (adjusted odds ratio (AOR) 0.95, 95% confidence interval (CI) 0.92–0.98), new sex partner (AOR 1.50, 95% CI 1.05–2.04), being HIV positive (AOR 1.90, 95% CI 1.35–2.68) and other substance using compared to cannabis-only (AOR 1.69, 95% CI 1.03–2.78) (Table 2).

DISCUSSION

We found that when the young MSM in our highly diverse cohort were using only cannabis they had no higher risk of acquiring STIs than when not using any drugs or when using other drugs. We examined this relationship between different types of drug use in a large cohort of very sexually active and frequent substance-using young men, among whom there is great variability in sexual frequency, partnering, and drug use²⁰⁻²². Furthermore, unlike most previous studies we assessed cannabis use both biologically and by self-report and associated just not the report of use, but frequency of use with a biological outcome - sexually transmitted infection. These are the individuals with highest HIV incidence in the United States, and are at high risk of having poor adherence to HIV treatment, making transmission and acquisition more likely.²⁰⁻²² This makes the relationships between drug use, behaviors, and STI acquisition of high public health relevance.

Use of substances such as methamphetamines, poppers, party drugs, and heroin have long been implicated in the HIV epidemic as associated with acquisition and transmission.^{2,9,23} Both the desire to have sex while using and the need to obtain drugs can put people into sexual situations that may compromise their health. The difference between cannabis and these drugs is that cannabis does not necessarily enhance sexual drive or stimulation. Though there is some evidence Black MSM may use cannabis during sex as a “sex drug”¹¹, this report comes from a small study in one city. Cannabis has not been demonstrated to have the physiological effects of poppers or stimulants that facilitate longer or more frequent sexual acts^{2,12} reducing this type of enhanced exposure to STI/HIV acquisition. Moreover, our findings suggest that unlike other substances, the heavier users of cannabis seem to have lower risk sexual exposures resulting in fewer acquiring STIs and potentially less HIV exposure. They may have less motivation to seek sexual partners while heavily using cannabis.

Our study found that when using only cannabis participants seem to interact with fewer social networks and environments where prevalence of STIs are high such as jails, networks of sexual diversity that include transgender individuals, and violent individuals who perpetrate interpersonal violence. Their most recent partners also do not seem to have higher risk with few having history of incarceration, suggesting the sexual and social networks of those engaging only in cannabis use compared to those in which other drugs are also in use may be less street and jail/prison involved. When only using cannabis they are less often unemployed and living on the street than when using other drugs, contexts in which violence and incarceration are intertwined. Much of this may be tied to how the drug itself is now acquired. While these data were collected just before adult-use cannabis use was legalized in California, medical cannabis has been legal in Los Angeles since 1996, possession of cannabis for personal use was decriminalized in 2010, and acquisition of cannabis is locally relatively easy often through commercial establishments such as dispensaries.^{26,27} HIV positive individuals may also have prescriptions for medical marijuana making their acquisition legal and through dispensaries rather than on the street. Therefore, acquiring cannabis in California for these MSM does not put the user into as many potentially violent or risky environments as when they are seeking other drugs, and may largely remove them from the street drug culture where STIs thrive. That also protects the cannabis users from

incarceration due to drug use itself because it is use is decriminalized reducing their need to be in situations to acquire or maintain the drug that can result in arrest and incarceration.

While we demonstrate lower sexual risk contexts when men are using cannabis, there may also be biological explanations for the lower prevalence of STIs we found during periods of cannabis only use that reduce probability of acquisition. There is some evidence that cannabis use affects the inflammatory response of those who use it.²⁸ Heavy cannabis use has also recently been shown to be associated with reduction of activated and inflammatory immune cells among HIV-positive patients on antiretroviral treatment.²⁹ While there is some macaque evidence of how a cannabis-induced lower inflammatory response could influence HIV viral load,³⁰ such results need to be combined with behaviors to establish the clinical relevance of this effect to transmission and acquisition of HIV and other STIs. While our findings did not show in a difference by cannabis use in viral load among our participants with HIV, reduced inflammation rectally could reduce probability of acquisition of rectal STIs. A future integrated analysis using our biological specimens and behavioral data could better explore this potential mechanism.

Limitations

Our measure of dose for drug use is based on self-report that may be affected by recall bias. As noted above, our more precise biomarkers of drug use could not be used to classify drug use for these analyses because the detection windows are too short that would lead to not enough overlap with the period of infectiousness for STIs. Moreover, we did not have a biomarker to quantify levels of drug in the body making it impossible to biologically differentiate heavy users from lighter users. Finally, the generalizability of our sample may be limited to other highly diverse large cities in the US and mostly minority drug using MSM.

Nevertheless, this is one of the first studies to challenge the notion that drug use in general is equated with sexual risk for STIs/HIV. During periods when our participants only used cannabis they did not practice greater risk nor experienced greater STI acquisition than during periods when there was either no drug use or use of other drugs. It may be that their cannabis use was for relaxation and sensations that remove them from sexual risk. Stoned may be safer than sober for young MSM if it helps keep them from using other drugs and off the streets.

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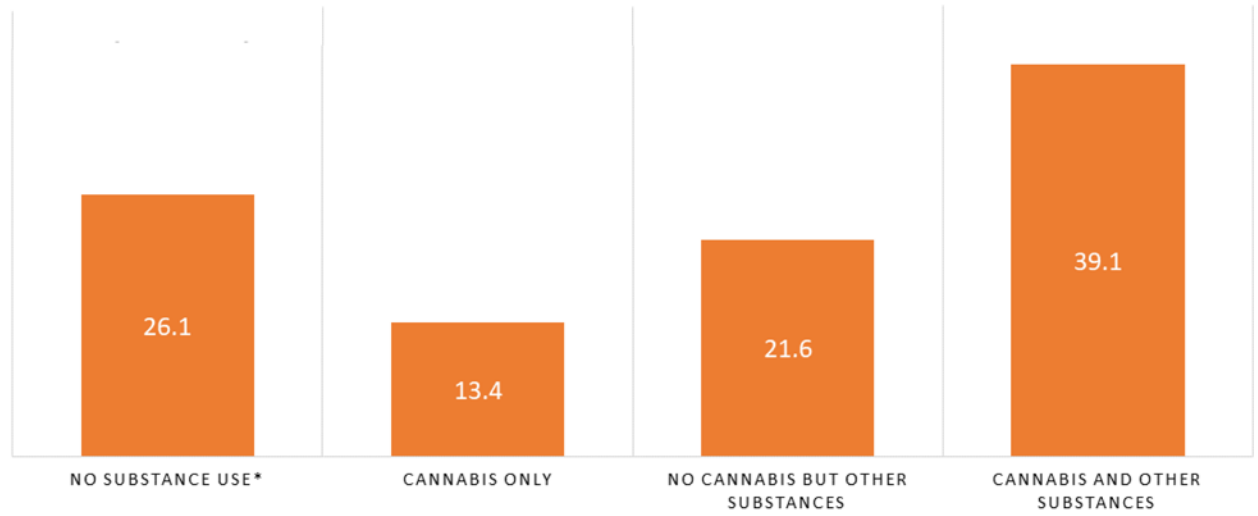
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*The no substance users include 7.8% binge drinkers and 18.3% non binge drinkers

Figure 1.
Percent of mSTUDY participants reporting substance use and cannabis use across 1,535 visits August 2014–December 2017.

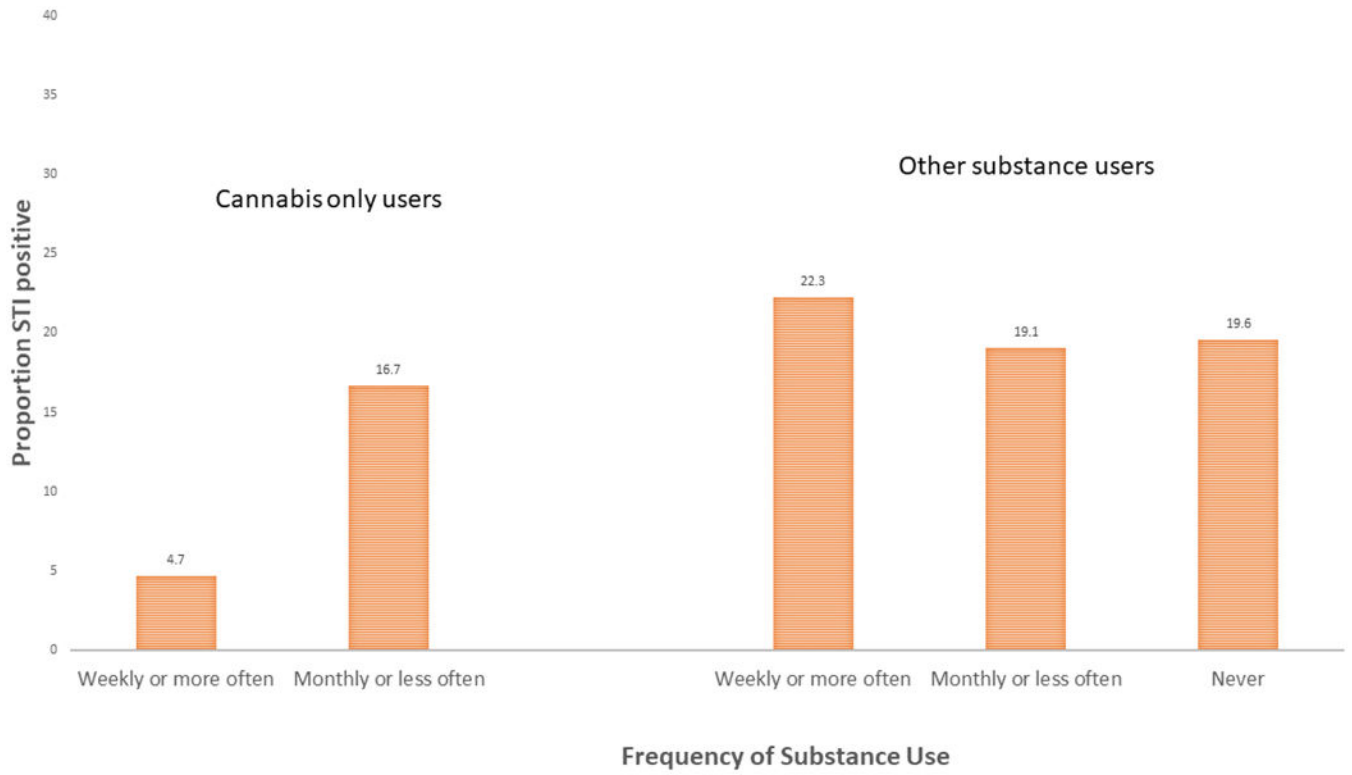


Figure 2:
Prevalence of STIs by frequency of cannabis use and other drug use among mSTUDY participants across visits (8/2014 – 12/2017)

Table 1.

Prevalence of demographic characteristics, sexual behaviors, and STIs by substance use status across study visits: mSTUDY participants (8/2014–12/2017)

	No Substance Use, past 6 months (n=400)		Marijuana Only, past 6 months (n=205)		Other Substance Use, past 6 months (n=930)		p value ~
	n	%	n	%	n	%	
Socio-demographic characteristics							
Age at study visit, mean (SD)	32.4 (7.1)		30.9 (6.9)		32.8 (6.8)		0.03
Race/ethnicity							0.19
African American	177	44.2	108	52.7	374	40.2	
Hispanic/Latino	127	31.8	50	24.5	344	37.0	
Other	38	9.5	20	9.8	80	8.6	
White	58	14.5	27	13.2	132	14.2	
Unemployed	114	30.2	60	30.3	461	50.9	0.09
Unstable Housing, past 6 months *	82	20.5	44	21.5	314	33.8	<.01
Ever Incarcerated	125	31.3	51	24.9	413	44.4	<.01
Sexual risk behaviors							
Number of Sex Partners, past 6 months, median (IQR)	2 (1–5)		2 (1–4)		4 (1–10)		0.01
Number of times had RAI, past month, median (IQR)	1 (0–3)		1 (0–3)		2 (1–15)		
New Sex Partner, past 6 months	213	53.2	121	59.0	684	73.6	<.01
Transgender Anal Sex Partner, past 6 months	20	5.0	9	4.4	82	8.8	0.03
Intimate Partner Violence, past 12 months **	42	10.9	8	3.9	192	21.1	<.01
Concurrent Sexual Partnership, past 6 months	106	29.1	62	31.3	440	52.6	<.01
Received \$/drugs/shelter for sex, past 3 months	27	7.1	7	3.5	219	24.4	<.01
Binge drinking, past 6 months ***	119	29.8	117	57.1	541	58.2	<.01.
Current Smoker	79	22.6	43	22.4	328	38.0	0.27
Sexual partnership/network characteristics							
Age discordant sex partner, past 6 months ****	45	12.3	35	17.6	200	22.6	0.96
Last partner incarcerated, ever							0.03
Yes	39	10.2	18	8.8	122	13.5	
Don't know	104	27.2	64	31.4	320	35.5	
No	239	65.6	122	59.8	460	51.0	
Last partner reported concurrent sexual partnerships							0.15
Yes	154	40.6	81	40.1	470	51.8	
Don't know	103	27.2	50	24.8	210	23.1	
No	122	32.2	71	35.2	228	25.1	
Last partner reported transactional sex							0.46
Yes	20	5.2	7	3.4	104	11.6	

	No Substance Use, past 6 months (n=400)		Marijuana Only, past 6 months (n=205)		Other Substance Use, past 6 months (n=930)		p value ~
	n	%	n	%	n	%	
Don't know	111	29.1	63	30.7	298	33.3	
No	251	65.7	135	65.9	493	55.1	
Last partner binge drinks, past 6 months ***							0.21
Yes	64	16.8	39	19.2	257	28.2	
Don't know	75	19.6	44	21.7	205	22.5	
No	243	63.6	120	59.1	450	49.3	
Last partner, marijuana use, past 6 months							0.09
Yes	71	18.5	98	48.3	400	43	
Don't know	73	19.0	35	17.2	175	19.2	
No	240	62.5	70	34.5	337	36	
Last partner, methamphetamine use, past 6 months							<.01
Yes	38	9.9	5	2.5	340	37.3	
Don't know	72	18.8	26	22.6	162	17.8	
No	273	71.3	152	74	410	44	
Last partner, HIV status							0.83
HIV-Positive	103	38.2	35	22.3	223	38.0	
Don't know status	19	7.0	6	3.8	34	5.8	
HIV-Negative	148	54.8	116	73	330	56.2	
HIV-related factors							
H IV-positive	197	49.2	61	29.8	513	55.2	0.04
PrEP use, past 6-months ^	74	36.5	51	35.4	171	41.0	0.75
HIV-1 RNA level, median (IQR), copies/mL ^^	1.3 (L2–1.8)		13 (1.2–3.1)		1.3 (1.2–3.5)		0.13
STI (laboratory testing)							
Any STI (Chlamydia, Gonorrhea, or Early Syphilis)	65	16.3	24	11.7	183	20.0	0.01
Chlamydia (urine, rectal, or throat)	31	7.9	12	5.9	86	9.5	0.09
Gonorrhea (urine, rectal, or throat)	25	6.4	9	4.4	94	10.4	<.01
Early Syphilis (primary, secondary, or early latent syphilis)	15	3.8	3	1.5	38	4.2	0.04

Abbreviations. IQR=Interouartile Range; PrEP=Pre-exposure Prophylaxis

~ p value adjusts for the effect of the subject (i.e. multiple observations for the same participant)

* Defined as not having a regular place to stay in the past 6 months

** Defined as being hit, kicked, or slapped by a lover, boyfriend/girlfriend when that person meant to hurt you physically

*** Defined as 6 more more drinks on one occasion

**** Age discordance defined as having a partner age discrepant by more than 10 years

^ Among HIV-negative participants;

^^ Among HIV-positive participants

Table 2:

GEE Models showing Unadjusted and Adjusted Associations between substance use and STI outcome among mSTUDY participants, (8/2014 – 12/2017)

	Undadjusted OR (95% CI)	Adjusted OR (95% CI)	
<u>Outcome: Any STI</u>			
Sotio-demographic characteristics			
Age at study visit, mean (SD)	0.96 (0.94–0.99)	0.95 (0.92–0.98)	
Race/ethnicity			
African American	1.05 (0.63–1.72)	--	--
Hispanic/Latino	1.16 (0.71–1.89)	--	--
Other	1.20 (0.67–2.18)	--	--
White	1.00 Reference	--	--
Unstable Housing, past 6 months *	1.19 (0.88–1.60)	--	--
Ever Incarcerated	1.00 (0.75–1.33)	--	--
Sexual risk behaviors			
Number of Sex Partners, past 6 months	1.48 (1.02–2.06)	1.46 (1.01–2.04)	
New Sex Partner, past 6 months	1.52 (1.12–2.06)	1.50 (1.05–2.04)	
Transgender Anal Sex Partner, past 6 months	1.25 (0.72–2.17)	--	--
Intimate Partner Violence, past 12 months **	1.10 (0.77–1.26)	--	--
Concurrent Sexual Partnership, past 6 months	1.64 (1.24–2.18)	--	--
Received \$/drugs/shelter for sex, past 3 months	1.64 (1.16–2.31)	--	--
Sexual partnership/network characteristics			
Age discordant sex partner, past 6 months ***	1.16 (0.78–1.73)	--	--
Last partner incarcerated, ever			
Yes	0.80 (0.50–1.29)	--	--
Don't know	1.09 (0.80–1.48)	--	--
No	1.00 Reference	--	--
Last partner, methamphetamine use, past 6 months			
Yes	1.36 (0.98–1.90)	--	--
Don't know	1.28 (0.91–1.80)	--	--
No	1.00 Reference	--	--
Last partner, HIV status			
HIV-Positive	0.83 (0.56–1.22)	--	--
Don't know status	0.94 (0.47–1.90)	--	--
HIV-Negative	1.00 Reference	--	--
HIV status			
HIV-positive	1.48 (1.10–1.99)	1.90 (1.35–2.68)	
Alcohol and substance use			
Binge drinking, past 6 months ***	0.95 (0.72–1.25)	--	--
Substance use status, past 6 months			
Marijuana only	1.00 Reference	1.00 Reference	

	Undadjusted OR (95% CI)	Adjusted OR (95% CI)
Other substance	1.89 (1.17–3.05)	1.69 (1.03–2.78)
No substance use	1.54 (0.91–2.62)	1.53 (0.88–2.66)

Abbreviations. OR=Odds ratio; CI=Confidence Interval

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