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Marijuana Use as a Sex-Drug is Associated with HIV Risk Among Black MSM and Their Network

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Abstract

Introduction—Black men who have sex with men (BMSM) are highest risk for HIV seroconversion in the United States. Little attention has been paid to marijuana use among BMSM and potential for HIV risk.

Methods—A sample of 202 BMSM was generated through respondent driven sampling. The relationship between differential marijuana use and both HIV risk behavior and social network factors were examined using weighted logistic regression.

Results—Of the BMSM in this sample 60.4% use marijuana in general and 20.8% use marijuana as sex-drug. General marijuana use was significantly associated with participation in group sex (AOR 3.50; 95% CI 1.10–11.10) while marijuana use as a sex drug was significantly associated with both participation in condomless sex (AOR 2.86; 95% CI 1.07–7.67) and group sex (AOR 3.39; 95% CI 1.03–11.22). Respondents with a moderate or high perception of network members who use marijuana were more likely to use marijuana both in general and as a sex-drug.

Conclusion—Network member marijuana use, while not associated with risk behaviors, is associated with individual marijuana use and individual marijuana use in the context of sex is associated with risk practices. Targeting interventions towards individuals and their respective networks that use marijuana as a sex drug may reduce HIV risk.

Keywords

HIV; marijuana; BMSM; networks; RDS

Introduction

In a seminal meta-analysis examining disparities in HIV rates among Black men who have sex with men (BMSM) compared to white MSM (WMSM), Millet found several important structural factors associated with increased HIV rates in BMSM, including homelessness, incarceration, low education and low income (1). Factors traditionally thought to increase the rate of HIV acquisition such as the use of crack, cocaine, methamphetamines, and amyl

nitrites as sex-drugs were not significant drivers of disparities. In fact there was a lower likelihood of these factors contributing to HIV in Black MSM compared to other MSM.

The types of drug used by individuals vary across race and age. The majority of the literature on MSM substance use and HIV has focused on WMSM and the drugs they more frequently use, such as methamphetamines. When research does focus on BMSM, the drugs considered are crack/cocaine and heroin, most commonly used by older BMSM (2–4) with little attention paid to drugs used more commonly by younger BMSM (YBMSM). Further, when focused on younger MSM, rates of transmission among YBMSM were not explained by any lifetime drug use. However, substances commonly used by younger MSM overall, such as alcohol and marijuana, were not disaggregated by type of use into either general use and/or use as a sex drug (personal communication Millet). In fact, most studies focus on opiates, cocaine and methamphetamines with methamphetamines exhibiting some of the strongest effects on sexual acquisition of HIV among MSM, particularly when used as a sex-drug (5). Thus we do not know if there are specific drugs such as marijuana that are impacting these disparities among YBMSM, particularly given the different contexts and networks that these BMSM occupy.

One of the reasons marijuana use is either not disaggregated or is excluded from analyses that examine HIV risk is because of common perceptions that it is not associated with HIV acquisition, as compared to other drugs typically described in the literature (5). In fact, analyses of marijuana and HIV risk are few and have mixed conclusions. Some studies have shown a positive association between marijuana use and sexual risk behaviors (6, 7), including reduced condom use (7, 8) and more sex with casual partners (9, 10); other studies have found no association between marijuana use and sexual risk behaviors (9). Importantly, some studies have shown that marijuana use in a sexual context has a stronger association with sexual risk behaviors than does general marijuana use (8).

Past studies have shown that, among young adults, individual marijuana use was typified by participation in networks of other marijuana users (11). This same study found that marijuana use by network members or sexual partners was an important predictor of individual marijuana use. Additionally, prior analyses have shown that younger MSM are less likely to be HIV-infected when their sexual partners are closer to their own age (12). Finally, Jessor (13) suggests that risk behaviors among adolescents, such as marijuana use, may aggregate and complicate health outcomes.

Few studies exist which directly examine the association between marijuana use and HIV risk behaviors such as condomless sex and group sex, with even fewer still examining differential marijuana use, either general use or use as a sex drug. In addition, none of these studies have been conducted in a population of Black MSM. In this paper we examine the use of marijuana, either general use or use as a sex drug, among a representative sample of Black MSM, a group with particularly high risk for HIV; in 2011, BMSM accounted for 39.0% of both new HIV and AIDS infections with YBMSM (aged 13–24) accounting for twice as many new HIV infections as young White or Hispanic/Latino MSM (14).

Methods

Setting

Between January and June of 2010, BMSM were recruited in Chicago using respondent-driven sampling (RDS) (15). All interviews took place at partnering community-based organizations by trained BMSM community members. HIV voluntary counseling and testing was conducted according to standard protocols at each organization. Informed consent was obtained from all respondents and waived for network members listed by respondents. The University of Chicago, National Opinion Research Center and Howard Brown Health Center IRBs approved the protocol. Three CBOs participated in the project.

Study Participants

Eligibility Criteria—Study participants included both study respondents who were interviewed, and the network members about whom they reported. Study respondents were eligible to participate if they 1) self-identified as African American or Black, 2) identified as male, 3) were age 18 years or older, 4) reported anal intercourse with a man within the past 12 months, and 5) were willing and able to provide informed consent at the time of the study visit. Network members were eligible if they were named by respondents during the interview.

Recruitment—RDS has been widely applied to study hard-to-reach populations such as injecting drug users, sex workers, and MSM (16–19). Recent theoretical and empirical work has assessed the strengths and weaknesses of RDS (19–21). This work has emphasized the importance of careful selection of “seeds” from diverse sources and sufficient iterative rounds of recruitment to penetrate further reaches of the larger social networked population being studied — “recruits”.

Prior research has shown that using multiple methods of seed selection can improve access to hidden populations (22) and can improve external validity by accessing participants through their social networks (23) thus seeds were selected from four kinds of venues either through referral from HIV program personnel (e.g., case manager) or through the posting of fliers referencing the study. In the case of referral by program personnel, requests were made for popular or charismatic candidates in order to maximize first wave recruitment (24).

Twenty-one seeds were recruited, from the following four venues: 1) Four seeds were recruited from a local Federally Qualified Health Center that provides HIV primary care; 2) Eight seeds were referred from existing group Effective Behavioral Intervention prevention programs in community-based organizations (25); 3) Four seeds were recruited through fliers from a substance use treatment program; and 4) Five seeds were recruited through fliers posted at an LGBT care center. Four vouchers were provided to each seed who were asked to refer up to four MSM from their social networks, with each subsequent recruit doing the same with additional vouchers. All respondents were paid $50 for participation in the survey.

Additional information regarding the survey instrument can be found in the appendix.

Sociodemographic, Attitude and Behavior Measures—Marijuana use was self-reported by respondents and included any use during the twelve-month period before the date of interview. Those respondents who reported any marijuana use were subsequently asked if they had used marijuana as a sex-drug at any time during the same twelve-month period: *"Have you ever used any of these substances as 'sex drugs,' that is to make sex easier, better, last longer, or something similar?"* Sex-drug use (SDU) was measured and defined as previously described (26, 27). Both general and marijuana use in the context of sex were dichotomous variables with any level of use recorded as use in that period.

Remaining survey items were adapted from the Centers for Disease Control and Prevention's National HIV Behavioral Surveillance Survey, MSM Cycle (26) and the visit 51 Core Behavioral survey of the MACS (available at http://statepi.jhsph.edu/macs/forms.html). These included: age, education, employment, HIV status, condomless sex, preferred sex position ("top, bottom, or versatile"), and whether the respondent has a regular physician. Group sex was defined as "having sex with two or more individuals at the same time". Risk factors were assessed in terms of frequency over the past six months and were coded for these analyses as present if they were reported as occurring at least once per month to indicate those who have a pattern of risk behavior. HIV testing and counseling were offered to all participants onsite and HIV-infected respondents were referred to appropriate services. Two-day training of the interviewers was conducted by the National Opinion Research Center. Interviewers were CBO staff.

Analysis

Respondent Driven Sampling—In order to generate RDS weights we asked respondents to estimate the number (degree) of MSM in their community who they "know well", on a first name basis, and with whom they would likely have contact within the next two weeks. Estimation of this measure of degree was different from the degree calculated from the personal network generator of confidants described previously. Transformations to correct for the non-normal distribution of degree were investigated using the ladder of power function in Stata. The data were transformed using the least-significant departure from normality, 1 divided by the square root of the respondent's network degree. We then generated RDS weights and compared these results to those obtained without the weights and assuming independent observations. These weights were subsequently used for all regression analyses. RDS weights were generated in Stata 13.1.

Risk factor and marijuana use analysis—The primary outcomes were defined in terms of risk-behaviors: condomless sex and group sex; marijuana use: either in general or as a sex-drug; and HIV serostatus, defined by the presence of HIV antibodies in blood serum via lab testing. These outcomes were individually examined using RDS weighted logistic regression and non-weighted regression.

Additional covariates include sociodemographic factors such as age and education. Age was stratified by those who are less than 30 and those who are 30 and older, in line with epidemiologic risk among Black MSM (28). Education was stratified by those who had a high school education or less and those who had some college education or a college degree.

Social network factors that could influence marijuana use included: proportion of perceived network using marijuana (categorized into tertiles – low: 0–31%, moderate: 32–58% and high: 59+%) and use of marijuana as a sex-drug by a sexual partner, categorized as those who have no sexual partners who use marijuana as a sex-drug and those who have at least one sexual partner who uses marijuana as a sex-drug. Similar to prior studies (29), perception of the respondent's personal network using marijuana was defined as the number of MSM in the network whom the respondent said use marijuana out of the total number of MSM in the respondent's network.

Finally, we adjusted for other drug use. Due to low numbers of other drug use in our sample we collapsed all other drug use into two categories: general drug use only or both general drug use and use as a sex-drug. Both categorical variables were separately assessed in all models.

Four sets of models were created with the following dependent variables: 1) the odds of respondent marijuana use given proportion of his network using marijuana, 2) the odds of respondent marijuana use given marijuana use as a sex-drug by a sexual partner, 3) the odds of engaging in condomless sex given marijuana use either in general or as a sex-drug, and 4) the odds of engaging in group sex given marijuana use either in general or as a sex-drug. Covariates included in all models, were factors statistically significant at $p<0.05$ in univariate analyses. All statistical analyses were performed in Stata 13.1.

Results

Respondent Driven Sampling

The study respondent sample was generated through RDS sampling with a maximum of nine waves (n = 202 BMSM respondents) using 21 seeds with a mean of 5.8 recruits (range 0–42) per seed. Outdegree of MSM community members was on average 18.6 (SD 44.9) with a range of 2–500.

Sample network characteristics

The sample included respondents (n = 202) who were generated from 21 seeds and who reported on other network members (n = 983) for a total of 1,185 participants. Baseline demographic and risk factor attributes for respondents are presented in Table I and stratified by marijuana use. Additional drug use was analyzed (Table II) according to general use and use as a sex-drug. Among those under 30, marijuana (69.8%), psychedelics (23.6%), and both cocaine/crack and poppers (8.5%) represented the three most common generally used drugs; meanwhile, marijuana (17.6%), psychedelics (11.1%) and poppers (8.3%) represented the most commonly used sex-drugs. Conversely, among those 30 and older, marijuana (50.0%), cocaine/crack (31.3%), and poppers (11.5%) represented the most common global drug use, while marijuana (24.0%), cocaine/crack (25.0%), and poppers (9.4%) represented the most commonly used sex-drugs. In addition, a greater percent of participants under 30 years of age (68.8%) report general marijuana use and a greater percent over 30 years of age report marijuana use as a sex-drug (54.8%).

Risk and social network analysis

Separate RDS-weighted logistic regression models were used to analyze social components of each respondent's network which may influence marijuana use (Table III). The proportion of social network members using marijuana is significantly associated with respondents' general marijuana use among both moderate (AOR 4.67; 95% CI 1.70–12.88) and high (AOR 3.03; 95% CI 1.25–7.39) proportions, as compared to a low proportion; network marijuana use is also associated with sex-drug use by the respondent in both the moderate (AOR 10.09; 95% CI 2.91–34.96) and high (AOR 4.93; 95% CI 1.42–17.515) proportions, as compared to a low proportion. Sex partner marijuana use as a sex-drug was also significantly associated with general marijuana use (AOR 7.08; 95% CI 2.41–20.81); however, the model was too unstable to estimate individual marijuana use as a sex-drug as only two individuals who use marijuana as a sex drug report a sex partner who does not use marijuana as a sex drug. Finally, marijuana use as a sex-drug by partner was significantly associated with condomless sex (AOR 3.69; 95% CI 1.18, 11.54).

RDS-weighted logistic regression models were also derived on respondents' sociodemographic covariates alone (data not shown). In these models age was significantly associated with HIV sero-status (AOR 4.20; 95% CI 2.05–8.61) and any other drug use was associated with both group sex (AOR 2.82; 95% CI 1.17–6.77) and HIV sero-status (AOR 2.84; 95% CI 1.33–6.04). When stratified marijuana use was included in the model (Table IV) with other general drug use, general marijuana use was significantly associated only with group sex (AOR 3.50; 95% CI 1.10–11.10) while marijuana use as a sex-drug was significantly associated with both condomless sex (AOR 3.2.86; 95% CI 1.07–7.67) and group sex (AOR 3.39; 95% CI 1.03–11.22). However, when other drug use (general or use as a sex-drug) was included in the model only marijuana use as a sex-drug remained significantly associated with condomless sex (AOR 2.86; 95% CI 1.04–7.84). No significant relationship found between HIV serostatus and marijuana use.

All analyses were also performed without RDS-weighting with no differences in results found (data not shown).

Discussion

To date, relatively little research has been done to characterize marijuana use among BMSM and little to examine the relationship between disaggregated marijuana use, either in general or within the context of sex, and sexual behaviors that are associated with HIV serostatus. In this study, we find results consistent with those previously reported by Millet et al. (2007) in that drug use is not related to HIV serostatus. However, we did find that marijuana use both in general and in the context of sex are related to increased participation in risk behaviors; we also found a number of other interesting findings.

First, we found that more than half of our sample (60.4%) report use of marijuana generally and 20.8% as a sex-drug, which was higher than any other drug use. Second, we find that proportion of network using marijuana is significantly associated with general marijuana use and marijuana use as a sex-drug by the respondent, but not respondents' HIV serostatus or other risk behaviors. Third, marijuana use as a sex-drug by partner is significantly associated

with general marijuana use and condomless sex, but not respondents' HIV serostatus or group sex. Finally, we find that only marijuana use as a sex-drug remains significantly associated with increased participation in condomless sex when adjusting for other drug use both in general and as a sex-drug. These results suggest that the context of marijuana use may be key in understanding HIV risk in this population. Together, these results suggest that interventions for marijuana users may need to focus on the context of marijuana use as well as renewed focus on the network rather than individuals in isolation.

With increasing legalization of marijuana and increasing rates of use, especially among young black men and women, it is prudent to directly examine the effects of marijuana use on factors statistically tied to HIV serostatus. To this end, we analyzed the differences between general and sex-drug marijuana use among a sample of BMSM (Table IV). In terms of increased risk-associated health behaviors, we found that, when adjusting for other drug use in general, both those who use marijuana in general or as a sex-drug are at a significantly increased risk of participation in either condomless or group sex. However, when adjusting for other drug use both in general and as a sex-drug, only marijuana use as a sex-drug remained significantly associated with condomless sex. These results suggest that marijuana use as a sex-drug may affect risk-associated health behaviors, though we find no association with general marijuana use or HIV serostatus even in this younger sample. Future studies should analyze the association between marijuana use and HIV risk behaviors and how this association may differ in areas that have now legalized marijuana as compared to areas where marijuana use remains illegal.

Prior research has examined the disparities between WMSM and BMSM and has found that, overall, BMSM report less risk-associated health behaviors and lower overall drug use (1, 4). However, BMSM, and especially YBMSM, continue to have the greatest risk of contracting HIV of any population, as previously mentioned. Curiously, prior research has found that while overall prevalence of marijuana use in the US has remained stable, marijuana abuse/dependence has increased significantly, especially among young black men and women (29), a trend which continues to be supported in this study. With the high rates of marijuana use found in this study and the implications of its use with sexual risk behaviors, this study points to a need for more research on disaggregated marijuana use both at the individual and network level, especially among those who use marijuana as a sex-drug.

While significant findings were obtained, we must interpret them within the context of our study limitations. Our data are cross-sectional and thus do not allow for causal inference. We also do not have a measurement of alcohol consumption, a known confounder in this association. Additionally, the lower level of some confidence interval estimates are close to unity and thus these results are only marginally significant and should be interpreted as such. Finally, the measurement of marijuana use as a sex drug may introduce a cognitive bias in that those who use marijuana as a sex drug may assume their sexual partners used the drug as well.

In addition, the cross-sectional nature of our study does not allow us to assess marijuana use over time and relies upon the self-reported use of our respondents in general terms without

quantification of marijuana use. Longitudinal research in this area is needed and would help identify changes in marijuana use and risk behaviors over time. Our confidant network is also limited in this analysis, limiting our ability to generate proportions of the respondents' network that participate in HIV risk behaviors, as well as limiting our precision of some estimates. However, we did not find any significant associations between the riskiness of the confidant network and our main outcome measures. Future research should further examine the risks of differential marijuana use on risk-associated health behaviors to better target interventions to community members and their networks most at-risk.

Despite these limitations, our study does have important implications on furthering the identification of HIV risk among BMSM. We have demonstrated a need to directly analyze behaviors which are more prevalent among BMSM, such as marijuana use as a sex-drug and general marijuana use within social networks, in order to better ascertain the reasons for observed disparities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table I

HIV risk behavior stratified by marijuana use among Black MSM in Chicago (n=202)

	All Respondents Marijuana Use				
	Never[a] (n=80)	**General Only[b] (n=80)**	**Sex-Drug[a] (n=42)**	**p-value[c]**	**Total Respondents (n=202)**
Attributes	***No. (%)***	***No. (%)***	***No. (%)***		***No. (%)***
	Demographics				
Age					
< 30	32 (40.0)	55 (68.8)	19 (45.2)	0.001	108 (52.9)
≥ 30	48 (60.0)	25 (31.2)	23 (54.8)		96 (47.1)
Education					
≤ High school	29 (36.3)	47 (58.8)	24 (57.1)	0.009	100 (49.5)
> High school	51 (63.8)	33 (41.3)	18 (42.9)		102 (50.5)
Employment					
Unemployed	12 (15.0)	13 (16.3)	6 (14.3)	0.12	31 (15.4)
Part-time	20 (25.0)	13 (16.3)	16 (38.1)		49 (24.3)
Full-time	48 (60.0)	54 (67.5)	20 (47.6)		122 (60.4)
HIV Sero-Status					
HIV-positive	37 (48.1)	30 (38.5)	22 (55.0)	0.201	89 (45.6)
HIV-negative	40 (52.0)	48 (61.5)	18 (45.0)		106 (54.4)
	Risk Behaviors				
Condomless Sex[d]	22 (28.2)	27 (33.8)	23 (56.1)	0.009	72 (36.2)
Group Sex[d]	8 (10.3)	22 (27.5)	14 (33.3)	0.004	44 (22.0)
	Network Factors				
Proportion of social network using marijuana[e]					
Low: 0–31%	41 (51.3)	16 (20.0)	7 (16.7)	< 0.001	64 (31.4)
Moderate: 32–58%	17 (21.3)	23 (28.8)	15 (35.7)		56 (27.5)
High: 59+%	22 (27.5)	41 (51.3)	20 (47.6)		84 (41.2)

	All Respondents Marijuana Use				
	Never[a] (n=80)	**General Only[b] (n=80)**	**Sex-Drug[a] (n=42)**	**p-value[c]**	**Total Respondents (n=202)**
Attributes	***No. (%)***	***No. (%)***	***No. (%)***		***No. (%)***
Sex partner marijuana use as a sex drug	15 (36.6)	18 (51.4)	32 (94.1)	< 0.001	65 (59.1)

[a] Over the previous twelve months

[b] Any non-sex-drug use of marijuana in the previous twelve months

[c] Calculated using chi-square analyses

[d] Ever over the previous six months

[e] Proportion of the respondent's personal network using marijuana was defined as the number of MSM in the network who uses marijuana out of the total number of MSM in the respondent's network

Table II

Respondent drug use stratified by general and sex-drug use for Black MSM (n=202)

	General Use[b]		Total	Sex-Drug Use Only		Total
Drug[a]	**< 30, *n*(%)**	**≥ 30, *n*(%)**	***n*(%)**	**< 30, *n*(%)**	**≥ 30, *n*(%)**	***n*(%)**
Cocaine/crack	9 (8.5)	30 (31.3)	39 (19.3)	2 (1.9)	24 (25.0)	26 (12.8)
Heroin	-	9 (9.4)	9 (4.5)	-	7 (7.3)	7 (3.4)
Marijuana	74 (69.8)	48 (50.0)	122 (60.4)	19 (17.6)	23 (24.0)	42 (20.6)
Psychedelics	25 (23.6)	5 (5.2)	30 (14.9)	12 (11.1)	1 (1.0)	13 (6.4)
Opiate Painkillers	4 (3.8)	4 (4.2)	8 (4.0)	1 (0.9)	-	1 (0.5)
Anti-Anxiety Medication	1 (0.9)	1 (1.0)	2 (1.0)	-	-	-
Methamphetamines	2 (1.9)	2 (2.1)	4 (2.0)	2 (1.9)	1 (1.0)	3 (1.5)
Poppers	9 (8.5)	11 (11.5)	20 (9.9)	9 (8.3)	9 (9.4)	18 (8.8)
Other Inhalants	-	-	-	-	-	-
Antidepressants	-	2 (2.1)	2 (1.0)	-	-	-
Erectile Dysfunction Drugs	-	7 (7.3)	7 (3.5)	-	7 (7.3)	7 (3.4)

[a] Use over the previous twelve months

[b] General use refers to any use of the drug, either recreational or as a sex-drug

Table III

Multivariable models[a] for marijuana use and HIV risk behaviors by social network factors for Black MSM (n=202)

	General Marijuana Use[b]	Marijuana Use as a Sex Drug[b]	Condomless Sex[b]	Group Sex[b]	HIV Status[c]
Variable	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Proportion of Social Network Using Marijuana[d]					
Low: 0–31%	*ref*	*ref*	*ref*	*ref*	*ref*
Moderate: 32–58%	4.67 (1.70, 12.88)**	10.09 (2.91, 34.96)**	1.69 (0.64, 4.46)	1.52 (0.49, 4.66)	0.89 (0.32, 2.43)
High: 59+%	3.03 (1.25, 7.39)*	4.93 (1.42, 17.15)*	0.72 (0.28, 1.82)	1.37 (0.47, 4.04)	0.88 (0.36, 2.13)
Sex Partner Marijuana Use as a Sex-Drug					
No	*ref*	*ref*	*ref*	*ref*	*ref*
Yes	7.08 (2.41, 20.81)**	-[e]	3.69 (1.18, 11.54)*	1.71 (0.48, 6.05)	0.46 (0.17, 1.22)

* $p \leq 0.05$;

** $p \leq 0.01$

[a] All models are RDS-weighted

[b] Adjusted for age, education, number of sex partners, any other drug use and HIV status

[c] Adjusted for age, education, any other drug use and number of sex partners

[d] Perception of the respondent's personal network using marijuana was defined as the number of MSM in the network who uses marijuana out of the total number of MSM in the respondent's network

[e] Model was too unstable to estimate parameter, only two individuals who use marijuana as a sex drug report a sex partner who does not use marijuana as a sex drug

Table IV

Multivariable models[a] for marijuana use and HIV risk behaviors for Black MSM (N=202)

	Condomless Sex[b]	Group Sex[b]	HIV Status[d]
Variable	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Marijuana Use[b]			
Never	*ref*	*ref*	*ref*
General Only	1.72 (0.69, 4.30)	3.50 (1.10, 11.10)*	1.19 (0.52, 2.69)
Sex-Drug	2.86 (1.07, 7.67)*	3.39 (1.03, 11.22)*	1.40 (0.49, 4.03)
Marijuana Use[c]			
Never	*ref*	*ref*	*ref*
General Only	1.41 (0.55, 3.60)	2.58 (0.76, 8.66)	1.13 (0.49, 2.57)
Sex-Drug	2.86 (1.04, 7.84)*	2.95 (0.89, 9.81)	1.03 (0.33, 3.19)

* $p \leq 0.05$

[a] All models are RDS-weighted

[b] Adjusted for age, education, number of sex partners, any other drug use (general only) and HIV status

[c] Adjusted for age, education, number of sex partners, any other drug use (either general or as a sex-drug) and HIV status

[d] Not adjusted for HIV status