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Marijuana use among young black men who have sex with men and the HIV Care Continuum: Findings from the uConnect Cohort

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Abstract

Background—Young Black men who have sex with men (YBMSM) are at highest risk for HIV seroconversion in the United States. Successful movement through the HIV care continuum is an important intervention for limiting onwards HIV transmission.

Objective—Little data exists on how substances most commonly used by YBMSM, such as marijuana, are related to the HIV continuum, which represents the primary aim of this study.

Methods—A cohort of YBMSM (N=618) was generated through respondent-driven sampling. Frequency of marijuana use and marijuana use as a sex drug were assessed across the HIV care continuum using weighted logistic regression models.

Results—Study participants reported more intermittent marijuana use (n=254, 56.2%) compared to heavy use (n=198, 43.8%). Our sample contained 212 (34.3%) HIV seropositive participants of which 52 (24.5%) were unaware of their HIV positive status. Study participants who were heavy marijuana users were more likely to be unaware of their HIV seropositive status (AOR: 4.18; 95%

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CI 1.26, 13.89). All other stages in the care continuum demonstrated no significant differences between those who use marijuana intermittently or heavily or as a sex-drug and non-users.

Conclusions—Young Black men who have sex with men who used marijuana heavily were more likely to be HIV-positive unaware than those who never used marijuana. Findings were inconclusive regarding the relationships between marijuana use and other HIV care continuum metrics. However, knowledge of ones' HIV status is a critical requirement for engaging in care and may have implications for onwards HIV transmission.

Keywords

HIV; marijuana; HIV care continuum; substance use; adherence; retention; viral suppression

Introduction

Marijuana use in the context of HIV prevention has largely focused upon risk of HIV acquisition by seronegative persons during sexual activity. Studies have demonstrated a positive association between marijuana use and sexual risk behaviors^{1–3}, reduced condom use^{4,5} and sex with at least one casual partner in the past month⁶. However, findings have been mixed and one study found no association between marijuana use and lack of condom use⁶.

In addition, the few studies examining HIV prevention and marijuana use among HIV seropositive persons have again focused on sex behavior and onwards transmission^{7,8}. Importantly, no studies have examined the potential relationship between marijuana and treatment as prevention⁹ – one of the few successful interventions available for limiting onwards HIV transmission. Treatment as prevention relies heavily on successful implementation of each step in the HIV care continuum – HIV testing, linkage to care, retention in care, adherence to antiretroviral therapy and viral suppression¹⁰. Each of these stages progressively leads an HIV-infected individual to viral suppression which is key in disrupting ongoing HIV infection. However, past research has found that, in the United States, a majority of HIV-infected individuals with detectable viral loads are poorly engaged in the HIV care continuum, making it critical to understand factors associated with poor engagement in care.

Marijuana use among HIV seropositive persons includes recreational use, sex enhancement¹¹, and the amelioration of HIV-related symptoms such as depression¹², stress relief, loss of appetite¹³, and relief of pain¹⁴. One recent observational study reported that 59.8% of those infected with HIV have used marijuana in the past six months with 44.3% reporting both therapeutic and recreational use and 55.7% of users reporting only recreational use¹⁵. Limited research examines influences of substance use, particularly marijuana, on specific HIV care continuum metrics^{16,17}. The few studies that have examined this relationship have found mixed evidence that marijuana use is both significantly associated¹⁸ and not significantly associated¹⁹ with non-adherence to medication. Moreover, there is a dearth of research focused on correlates of the HIV care continuum among YBMSM who have the highest vulnerability for contracting HIV among MSM populations²⁰.

In the United States, men who have sex with men all races, compared to their heterosexual counterparts are six times more likely to be diagnosed with HIV. A wide disparity exists when examining risk of HIV diagnosis by race and ethnicity: 1 in 2 for black MSM, 1 in 4 for Hispanic MSM, and 1 in 11 for white MSM²¹. Further, YBMSM (aged 13-24) account for twice as many new HIV infections as young white or Hispanic/Latino MSM²².

The vast majority of research on MSM substance use and HIV risk has focused on men of all races and the substances they use that are most linked to sexual acquisition of HIV, such as methamphetamine²³. Another small body of research has focused upon people who inject drugs and the MSM within those samples^{17,24}. When research has focused on BMSM, the emphasis has been on examining lifetime risk of cocaine and heroin use, substances most commonly used by older BMSM²⁵⁻²⁷ with limited attention to marijuana which is very commonly used by YBMSM.

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 women²². A recent report²⁸ by the United States Department of Health and Human Services found the rate of marijuana use among young adults (aged 18-25) has increased to 19.1% in 2013, up from 17.3% in 2002. Further, past research has found that young Blacks, compared to young whites, self-report higher growth in prevalence and frequency of marijuana use²⁹; frequency of marijuana use disorder is also greatest among Blacks, compared to other race/ethnicities³⁰. Consequently, given the above gaps in the extant research combined with the increasing decriminalization of marijuana and forthcoming medically sanctioned uses, it is critical to examine whether marijuana use is related to the HIV care continuum.

In this paper we examine marijuana use, among a population-based sample of YBMSM in Chicago and assess the relationship between marijuana use and several HIV care continuum metrics.

Methods

Setting and Population

uConnect is a longitudinal population-based cohort study^{31,32} which aims to examine factors associated with HIV risk and transmission within a socially diverse sample of young Black men who have sex with men (YBMSM) within South Chicago and adjacent south suburbs, the largest contiguous Black community area in the United States³³. In 2011, BMSM accounted for 39% of newly-diagnosed HIV infections in the United States despite representing only 0.2% of the overall population³⁴. Further, young MSM in Chicago have experienced a 5% increase in the number of new HIV diagnoses since 2009, compared to a decline across all other risk categories across the city³⁵.

Study Participants

Eligibility Criteria—Study respondents were eligible to participate if they 1) self-identified as African American or Black, 2) were born male, 3) were between 16 and 29 years of age (inclusive), 4) reported oral or anal sex with a male within the past 24 months,

5) were residing on the South side of Chicago, and 6) were willing and able to provide informed consent at the time of the study visit.

Respondent Driven Sampling—Respondent Driven Sampling (RDS) is a widely used approach that provides a design for sampling using seeds and subsequent recruits, and a methodology for estimating statistical properties of the target population³⁶. These strengths of RDS have prompted its wide use in public health studies, especially when populations are stigmatized or not accessible through traditional rosters^{36–39}. Inference from RDS data requires strong assumptions to treat the sampling scheme as probabilistic, and may be biased due to a number of underlying assumptions, which are discussed in detail elsewhere^{31,32}. Methodological research to improve estimation of parameters and standard errors from RDS studies has received much recent attention^{40–43}.

Recent recommendations for estimation of population parameters from RDS data include an estimator that treats the RDS recruitment process as a successive sampling (SS) process when the size of the population is known or can be reliably estimated^{44,45}. Previously, the population of YBMSM in South Chicago was estimated to be 5500⁴⁶. To assess the sensitivity of our results to this estimator, we compared our results with weights generated by another commonly used estimator⁴³. Additional information regarding computation of finite population correction, sensitivity analyses, implementation of RDS sampling and sourcing of seeds can be found in the Supplementary Materials 1.0 - 3.0.

Interview—Between August 2013 and July of 2014, YBMSM were recruited in Chicago using respondent-driven sampling (RDS) All interviews were conducted using Computer-Assisted Personal Interviewing (CAPI). Some sections of the interview were self-administered. The interview itself involved different types of questions and activities: background and socio-demographic questions, self-administered scales of substance use, HIV care continuum measures, and collection of dried blood spots for HIV related testing (Supplementary materials 2.0 with additional information on survey content and administration)

Measures

Primary outcomes of this study were defined in terms of HIV care continuum measures: HIV infected status, linkage to care, retention in care, adherence to antiretrovirals and viral suppression¹⁰. HIV infection status (including acute infection) was determined by 4th generation HIV immunoassay (Abbott ARCHITECT HIV Ag/Ab Combo assay), HIV-1/-2 Ab differentiation (Bio-Rad Multispot HIV-1/-2 Rapid Test) and viral load testing (Abbott RealTime HIV-1 assay) applied to samples eluted from dry blood spots (DBS)⁴⁷. HIV-infected but unaware individuals were identified by self-report, including individuals who reported that they had never tested, yet were found by DBS screening to be HIV infected. To verify HIV-infected unaware statuses considering some of the inaccuracies inherent to self-reported HIV status⁴⁸, all clients found to be infected but unaware were contacted by a trained social worker following the study visit in order to confirm whether the test results were new. Linkage to care was self-reported and defined as having at least one HIV medical care visit within three months of diagnosis⁴⁹. Retention in care was self-reported and

defined as two or more appointments at least 90 days apart in the previous 12 months⁴⁹. Adherence to antiretrovirals was self-reported and dichotomized at 90% adherence or better in the previous month⁵⁰. Finally, individuals with HIV RNA of <2000 nucleic acid (NA) copies/mL were identified as “virally suppressed” below the limit of assay quantification.

The primary independent variable was frequency of marijuana use in the past 12 months. Prior research defines marijuana users as current, former or never users^{51,52}; however, given the high level of use among our sample we defined use as: never, intermittent, and heavy. Intermittent marijuana use included any use of marijuana up to and including multiple times per week. Heavy marijuana use was defined as using at least once per day. Marijuana use in the context of use as a “sex-drug” was also examined: *“Have you ever used any of these substances as ‘sex drugs,’ that is to make sex easier, better, last longer, or something similar?”*. Marijuana use as a sex-drug was used as a binary variable representing those who had used marijuana as a sex-drug in the previous 12 months and those who had not.

Sociodemographic factors included age and education. Additional covariates included time since HIV diagnosis, employment status, housing stability, insurance status, depressive symptoms, and other substance use²³. Depressive symptoms were measured using the BSI-18, scored^{53,54} and used as a binary variable. Given that other substance use is often associated with poor outcomes, we included a composite variable to ensure any potential association found was attributable to marijuana and not other drug use. Other substance use was defined as any use of the following drugs over the past twelve months: ecstasy, E or molly (MDMA); poppers (volatile nitrates); crack (cocaine); acid, LSD, mushrooms, G or GHB, K or special K, PCP (psychedelics); oxycodone, Vicodin, T3, etc (prescription pain killers). A full list of measures can be found in the Supplementary Materials 4.0.

Analysis

RDS-weighted multivariable logistic regression was utilized to analyze the individual care continuum metrics for both marijuana use and marijuana use as a sex-drug. Covariates, included in all models, were factors statistically significant at $p < 0.05$ in unadjusted analyses or were known confounders. Effect modification was assessed using cross-products between frequency of marijuana use and each of the covariates in the models. All statistical analyses were performed in Stata 13.1.

Results

Sample characteristics

The final analytic sample included 618 respondents generated through RDS chains of up to 13 waves in length and with a median of 2 recruits per participant. Baseline demographic and risk factor attributes for respondents are presented in Table 1 and are stratified by frequency of marijuana use. Study participants used marijuana frequently ($n=452$, 73.1%), with more reporting intermittent use ($n=254$, 41.1%) compared to heavy use ($n=198$, 32.0%). Among those who use marijuana in the past 12 months, only 104 (16.8%) reported any use of marijuana as a sex-drug in the past 12 months. Our sample contained 212 HIV seropositive participants (34.3%) of which 52 (24.5%) reported unaware status with a final

43 (20.2%) confirmed as unaware of their HIV positive status. Among those that were HIV+ aware, 30.7% were virally suppressed (Figure 1).

Overall we find that in the past 12 months, 535 (86.6%) individuals drank alcohol, 57 (9.2%) used MDMA (ecstasy, E, or molly), 47 (7.6%) used alkyl nitrates (poppers), 32 (5.2%) used prescription pain killers (oxycodone, Vicodin, T3, etc.), 29 (4.7%) used cocaine and/or crack, 9 (1.5%) used methamphetamines, 6 (1.0%) used psychoactive drugs (acid, LSD, mushrooms, G or GHB, K or special K, PCP), and 4 (0.7%) used heroin. The relationship between any other substance use and any marijuana use was examined (Table 2) demonstrating that both alkyl nitrates (poppers) (0.12) and alcohol use (0.28) each had a significant positive correlation with intermittent marijuana use. Meanwhile, MDMA (ecstasy, E, or molly) (0.23), alkyl nitrates (poppers) (0.12), cocaine and/or crack (0.13), methamphetamines (0.11), and alcohol use (0.26) each had a significant positive association with heavy marijuana use.

We also assessed frequency of marijuana use among those who report symptoms of depression and anxiety. Overall, we noted that 68 (11.0%) participants self-report symptoms associated with depression and 95 (15.4%) participants self-report symptoms associated with anxiety. Further, in unadjusted analyses, among those who reported symptoms associated with anxiety (OR 2.24; 95% CI: 1.21 – 4.15), compared to those who do not self-report symptoms, are significantly more likely to use marijuana. In addition, those who self-report depressive symptoms, compared to those who do not self-report symptoms, are marginally more likely to use marijuana (OR 1.98; 95% CI: 0.99-3.98). There is no significant correlation, however, between frequency of use and either anxiety or depression (data not shown).

HIV Care Continuum analysis

Separate RDS-weighted logistic regression models were used to analyze each of the HIV care continuum stages separately (Table 3). Among those who self-report as HIV negative, compared to those who never use marijuana, we find that those who are heavy users, but not intermittent users, are significantly more likely (AOR: 4.18; 95% CI 1.26, 13.89) to be unaware of their HIV seropositive status. All other stages in the care continuum including linkage to care, retention in care, adherence to care, and viral suppression show no significant differences between those who use marijuana intermittently or heavily and non-users. Additionally, marijuana use as a sex-drug is not significantly associated with any stage in the care continuum or has too few participants to estimate the parameter (data not shown). The relationship between marijuana use and each of the continuum of care metrics remained unchanged after adjusting for time since HIV diagnosis.

Table 4 shows the full model examining factors associated with HIV positive unaware status. In addition to significant findings among those who use marijuana heavily, we also find increasing age (AOR: 1.29; 95% CI 1.12-1.48) and lack of insurance (AOR 3.73 95% CI 1.56-8.93) to be significantly associated with being HIV-positive and unaware of one's status. No other covariates were found to be statistically significant in the full model. The continuum of care was also assessed as an ordinal categorical dependent variable and no changes were found in the analyses.

Discussion

To date, relatively little research has characterized marijuana use in YBMSM and none has examined its relationship with the HIV care continuum. In this study, we present novel findings regarding the use of marijuana. First, we found that nearly three-quarters of our population-based sample of YBMSM (n=452, 73.1%) used marijuana, either intermittently or heavily, which other than alcohol use at 86.6%, is higher than other substances used by this cohort and higher than other reports of Black MSM^{55,56}. Second, we find that those who use marijuana heavily, but not intermittently, are significantly more likely to be HIV-positive unaware than those who never use marijuana. Finally, and probably most importantly, we find no relationship between marijuana use and other HIV care continuum metrics: linkage to care, retention in care, adherence to antiretrovirals or viral suppression – all drivers of effective treatment as prevention.

From our data, it seems that marijuana use may only impact whether HIV infected persons are aware of their status. Comparatively, past research has demonstrated no significant association between marijuana use in the past three months and the number of HIV tests⁵⁷. Our finding may be attributable to competing requirements of heavy marijuana consumption and other tasks such as HIV testing. Our data also indicate that it does not seem that increased use, either intermittent or heavy, would impact other care continuum metrics directly.

The recent move to decriminalize marijuana use in some states may have varied impact on the HIV care continuum among YBMSM. A reduction in the criminal penalties of possession of small amounts of marijuana (< 1.5oz) from a felony to a misdemeanor offense has not resulted in any significant changes in the choice to use or frequency of the use of marijuana⁵⁸. A similar move to fully decriminalize marijuana use may further remove remaining stigma and thus increase the choice to use or frequency of use. Marijuana use in this population may be near its peak given the already high proportion of use in YBMSM, and decriminalization may not serve to affect the continuum in any meaningful way. Other studies suggest that decriminalization might negatively impact care continuum because HIV care engagement is highest among incarcerated populations⁵⁹.

Additionally, while we did examine marijuana use as a sex-drug, we did not examine marijuana use in a therapeutic context. While therapeutic marijuana use as prescribed by a provider was not operational in Illinois at the time of data collection, such use is of interest and should be examined further, particularly as it becomes available. While many clients may not explicitly describe their use as “medication”, it is not uncommon for use of marijuana as self-treatment of a wide array of conditions including anxiety and depression⁶⁰, whether use in this way is conscious or not. Future work should examine the purpose of use in the context of health and well-being and how this might impact HIV care engagement.

While we found important insignificant associations between marijuana use and HIV care continuum metrics, there are some important limitations to our study. First, our findings should not be interpreted as supportive or non-supportive of marijuana use by YBMSM. We have attempted to maintain equipoise in our hypotheses and analyses. Second, our data are

cross-sectional and thus do not allow for causal inference. In addition, the cross-sectional nature of our study does not allow us to assess marijuana use over time within a dynamic care continuum. However, because the sample is young and diagnoses are recent (on average 2.3 years) recent marijuana use has overlap with many of the care continuum metrics. Linkage to care, retention in care, and adherence to HIV medication were self-reported and thus subject to potential recall bias. Adjusting for time since HIV diagnosis did not change our results (data not shown). Finally, data relies upon the self-reported marijuana use of our respondents according to frequency without objective quantification of use. However, frequency is a known marker of marijuana use or abuse and is commonly used⁶¹. Thus, even at one point in time, frequency of use represents a useful measure to assess the associations of marijuana with the care continuum.

In the context of our study limitations, we have shown that marijuana use among YBMSM is not associated with post-diagnosis HIV care continuum stages that are important to limiting onwards HIV transmission. However, there is some evidence that marijuana use is associated with limited knowledge of one's HIV status by participants who are HIV infected. HIV status awareness is a critical first step in the HIV care continuum and its association with heavy marijuana use suggests that additional research is needed to determine if this association is causal.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. HIV care continuum metrics as a percent of HIV seropositive persons or those who are HIV+ aware, among young Black MSM in Chicago, uConnect (n = 212)

Black shading denotes percentage of all clients that are HIV+. Grey shading denotes percentage of all HIV+ individuals who are aware of their HIV status. Percentages in later care continuum stages represent a proportion of those in original, HIV seropositive stage.

*HIV care continuum metrics: HIV infected unaware - the number of clients who reported HIV negative status (or never tested), and who were HIV seropositive; Linkage to care - at least one HIV medical care visit within three months of diagnosis; Retention in care - two or more appointments within 90 days in the previous 12 months; Adherence to antiretrovirals - 90% adherence or missing HIV medications on fewer than four days in the previous month; viral suppression - HIV RNA <2000 nucleic acid (NA) copies/mL.

YBMSM sample characteristics stratified by marijuana use among young Black MSM in Chicago, uConnect (n=618)

Table 1

Characteristic	Never ^{*,†} (n=166)	Intermittent ^{*,†} (n=254)	Heavy ^{*,†} (n=198)	p-value [§]	Total (N=618)
Age, mean (range)	22.6 (16-29)	22.7 (16-29)	22.9 (16-29)		22.8 (16-29)
Education, n(%)				0.73	
< High school	18 (10.8)	36 (14.2)	22 (11.2)		73 (12.4)
High school degree	45 (27.1)	57 (22.4)	62 (31.5)		164 (26.6)
Some college	74 (44.6)	121 (47.6)	85 (43.2)		280 (45.4)
Associate's degree	15 (9.0)	23 (9.1)	18 (9.1)		56 (9.1)
Bachelor's degree	12 (7.2)	15 (5.5)	9 (4.6)		35 (5.7)
Master's Degree	2 (1.2)	3 (1.2)	1 (0.5)		6 (1.0)
Employment, n(%)				0.29	
Unemployed	75 (45.2)	116 (45.7)	104 (52.5)		295 (47.7)
< 30 hours/week	43 (25.9)	79 (31.1)	49 (24.8)		171 (27.7)
> 30 hours/week	48 (28.9)	59 (23.2)	45 (22.7)		152 (24.6)
Housing Instability [*] , n(%)	38 (22.9)	52 (20.5)	65 (33.2)	0.006	155 (25.2)
Depressive Symptoms [‡] , n(%)	13 (7.8)	29 (11.4)	26 (13.1)	0.26	26 (13.1)
Uninsured, n(%)	72 (45.0)	104 (41.8)	95 (49.0)	0.32	271 (44.9)
Alcohol Use, n(%)				< 0.001	
Never	45 (27.1)	22 (8.7)	16 (8.1)		83 (13.4)
1-2 per year	22 (13.3)	41 (16.1)	22 (11.1)		85 (13.8)
1-2 per month	47 (28.3)	83 (32.7)	61 (30.8)		191 (30.9)
1-2 per week or everyday	52 (31.3)	108 (42.5)	99 (50.0)		259 (41.9)
Other Substance Use ^{*,§} , n(%)	16 (9.6)	49 (19.3)	59 (29.8)	< 0.001	124 (20.1)
Care continuum Metrics , n(%)					
HIV-Positive Unaware	7 (4.2)	20 (7.8)	25 (12.6)	0.014	52 (8.4)
Linked to care	28 (16.9)	58 (22.8)	38 (19.2)	0.15	124 (20.1)
Retained in care	19 (11.4)	42 (16.5)	29 (14.6)	0.67	90 (14.6)
Antiretroviral Adherence	19 (11.4)	34 (50.0)	16 (8.1)	0.10	69 (11.2)

<i>Characteristic</i>	Never ^{*,†}	Intermittent ^{*,†}	Heavy ^{*,†}	p-value [¶]	Total
	(n=166)	(n=254)	(n=198)		(N=618)
Virally Suppressed	16 (9.6)	25 (13.4)	11 (5.6)	0.46	52 (8.4)
Marijuana use as a sex-drug, n(%)	2 (12.5)	41 (69.5)	63 (85.1)	< 0.001	106 (71.1)

^{*}In the past 12 months

[†]Intermittent marijuana use (including weed, hash, blunt, etc.) is defined as up to and including multiple times per week. Heavy marijuana use is defined as at least once per day.

[‡]Brief Symptom Inventory 18 (BSI-18)

[§]Includes the use of ecstasy/molly/E, poppers, cocaine/crack, heroin, psychedelics, methamphetamines, prescription drugs

^{||}HIV care continuum metrics: HIV infected unaware - the number of clients who reported HIV negative status (or never tested), and who were HIV seropositive; Linkage to care - at least one HIV medical care visit within three months of diagnosis; Retention in care - two or more appointments within 90 days in the previous 12 months; Adherence to antiretrovirals -missing HIV medications on fewer than four days in the previous month; viral suppression - HIV RNA <2000 nucleic acid (NA) copies/mL.

[¶]Using chi-square analysis

Table 2
Correlation* between intermittent and heavy marijuana use with other substance use, in the past 12 months, among young Black MSM in Chicago, uConnect (N = 618)

<i>Other Substances[†]</i>	<i>Intermittent Use[§]</i>	<i>Heavy Use[§]</i>
MDMA	0.094	0.23 [‡]
Alkyl Nitrates	0.12 [‡]	0.12 [‡]
Cocaine	0.054	0.13 [‡]
Heroin	0.071	0.049
Psychoactive Drugs	0.041	0.085
Methamphetamines	0.082	0.11 [‡]
Prescription Pain Killers	0.030	0.046
Any Alcohol Use	0.28 [‡]	0.26 [‡]

* Using Pearson's correlation coefficient

[†] Other substances subcategories included: ecstasy, E or molly (MDMA); poppers (volatile nitrates); crack (cocaine); acid, LSD, mushrooms, G or GHB, K or special K, PCP (psychedelics); oxycodone, Vicodin, T3, etc (prescription pain killers).

[‡] $p < 0.05$

[§] Intermittent marijuana use (including weed, hash, blunt, etc.) is defined as up to and including multiple times per week. Heavy marijuana use is defined as at least once per day.

Table 3

Multivariable RDS-weighted logistic regression models for HIV care continuum metrics among young Black MSM in Chicago, stratified by frequency of marijuana use, uConnect

	<i>Care continuum Metrics</i> ^{* †}					
	All participants (n = 598)	HIV + unaware (n = 406)	Linked (n = 142)	Retained (n = 152)	Adherent (n = 152)	Suppressed (n = 64)
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Intermittent Use ^{§ //}	1.62 (0.87, 3.00)	2.89 (0.86, 9.77)	2.96 (0.42, 20.64)	1.69 (0.53, 5.38)	1.09 (0.31, 3.84)	0.07 (0.001, 3.32)
Heavy Use ^{§ //}	1.82 (0.94, 3.52)	4.18 (1.26, 13.89) [‡]	0.37 (0.05, 2.54)	1.31 (0.40, 4.30)	0.65 (0.17, 2.42)	0.04 (0.0003, 5.34)

^{*} HIV care continuum metrics: HIV infected unaware - the number of clients who reported HIV negative status (or never tested), and who were HIV seropositive; Linkage to care - at least one HIV medical care visit within three months of diagnosis; Retention in care - two or more appointments within 90 days in the previous 12 months; Adherence to antiretrovirals - missing HIV medications on fewer than four days in the previous month; viral suppression - HIV RNA <2000 nucleic acid (NA) copies/mL. Each variable is a separate model.

[†] Adjusting for age, education, employment, insurance status, housing stability, depressive symptoms, alcohol use and other substance use

[‡] p 0.05

[§] Compared to those who report never using marijuana in lifetime

// Intermittent marijuana use is defined as up to and including multiple times per week. Heavy marijuana use is defined as at least once per day.

Table 4
Multivariable RDS-weighted logistic regression model comparing HIV infected unaware to HIV negative status among young Black MSM in Chicago, uConnect (n = 406^{})**

<i>Variable</i>	<i>HIV infected unaware OR (95% CI)</i>
Marijuana Use (12 mos) *	
Never	<i>ref</i>
Intermittent	2.89 (0.86, 9.77)
Heavy	4.18 (1.26, 13.89) [‡]
Age	1.29 (1.12, 1.48) [‡]
Education	
< High School	<i>ref</i>
High School Degree	1.66 (0.32, 8.51)
Some college	1.06 (0.18, 6.21)
Associate/technical degree	2.42 (0.32, 18.50)
Bachelor's Degree or higher	0.82 (0.07, 9.32)
Employment Status	
> 30 hours per week	<i>ref</i>
< 30 hours per week	0.91 (0.31, 2.68)
Not employed	1.10 (0.40, 3.06)
Uninsured	3.73 (1.56, 8.93) [‡]
Housing Instability	0.46 (0.16, 1.33)
Depressive Symptoms[§]	0.47 (0.08, 2.74)
Alcohol Use	
Never	<i>ref</i>
Yearly	3.61 (0.71, 18.42)
Weekly/Monthly	1.94 (0.40, 9.47)
Daily	2.36 (0.55, 10.04)
Other Substance Use^{//}	0.41 (0.11, 1.57)

* Intermittent marijuana use is defined as up to and including multiple times per week. Heavy marijuana use is define as at least once per day.

[‡]p 0.05

[‡]p 0.01

[§] Measured via the Brief Symptom Inventory (BSI-18)

^{//} Other substances subcategories included: ecstasy, E or molly (MDMA); poppers (volatile nitrates); crack (cocaine); acid, LSD, mushrooms, G or GHB, K or special K, PCP (psychedelics); oxycodone, Vicodin, T3, etc (prescription pain killers).

^{**} Model utilizes case wise deletion, thus discrepancy is due to missing data.