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Differentially Classified Methamphetamine-Using Men Who Have Sex with Men: A Latent Class Analysis

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Abstract

Context—Substance use interventions for methamphetamine-using MSM are limited due to the assumption that they are a uniform group. We hypothesized that a LCA would identify distinct patterns of substance use, and demographic and psychosocial variables associated with different substance-using groups would aid in understanding distinctions. Using cross-sectional data from 343 methamphetamine-using MSM, we conducted a LCA to model the patterns of polysubstance use, then examined how the classes varied on psychosocial variables defined by the Information-Motivation-Behavioral Skills (IMB) model.

Main Findings—Because we were interested in identifying patterns of polysubstance use (PSU) among our sample, we identified four classes: minimal PSU, marijuana PSU, cocaine/hallucinogens PSU, and designer drugs/heroin PSU. Men in the marijuana PSU class were less likely to have positive attitudes towards methamphetamine than participants in the other three classes. Men in the Cocaine and Hallucinogens PSU class were more likely to have higher PANAS scores (OR=13.00 [3.25, 52.07]) compared to the other classes, and they are more likely to have higher self-efficacy to enact safer substance use strategies (OR = 10.72 [3.23, 35.47]). MSM in the Designer Drug and Heroin PSU class were more likely to have a diagnosis of Hepatitis B (OR=4.07 [0.86, 19.36], despite having higher knowledge of sexual health practices (OR=0.55[0.36, 0.84].

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Principal Conclusions—Differential classification for methamphetamine-using MSM suggests an opportunity for tailored interventions and secondary prevention programs. By understanding how men vary on illicit substance use, interventionist can routinely screen and link men before they potentially progress to another classification.

Keywords

HIV/AIDS; alcohol & substance use; health behavior; gay men; behavioral theories

1. Introduction

Methamphetamine-using men who have sex with men (MSM) are at increased risk for HIV (Warburton et al. 2000; Avants et al. 2003; Colfax et al. 2005; Gorman et al. 2008). The U.S. National HIV/AIDS Strategy highlights the importance of substance use prevention and treatment as a critical component in reducing HIV incidence in the United States (ONAP, 2016). Substance use prevention and treatment interventions have found success in combining motivational interviewing or contingency management with cognitive behavioral therapy to reduce risk behavior (Avants et al. 2004; Rawson et al. 2004; Shoptaw et al. 2005; Schumacher et al. 2007; Garfein et al. 2010; Lim et al. 2015; Rice, 2016; Lea et al. 2017). Motivational interviewing aims to increase awareness of the consequences and risk associated with behaviors. Contingency management aims to reinforce a target health behavior through operant conditioning (Kirby et al. 1999; Kellogg et al. 2005). Cognitive behavioral therapy aims to develop coping strategies by changing beliefs, thoughts, and attitudes to solve problems and regulate emotions and behaviors. Combining cognitive behavioral therapy with contingency management or motivational interviewing is more effective than cognitive behavioral therapy alone at reducing drug use and HIV risk (Zule et al. 2012; Reeback et al. 2014).

Examining how patterns of substance use relate to HIV risk among MSM is relatively new (McCarty-Caplan et al. 2013; Rajasingham et al. 2012; Wilkerson et al. 2015). Few studies have differentiated drug use patterns (Lim et al. 2015; McCarty-Caplan et al. 2014; Newcomb et al. 2014; Trenz et al. 2013). There is growing evidence of discrete patterns of substance use, with distinct behavioral risk profiles ranging from moderate to severe use, which effect HIV treatment outcomes (Lim et al. 2015; Parsons et al. 2014, Starks et al. 2017). However, reducing HIV incidence within this population is complicated because we do not fully understand drug use patterns of methamphetamine-using MSM (Halkitis et al. 2003; Halkitis et al. 2007; Mimiaga, 2008; Mimiaga et al., 2008).

The purpose of this research was to determine if meaningful patterns of substance use exist among a sample of methamphetamine-using MSM, and then explore the utility of using constructs from the Information-Motivation-Behavioral Skills (IMB) model (Fisher and Fisher, 1992) to understand similarities between men within a class, and how men in different classes vary from each other. The IMB model was developed to promote changes in HIV-related behaviors. The model theorizes that information, motivation, and behavioral skills are key determinants of behavior and behavioral change. By understanding the nuance

in drug use patterns, we can begin to develop interventions for a spectrum of person who use substances.

Per IMB, information is defined as the primary determinate for engaging in a health behavior. Motivation is defined by two factors: personal motivation and social motivation. Personal motivation is the collection of beliefs about the behavioral intervention outcome and attitudes toward the health behavior. Social motivation is the perceived social norm for engaging in the behavior. Behavioral skills are defined as the development of the individual's objective skills and increased perceived self-efficacy (Fisher and Fisher, 1992).

2. Material and Methods

2.1 Data Collection

Using a combination of online recruitment strategies (blinded for peer review), we recruited 343 methamphetamine-using MSM between July and October 2012 to complete an online survey about recent substance use and sexual behavior. To participate, respondents needed to self-report as male, age 18 or older, living in the United States or one its territories, having sex with a man in the last 30 days, and having used methamphetamine in the last 30 days. The survey took an average of 21 minutes to complete. For completing the survey, participants were compensated \$25. The institutional review boards of the authors' universities approved all study procedures.

2.2 Measures

Participants were asked questions about recent substance use, sexual behavior, and psychosocial measures. All survey items included a "refuse to answer" option. In addition, participants provided demographic information, including age, race/ethnicity, education, and HIV status. Items were developed in collaboration with a community advisory board that included current and former methamphetamine-using MSM, health educators, and healthcare providers with substance-using MSM clients.

Items used as indicators of the latent substance use categories were adapted from the Risk Behavior Assessment Questionnaire (Dowling-Guyer et al. 1994). The offline version of the questionnaire asked about lifetime use and the number of days and times used in the last 30 days. Because this was an online survey, we reduced participant burden by creating a skip pattern. We did this by adding the question, "Have you used the following substances in the last 30 days (yes/no)?" Thirteen substances, including alcohol, were included in this analysis.

To assess information about safer substance use and sexual behavior, we asked participants to respond to a list of true/false questions. Participants were asked to respond to five substance use items and six sexual behavior items. The substance use items included statements such as, "If you don't use bleach, rinsing out a needle three times with hot water will kill anything that is in the syringe (false)," and "You will not get addicted to meth if you only use it on weekends (false)." The sexual behavior items included statements such as, "If a person puts their penis inside your anus without a condom and pulls out before cumming, your risk of HIV is low (false)," and "An HIV-positive person with an undetectable viral

load is less likely to give someone HIV (true).” We assigned separate sum scores to the number of correct responses to each of the substance use and sexual behavior items. The range of the substance use items was 0–5, and the range of the sexual behavior items was 0–6. We used the median split to create low and high knowledge variables.

In assessing attitudes, a proxy for motivation, we focused on the extent to which participants held positive attitudes toward methamphetamine use and anal sex without condoms (barebacking). To assess positive attitudes for methamphetamine use, participants responded to Likert-type questions with response options ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Items included statements such as, “I enjoy the high I get from meth” and “I have better sex when I use meth.” We conducted an exploratory factor analysis (EFA) with oblique rotation and a confirmatory factor analysis (CFA) on a 30–70 randomized split of the sample, respectively. The four-item scale had modest fit and internal consistency ($\alpha=.58$). To assess positive attitudes toward anal sex without condoms, we used the Benefits of Barebacking Scale (Halkitis et al. 2003), which has been previously validated with an internal consistency of $\alpha=.90$ and includes nine Likert-type items with response options ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) ($\alpha=.71$ in the current study). Items included statements such as, “barebacking increases intimacy between men,” and “barebacking is hotter than sex with condoms.” We averaged responses to the substance use and sexual behavior items, respectively. The range of the substance use items was 1–5, and the range of the sexual behavior items was 1–7. We used the median split from each to create low and high attitude variables.

To assess self-efficacy for safer substance use and sexual behavior, we asked participants to respond to a list of Likert-type items with response options ranging from 1 (*not at all sure*) to 5 (*completely sure*). The substance use items included statements such as, “Use only one drug at a time,” and “Only use drugs when other people are around to look out for you if you overdose.” A five-item scale was extracted using EFA and CFA ($\alpha=.75$; see Table 4). The sexual behavior items included statements such as, “Stop to use a condom even if you are very sexually aroused (horny),” and “Use a condom without having it slip or break.” In the EFA and CFA, six items loaded onto two factors, the first about taking deliberate actions to decrease risk and the second about properly using a condom in the midst of a sexual act ($\alpha=.73$ for both subscales, $\alpha=.77$ for combined). We averaged responses to the substance use and sexual behavior items, respectively. The range for both the substance use and sexual behavior items was 1–5, and we used the median split from each to create low and high self-efficacy variables.

Participant characteristics included in analyses were age, race/ethnicity, hepatitis B, hepatitis C, and HIV status, and affect. To assess affect, we used the Positive and Negative Affect Schedule (PANAS; Watson et al. 1988). The PANAS is a self-report 20-item measure on a 5-point Likert scale (1 “very slight or not at all” to 5 “extremely”). The scale has established internal consistency for both positive and negative affect ranging from $\alpha=.84$ - .90.

2.3 Data Analysis

In this analysis, our goal was to classify participants into meaningful and distinct classes based on their substances of choice and then to identify the psychosocial variables of

information, motivation, and behavioral skill variables associated with the identified classes. Our analysis consisted of two steps. In the first step, we used a latent class model to identify homogeneous classes based on their responses to the question, “Have you used the following substances in the last 30 days?” LCA is a statistical modeling technique for uncovering unobserved heterogeneity in a population and for creating substantively meaningful subgroups or latent classes of people from a set of observed indicators (McCutcheon, 1987). Rather than grouping on similar items and variables, as in regression and in factor analysis, LCA groups individuals into classes on shared patterns of behaviors. Individuals within classes are more alike than those between classes (B. Muthén and Muthén, 2000). LCA has shown promise in identify distinct profiles of persons who use alcohol and illicit substances (Argawal et al. 2007; Green et al. 2010; Kuramoto et al. 2011; Monga et al. 2007; Noor et al. 2014; Watson et al. 2013). In the second step, we used multinomial logistic regression to identify differences in predictors of class membership.

Using Mplus 7 (B. Muthén and Muthén, 1998–2012), series of preliminary LCA models with increasing number of classes were estimated to identify a model with the optimal number of classes. We used several starting values to avoid the issue of local maxima and to ensure all values converge to identical solutions (L. K. Muthén and Muthén, 1998–2007). We specified 100 sets of random starting values for the initial stage and 10 optimizations for the final stage of the maximum likelihood optimization. We used Bayesian Information Criterion (BIC; Nylund et al. 2007) and the Lo-Mendel-Rubin likelihood ratio test (LMR-LRT; Nylund et al., 2007) to identify how many classes best fit the data. We also used the entropy statistic to provide summary information about the classification (Ramaswamy et al. 1993). Additional considerations in arriving at the final model included parsimony and substantive interpretation of the latent classes.

Once we had identified an LCA model with the optimal number of latent classes, we used Stata 13.1 (StataCorp LP, 2012) for bivariate and regression analyses. We used Pearson’s chi-square test (for categorical) and ANOVA (for continuous variables) to examine if participants differ by selected personal characteristics. We also examined if the classes differed by measures of information, motivational, and behavioral skills. We wanted to assess the relative contribution of each factor as well as the block of factors on substance use. Therefore, we used a block regression strategy. Three separate multinomial regression models were run to identify factors associated with the drug use classifications. We entered personal characteristics that were significant ($p < 0.05$) at the bivariate level into the first regression model. In the second regression model, we included substance-use-associated informational, motivational, and behavioral skill variables that were significant ($p < 0.05$) at the bivariate level. Next, in the third regression model, we included sex-related informational, motivational, and behavioral skill variables that were significant ($p < 0.05$) at the bivariate level. In the final model, we included variables from the first three regression models that were significant ($p < 0.05$) with at least two classes.

3. Results

3.1 Participant Characteristics

A total of 343 methamphetamine-using MSM who live across the United States completed the online survey. In general, participants were young ($M=29$ years; $SD=5.50$), racially and ethnically diverse (52% racial-ethnic minority) and educated (98% had some college experience; 41% had a degree). Only 5% of the sample reported having HIV. In addition to using methamphetamine (an eligibility requirement), the most commonly used substances were alcohol (62%), marijuana/cannabis (18%), gamma-hydroxybutyrate/gamma-butyrolactone (38%), amyl nitrite/isobutyl nitrite/poppers (36%), flunitrazepam/roofies (34%), erectile dysfunction medications (31%), and cocaine (31%).

3.2 Latent Classes Identification

The fit indices of the latent class models are summarized in Table 1. We determined the four-class solution resulted in the most meaningful and distinct classes. Whereas the fit indices presented in Table 1 suggested a five-class solution as optimal, an insufficient number of participants in one of the classes necessitated the use of a four-class solution.

Endorsement patterns for the four-class solution are summarized in Table 2. The labels for the four classes were determined by identifying the more highly endorsed (>0.70) substances within each class. We labeled the classes based on their distinguishing use patterns: minimal PSU, marijuana PSU, cocaine and hallucinogens PSU, and designer drugs and heroin PSU. The minimal PSU class (53%) includes persons least likely to report using substances other than methamphetamine. The remaining three classes include a large proportion of participants who reported consuming alcohol. Thus, alcohol was not a meaningful substance to use as a means to differentiate participants in the remaining classes. Similarly, a large proportion of participants in the cocaine and hallucinogen class and in the designer drugs and heroin class were likely to endorse club drugs (GHB/GLB and flunitrazepam), limiting their utility to distinguish between persons in these two classes. Thus, as indicated by their labels, the remaining three groups can be distinguished by their marijuana use, cocaine and hallucinogen use, and designer drugs and heroin use. It is worth noting that participants in the marijuana class endorsed using amyl nitrite/isobutyl nitrate (a commonly used substance for sexual enhancement) more than participants in the cocaine and hallucinogen class and in the designer drugs and heroin class.

3.3 Measurement Validation

Table 3 summarizes the proportion of participants who correctly endorsed items used to assess information about safer substance use and sexual behavior. While a strong majority (81%) correctly responded to the item about sharing injection equipment and most correctly responded to the items about preventing overdose and improving health (64% and 62%), fewer than half (46%) correctly responded to the item that asked about the potential for getting addicted if using methamphetamine only on weekends. Only a quarter of participants (26%) correctly responded to the bleaching. In general, participants incorrectly responded to items asking about strategic positioning (15%), withdrawal (56%), serosorting (32%), oral sex (36%), and viral suppression (36%).

Table 4 summarizes model fit indices from exploratory and confirmatory factor analyses of items used to measure positive attitudes towards methamphetamine, self-efficacy for safer substance use, and self-efficacy for sexual behavior. We used four items to assess positive attitude towards methamphetamine, five items to assess self-efficacy for safer substance use, and six items to assess self-efficacy for safer sexual behavior. Table 5 summarizes the standardized factor loadings from the confirmatory factor analyses. Factor loadings indicated that slightly more than half of participants held positive attitudes towards methamphetamine, with the exception of feeling more focused; only a third of participants (0.31) endorsed feeling more energetic when using methamphetamine. Factor loadings also indicated most participants had the self-efficacy to enact the substance-use harm reduction strategies with the exception of talking with people with whom they inject drugs about less risky ways of taking the drugs (0.39). Using the 0.70 cutoff used when labeling the previously discussed latent classes, we labeled the two factors of the self-efficacy for sexual behavior construct as condom use when using substances and communicating about condom use. Factor loadings indicated most participants had self-efficacy to enact the condom use harm reduction strategies, with the exception of pulling out after ejaculation while still erect and talking with a partner about condom use no matter how aroused; both of these items had MSM in a category of participants with low factor loadings.

3.4 Differences between Participants in Latent Classes

We identified key differences between groups when we compared responses to demographic questions and responses to measures of information, attitudes, and self-efficacy to enact safer substance use and sexual behaviors. Table 6 summarizes descriptive statistics of each measure and the probable classifications. Age, race/ethnicity, education, PANAS score, and HIV-status were statistically significant demographic characteristics. More favorable attitudes toward methamphetamine and higher self-efficacy were statistically significant IMB measures of safer substance use. Information was a statistically significant IMB measure of sexual behavior. Associations that were statistically significant at $p < 0.05$ were entered into block regression models to aid in understanding differences between participants in each class.

In Table 7, we report the adjusted relative risk ratios for the block multinomial regression models. In all models, we used the minimal PSU class as the referent group. Compared to participants in the minimal PSU class, participants in the higher PSU classes (Marijuana PSU, Cocaine/Hallucinogens PSU, and Designer Drugs/Heroin PSU) were more likely to be older, more educated, and White. Participants in the higher PSU classes were more likely to have higher PANAS scores, higher self-efficacy for safer substance use, and less knowledge about sexual behavior. Older, educated, and white participants were the majority of participants in the three higher PSU classes.

The final model suggests participants in the marijuana PSU class were less likely to have a positive attitude towards methamphetamine than participants in the other three classes (note that adjusted odds ratios designer drugs and heroin class as not significantly different as the minimal PSU class). Participants in the Designer Drug/Heroin PSU class were more likely to have a diagnosis of hepatitis B, compared to the other classes. Participants in the Cocaine

and Hallucinogens PSU class were more likely to have higher PANAS scores (OR=13.00 [3.25, 52.07]) compared to the other classes and they were more likely to have higher self-efficacy to enact safer substance use strategies (OR = 10.72 [3.23, 35.47]).

4. Discussion

Methamphetamine-using men who have sex men can be classified based on pattern of substance use. Men in the marijuana PSU class were less likely to have positive attitudes towards methamphetamine than participants in the other three classes. Men in the Cocaine and Hallucinogens PSU class were more likely to have higher PANAS scores compared to the other classes, and they are more likely to have higher self-efficacy to enact safer substance use strategies. MSM in the Designer Drug and Heroin PSU class were more likely to have a diagnosis of Hepatitis B, despite having higher knowledge of sexual health practices. The identification of within group similarities and between group differences on IMB constructs and demographic characteristics allows for the tailoring of content, images, and other intervention components by drug use class.

Much of the intervention work for methamphetamine-using MSM has focused on therapeutic or individual-level interventions that rely on cognitive behavioral therapy, often with motivational interviewing or contingency management. Research has demonstrated the effectiveness of this approach (Rawson et al. 2004; Zule et al. 2012; Reeback et al. 2014; Lea et al. 2017). However, it is likely that men in the minimal and marijuana PSU classifications and perhaps some men in the other classifications are functional users who are not actively seeking therapeutic, detoxification, or treatment services. For men in these classes, it might be helpful to implement community-based interventions that strengthen harm reduction skills, self-efficacy to enact safer substance-use strategies, and strengthen the salience of unfavorable attitudes (Garfien et al. 2010; Mimiaga et al. 2012; Reback and Shoptaw, 2014). It might also be useful to routinely screen and link men before they potentially progress to another classification to an individual-level intervention that uses cognitive behavioral therapy with either motivational interviewing or contingency management.

For methamphetamine-using men who also use heroin—an indicator of injection drug use—additional tailoring is required. For men in this classification, interventionists should include harm reduction strategies to reduce injection-associated health risks, such as minimizing abscesses or damage to veins, and reducing risk of overdose and HIV and Hepatitis C transmission, as well as train both persons who inject and those close to them how to administer naloxone to reverse an opioid-related overdose.

There are at least three limitations. First, the generalizability of our findings is based on a sample of methamphetamine MSM. Though our classification is somewhat similar to what has been reported elsewhere (McCarty-Caplan et al. 2013), further research is needed to replicate the associations we found between methamphetamine-using MSM and the IMB constructs. We do not know if these results would be similar to other polysubstance using populations. Second, our recruitment was specific to completing an online cross-sectional survey. It might be that recruitment with other study designs would produce different results.

Third, because this was a formative research study and many of the measures were developed in collaboration with our community advisory board, further validation studies of the measures are needed. In addition, we dichotomized explanatory variables because of a small sample size. A longitudinal study with a larger sample size is needed to validate the measures and to examine how information, attitude, and self-efficacy might change behavior over time.

5. Conclusion

In summary, we identified four classes of polysubstance use among methamphetamine-using MSM and described differential characteristics of men in each class. Interventionists can use these differences to tailor intervention components. By tailoring to men in each class, it is likely that message salience and intervention effect will increase.

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Table 1.

Fit indices comparisons of the latent class models and classifications of polysubstance use, last 30 days ($N=343$)

Fit Indices	Class 2	Class 3	Class 4	Class 5	Class 6
Log likelihood	-1863.66	-1729.01	-1675.15	-1630.45	-1602.16
AIC	3781.31	3540.01	3460.29	3398.91	3370.33
BIC	3884.93	3697.36	3671.37	3663.71	3688.86
aBIC	3799.28	3567.29	3496.89	3444.83	3425.56
Entropy	0.98	0.97	0.97	0.97	0.97
LMR-LRT	1393.98	266.05	106.42	88.31	55.90
p-value	<0.001	<0.001	0.002	0.02	0.72
Bootstrapped LMR-LRT	1411.04	269.30	107.72	89.39	56.58
p-value	<0.001	<0.001	<0.001	<0.001	<0.001

Note: AIC=Akaike Information Criterion; BIC=Bayesian Information Criterion; aBIC=Adjusted Bayesian Information Criterion; LMR-LRT=Lo-Mendell-Rubin adjusted likelihood ratio test.

Table 2.

Classifications of polysubstance use, last 30 days ($N=343$)

	Minimal PSU n=181 (53%)	Marijuana PSU n=62 (18%)	Cocaine & Hallucinogens PSU n=64 (19%)	Designer Drugs & Heroin PSU n=36 (10%)
Alcohol	0.34	0.85	1.00	1.00
GHB/GLB	0.04	0.42	0.99	1.00
Flunitrazepam	0.02	0.29	0.99	0.89
Marijuana	0.04	0.89	0.00	0.00
Designer drugs	0.03	0.43	0.00	0.80
Crack cocaine	0.01	0.27	1.00	0.61
Cocaine	0.01	0.43	0.98	0.44
Heroin	0.01	0.41	0.02	0.78
Hallucinogens	0.03	0.43	0.72	0.51
Benzodiazepines	0.02	0.52	0.26	0.66
Prescription opioids	0.00	0.56	0.46	0.50
Erectile dysfunction	0.04	0.49	0.69	0.67
Amyl nitrite/isobutyl nitrite	0.06	0.77	0.65	0.62

Note: Bolded values 70%.

Table 3.Count and percent of responses to each of the knowledge items ($n=343$)

Item	Correct response	
	n	%
Information about safer substance use		
1. Waiting until your high has peaked before taking another hit of a drug reduces the risk of an overdose (True)	222	64%
2. If you don't have bleach, rinsing out a needle three times with hot water will kill anything that is in the syringe (False)	81	24%
3. You will not get addicted to meth if you only use it on the weekends (False)	162	47%
4. Reducing your drug use by a little does nothing to improve your health (False)	208	60%
5. Sharing injection works increases your risk of hepatitis C infection (True)	207	78%
Information about sexual behavioral behavior		
1. When putting your penis inside someone's vagina and/or anus, condoms are the best way to prevent spreading HIV (True)	289	84%
2. Putting your penis inside someone's vagina and/or anus without a condom is just as risky as letting someone put their penis in your anus without a condom (False)	58	58%
3. If a person puts their penis inside your anus without a condom and pulls out before cumming, your risk of getting HIV is low (False)	191	55%
4. If people are only having sex with someone of the same HIV status, there is no risk of HIV transmission (True)	104	30%
5. Oral sex without a condom is just as risky as anal sex without a condom (False)	123	35%
6. An HIV-positive person with an undetectable viral load is less likely to give someone HIV (True)	135	39%

Table 4.
Model fit statistics of selected exploratory and confirmatory factor analyses ($n_{EFA}=71$, $n_{CFA}=272$)

Model	χ^2 , df	p-value	RMSEA	90% CI	CFI	TLI	SRMR/WRMR ^a
<i>Positive attitude toward methamphetamine</i>							
EFA sample	1-factor, 7-item	4,019, 14	0.001	0.162	[.104, .222]	0.506	0.26
	2-factor, 7-item	Model did not converge					0.151
	1-factor, 4-item	3,396, 2	0.183	0.099	[.000, .275]	0.959	0.876
	2-factor, 5-item	299, 1	0.584	0.000	[.000, .256]	1.000	0.060
CFA sample	1-factor, 4-item	9,373, 2	0.009	0.116	[.049, .196]	0.956	0.017
	2-factor, 5-item	Model was not identified				0.868	0.601
<i>Self-efficacy for safer substance use</i>							
EFA sample	1-factor, 13-item	138,727, 65	<0.0001	0.126	[.097, .155]	0.889	0.866
	2-factor, 13-item	94,675, 53	0.0004	0.105	[.070, .139]	0.937	0.125
	1-factor, 5-item	6,500, 5	0.2606	0.065	[.000, .187]	0.995	0.096
CFA sample	1-factor, 5-item	9,543, 5	0.0893	0.058	[.000, .113]	0.994	0.991
<i>Self-efficacy for sexual behavior</i>							
EFA sample	1-factor, 11-item	162,380, 44	<0.0001	0.195	[.163, .227]	0.453	0.316
	2-factor, 11-item	114,196, 34	<0.0001	0.182	[.146, .220]	0.629	0.401
	3-factor, 11-item	7,327, 25	<0.0001	0.160	[.116, .205]	0.791	0.130
	1-factor, 6-item	59,468, 9	<0.0001	0.281	[.216, .351]	0.606	0.539
	2-factor, 6-item	6,562, 4	0.1609	0.095	[.000, .220]	0.980	0.343
CFA sample	2-factor, 6-item	20,845, 8	0.0076	0.077	[.037, .118]	0.979	0.925
	With 1 cross-loading	15,980, 7	0.0253	0.069	[.023, .114]	0.985	0.961
	With 2 cross-loadings	11,595, 6	0.0716	0.059	[.000, .109]	0.991	0.628
						0.977	0.545
						0.463	

^a SRMR was computed for the EFA. WRMR was computed for the CFA.

Table 5.

Factor loadings from confirmatory factor analyses ($n=272$)

	Factor 1		Factor 1: Condom use when using substance	Factor 2: Communication about condoms
Positive attitude toward methamphetamine				
1. I enjoy the high I get from using meth	0.625			
2. I am more energetic when using meth	0.679			
3. I am more focused when using meth	0.313			
4. I am more confident when using meth	0.565			
Self-efficacy for safer substance use				
1. Use only one drug at a time	0.711			
2. Talk to the people with whom you use drugs about using drugs less often	0.806q			
3. Talk to the people with whom you use drugs about getting help if you need it	0.677			
4. Talk to the people with whom you use drugs about less risky ways of taking them, e.g., popping pills instead of injecting them	0.395			
5. Only use opiates, e.g., heroin and OxyContin, when you have access to Narcan (Naloxone)	0.666			
Self-efficacy for sexual behavior				
1. Avoid situations that can lead to unsafe sex		0.641		
2. Use a condom without “breaking the mood”				0.840
3. Pull out while still erect after ejaculating (cumming) when having sex with a condom		0.510		0.132
4. Use a condom without having it slip or break				0.616
5. Use a condom even when you have been drinking or using drugs			0.769	
6. Talk to any partner about using condoms no matter how aroused (horny) you are		0.127		0.665

Note: The EFA and CFA were conducted using Mplus 7 (B. Muthén & Muthén, 1998–2012).

Table 6.

Descriptive statistics by classifications ($N=343$)

	Minimal PSU n=181 (53%)	Marijuana PSU n=62 (18%)	Cocaine & Hallucinogens PSU n=64 (19%)	Designer Drugs & Heroin PSU n=36 (10%)
<i>Participants' characteristics</i>				
Age [mean (SD)] [†]	26.62 (4.30)	33.08 (6.57)	31.84 (3.99)	32.16 (3.73)
Race/Ethnicity [†]				
Men of color	138 (76.24)	11 (17.74)	22 (34.38)	8 (22.22)
White	43 (23.76)	51 (82.26)	42 (65.63)	28 (77.78)
Education [†]				
Bachelor or above	57 (31.49)	35 (56.45)	32 (50.00)	18 (50.00)
HS or some college	124 (68.51)	27 (43.55)	32 (50.00)	18 (50.00)
PANAS [†]	3.62 (0.27)	3.74 (0.62)	3.91 (0.26)	3.88 (0.27)
HIV status [†]				
HIV-positive	7 (3.89)	11 (18.33)	--	--
HIV-negative	173 (96.11)	49 (81.67)	63.0 (100.00)	36 (100.00)
<i>Participants' substance use information, attitude, and self-efficacy</i>				
Information about safer substance use				
Low	53 (29.28)	14 (22.58)	17 (26.56)	7 (19.44)
High	128 (70.72)	48 (77.42)	47 (73.44)	29 (80.56)
Attitude toward methamphetamine [†]				
Low	22 (12.15)	25 (40.32)	16 (25.00)	10 (27.78)
High	159 (87.85)	37 (59.68)	48 (75.00)	26 (72.22)
Self-efficacy for safer substance use [†]				
Low	126 (69.61)	27 (43.55)	25 (39.06)	11 (30.56)
High	55 (30.39)	35 (56.45)	39 (60.94)	25 (69.44)
<i>Participants' sexual information, attitude, and self-efficacy</i>				
Information about sexual behavior [†]				
Low	48 (26.52)	40 (64.52)	46 (71.88)	24 (66.67)
High	133 (73.48)	22 (35.48)	18 (28.13)	12 (33.33)
Attitude toward barebacking				

	Minimal PSU n=181 (53%)	Marijuana PSU n=62 (18%)	Cocaine & Hallucinogens PSU n=64 (19%)	Designer Drugs & Heroin PSU n=36 (10%)
Low	77 (42.54)	27 (43.55)	25 (42.57)	17 (47.22)
High	104 (57.46)	35 (56.45)	39 (60.94)	19 (52.78)
Self-efficacy for sexual behavior				
Low	103 (56.91)	37 (59.68)	31 (48.44)	21 (58.33)
High	78 (43.09)	25 (40.32)	33 (51.56)	15 (41.67)

Note: Men of color include 19.0% Hispanic, 16.9% American Indian, 8.5% Asian, and 7.9% Black.

[†] Statistically significant at p 0.05.

Table 7.

Adjusted relative risk ratios associated with classifications ($N=343$)

	Marijuana PSU n=62 (18%)	Cocaine & Hallucinogens PSU n=64 (19%)	Designer Drugs & Heroin PSU n=36 (10%)
<i>Model 1: Participants' characteristics</i>			
Older age	1.40 [1.25–1.57]	1.44 [1.30–1.62]	1.46 [1.30–1.66]
Men of color	0.06 [0.02–0.15]	0.12 [0.05–0.28]	0.06 [0.02–0.17]
Bachelor's degree & above	2.83 [1.23–6.45]	1.71 [0.76–3.85]	1.53 [0.60–3.93]
PANAS positive score	17.08 [5.49–53.12] [*]	27.53 [7.22–105.07] [*]	18.94 [4.32–83.13] [*]
Hepatitis B Diagnosis	4.11 [1.09–15.52] [*]	8.23 [2.55–26.52] [*]	6.13 [1.52–24.74] [*]
Hepatitis C Diagnosis	0.23 [0.02–2.21]	--	--
Living with HIV	0.67 [0.12–3.67]	--	--
<i>Model 2: Participants' substance use information, attitude, and self-efficacy</i>			
High knowledge toward safe substance use	1.75 [1.26–2.44]	1.69 [1.22–2.37]	1.83 [1.21–2.76]
High positive attitude toward methamphetamine	0.35 [0.16–0.77]	0.48 [0.19–1.22]	0.57 [0.18–1.74]
High self-efficacy to enact safer substance use	5.66 [2.82–11.36]	13.63 [5.84–31.85]	10.82 [4.03–29.05]
<i>Model 3: Participants' sexual information, attitude, and self-efficacy</i>			
High motivation for sexual behavior	0.92 [0.45–1.90]	0.48 [0.28–0.82]	0.32 [0.32–1.30]
High self-efficacy to enact sexual behavior	0.90 [0.39–2.10]	0.39 [0.20–0.62]	0.88 [0.35–2.22]
High knowledge of sexual behavior	0.32 [0.30–0.45]	0.40 [0.30–0.54]	0.43 [0.30–0.62]
<i>Model 4: Final model</i>			
Older age	1.31 [1.18–1.46]	1.31 [1.17–1.46]	1.32 [1.18–1.49]
Men of color	0.07 [0.03–0.20]	0.16 [0.06–0.41]	0.08 [0.03–0.26]
PANAS positive score	6.90 [1.83–26.01]	13.00 [3.25–52.07]	12.52 [2.81–55.74] [*]
Hepatitis B Diagnosis	3.20 [0.73–13.96]	3.35 [0.80–14.02]	4.07 [0.86–19.36]
High knowledge toward safe substance use	1.51 [0.98–2.33]	1.47 [0.94–2.28]	1.60 [0.96–2.62]
High positive attitude toward methamphetamine	0.26 [0.07–0.90]	0.27 [0.72–0.99]	0.36 [0.09–1.48]
High self-efficacy to enact safer substance use	5.24 [1.88–14.59]	10.72 [3.23–35.47]	8.05 [2.28–28.50]
High knowledge of sexual behavior	0.51 [0.35–0.75]	0.44 [0.30–0.65]	0.55 [0.36–0.84]

Note: Only variables that were statistically significant with at least two classifications were included in the final model. We used the minimal group as the referent group for the multinomial logistic regression. Bolded values are statistically significant at $p < 0.05$.

*
Wide CI levels.

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