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Complex Drug Use Patterns and Associated HIV Transmission Risk Behaviors in an Internet Sample of U.S. Men Who Have Sex with Men

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Abstract

Although the relationship between drug use and HIV risk among men who have sex with men (MSM) is well described, relatively few studies have employed empirical methods to assess underlying classes of drug use that may better predict the risk of HIV or sexually transmitted infections (STIs) among MSM. The aim of this study was to determinewhether latent class analysis (LCA) would identify underlying drug classes reported prior to sex, as well as predict unprotected anal intercourse (UAI) in the last sexual encounter among MSM. From 2004 to 2005, an anonymous online survey was conducted among 8,717 sexually active MSM recruited from gay-affiliated U.S. websites. LCA clustered participants into six distinct drug use classes based on the specific types and number of drugs used: (1) low/no drug use, (2) recreational drug use, (3) poppers with prescription erectile dysfunction (ED) drug use, (4) poppers with both prescription and non-prescription ED drug use, (5) recreational, club, and ED drug use, and (6) high polydrug use. Compared with men in Class 1, men in the highest drug use class were 4.84 times more likely to report UAI in their last sexual encounter and 3.78 times more likely to report an STI in the past year (both *ps*<.001). Younger MSM aged 18–29 were significantly more likely to report an STI than men aged 50 and above (*p*<.001). There is a need to better understand the complex relationship between a diverse set of drugs used among MSM and how polydrug use impacts sexual negotiation over time.

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Keywords

Men who have sex with men; Gay men; Internet; Drug use; HIV; Group sex

Introduction

Numerous research studies have examined the relationship between drug use and HIV transmission risk among men who have sex with men (MSM). However, relatively little work has investigated empirical methods to uncover, or more precisely define, underlying classes of drug use that may better predict HIV transmission risk or risk of sexually transmitted infections (STIs) (Vosburgh, Mansergh, Sullivan, & Purcell, 2012).

Studies of drug use among MSM have examined the separate effects of individual drugs associated with sexual HIV transmission risk, such as crystal methamphetamine, which has been consistently associated with an increased risk of unprotected anal intercourse (UAI) and HIV/STI transmission (Colfax et al., 2005; Hirshfield, Remien, & Chiasson, 2006, 2004; Rajasingham et al., 2012). Multiple drug categories have also been explored for their differential association with risky sexual behaviors among MSM. For example, club drugs (e.g., crystal methamphetamine, gamma hydroxybutyrate) have been associated with increased risk of sexual activity resulting in HIV transmission (Drumright et al., 2006a; Nettles, Benotsch, & Uban, 2009; Prestage, Grierson, Bradley, Hurley, & Hudson, 2009); recreational drugs (e.g., alcohol, marijuana, cocaine, poppers [nitrite inhalants]) have been associated with STIs and sexual risk (Li, Baker, Korostyshevskiy, Slack, & Plankey, 2012; Mansergh et al., 2008; Stueve, O'Donnell, Duran, San Doval, & Geier, 2002); injection drug use (e.g., heroin) (Ghanem et al., 2011) and stimulants (e.g., methamphetamine) (Gorbach et al., 2011) have been reported in the context of unprotected sexual intercourse and HIV serocon-version; and erectile dysfunction (ED) drugs (e.g., Viagra, Cialis, Levitra) have been frequently reported with methamphetamine in a sexual context (Carey et al., 2009; Fisher, Reynolds, Ware, & Napper, 2011; Semple, Zians, Strathdee, & Patterson, 2009; Spindler et al., 2007).

These drug categories have been associated with a differential magnitude of increase in UAI as well as non-disclosure of HIV status and lack of knowledge of a sex partner's HIV status (Gorbach et al., 2011; Hirshfield et al., 2010; Kelly & Parsons, 2013; Li et al., 2012; Mansergh et al., 2008; Stueve et al., 2002; Vosburgh et al., 2012). Although there is a body of literature on the relationship between HIV transmission risk and individual drugs used prior to sex, as well as drug categories used prior to sex (Hirshfield et al., 2010), little information exists on examining combinations of specific drugs using latent class analysis (LCA) (Rindskopf & Rindskopf, 1986) to empirically identify clusters (i.e., latent classes) that estimate the likelihood of reporting HIV transmission risk behaviors (McCarty-Caplan, Jantz, & Swartz, 2014). In addition, drug categories (i.e., club drugs, recreational drugs, erectile dysfunction drugs) (Hirshfield et al., 2010) have not focused on the independent and additional effects of specific drugs on HIV transmission risk outcomes. Ostrow et al. (2009) examined the effects of specific combinations of drug categories (poppers, stimulants and ED drugs) on HIV seroconversion and found that men who reported using all three drug

types together had the greatest risk for HIV seroconversion. However, alimited combination of drug categories was examined and injection drug use was not assessed.

This study builds upon previous research by empirically identifying complex patterns of drugs used prior to sex using LCA. The aim of this study was to identify underlying patterns and prevalence of a combination of different drugs and the associated probability of engaging in risky sexual behaviors among MSM before their most recent sexual encounter in the past year. We present data from an online sample of adult MSM from the U.S.

Method

Participants

From 2004 to 2005, MSM were recruited via study banner ads that were posted on eight U.S. and Canadian gay-oriented websites, ranging from sexual networking (83 %) to news (10 %) and search engine websites (7 %) (Grov, Hirshfield, Remien, Humberstone, & Chiasson, 2013; Hirshfield et al., 2010). Men who clicked on a study banner ad were automatically directed to the study landing page, which briefly described the study and contained the online consent form. Men who clicked consent were then prompted to complete an anonymous survey about sexual and drug- and alcohol-using behaviors in the past year. Participants resided in every U.S. state, Canadian province or territory, and abroad. The survey took 10–15 min to complete and no incentives were given. The institutional review board at Public Health Solutions approved all study procedures and granted a waiver of the requirement to obtain documentation of informed consent.

Overall, 19,253 individuals clicked on the survey banner ad and consented to participate. Of those, 4,635 immediately broke off from the survey; men recruited from a sex-related search engine were significantly more likely to break-off from the survey compared with men recruited from other sites (odds ratio [OR] 8.19, 95 % CI 8.19–8.84). Men recruited from gay-related websites were significantly less likely to break-off (OR 0.15, 95 % CI 0.14–0.16). Of the remaining 14,618 individuals, men who reported no lifetime sex (n = 2,394) or past year sex (n = 540) were skipped out of most survey sections and considered partial completers. Men who did not report lifetime sex were significantly younger than men who did (median age 28 vs. 36, $p<.001$) and were significantly more likely to have been recruited from the sex-related search engine.

The completion rate, based on the American Association for Public Opinion Research (AAPOR RR1), was 58 % for completed cases (n = 11,239) and 74 % with partials included (AAPORRR2)(The American Association for Public Opinion Research, 2011). The number of banner ad impressions men were exposed to was not available from the websites; therefore, we could not calculate a click-through-rate or responserate. Of the 11,239 completed cases, we detected 90 duplicate cases (.008 %) by comparing demographic and behavioral data, encrypted user IP addresses, computer operating system information, and referrer data. The more complete case was kept. A complete list of exclusions is described in detail elsewhere (Grov et al., 2013; Hirshfield et al., 2010). The analytic sample was limited to 8,717 MSM residing in the U.S. who reported having had sex in the last year and were thus prompted to answer questions regarding their drug use before sex within the last year.

Measures

The main outcome variables were: (1) unprotected insertive or receptive anal intercourse with only male partners during the last sexual encounter within the past year; (2) self-report of a STI diagnosed by a healthcare professional within the past year, which included a checklist: genital herpes, human papilloma virus, chlamydia, gonorrhea, syphilis, chancroid, and non-gonococcal urethritis; (3) knowledge of a sex partner's HIV status at the last sexual encounter within the past year (Did you know this person's HIV status?); and (4) discussion or disclosure of the participant's HIV status with the sexual partner in the most recent sexual encounter within the past year (Did you discuss or disclose your HIV status?).

Participants were asked if they had used any of the following 19 drugs prior to or during any sexual encounter within the past year: ketamine, methamphetamine, injected methamphetamine, ecstasy, gamma hydroxybutyrate (GHB), alcohol, marijuana, poppers, downers, cocaine (smoked, snorted, or swallowed), injected cocaine, heroin (smoked, snorted, or swallowed), injected heroin, prescription and non-prescription erectile dysfunction drugs (Viagra, Levitra, Cialis). Polydrug use was defined as reporting 3 or more drugs prior to or during sex. Only participants who had had sex within the past year saw these drug use questions. Participants were asked to specify which, if any, of the drugs used within the past year had been used before or during the last sexual encounter.

Statistical Analysis

LCA (Rindskopf & Rindskopf, 1986) was used to empirically identify clusters of individuals reporting similar patterns of drug use prior to or during sex within the past year. The 19 dichotomous drug use indicators, and an overall count of the number of different drugs used, were analyzed using LCA with varying numbers of classes, ranging from 1 to 7. The optimal number of classes was determined using the Bayesian information criterion (BIC), which balances model fit and parsimony (Fraley & Raftery, 1998; McLachlan & Peel, 2004). The parameters of the LCA model included: (1) the creation of a total drug count indicator as a simple sum of all drug items to reflect the cumulative exposure, (2) the probability of each specific drug being used with in each latent class, (3) the overall proportion of the population in each of the latent classes, and (4) the mean number of different drugs used in each latent class. The LCA model was fit using maximum likelihood in Mplus version 6.11 (Muthén & Muthén, 1998–2011), where the dichotomous drug use indicators were modeled with a binomial logit link and the overall count of different drugs used was modeled with a log Poisson link. Once the optimal number of classes was determined, the posterior probability that a certain individual belongs to a certain latent class was computed using Bayes' Rule (Rindskopf & Rindskopf, 1986).

A moderate correlation (Spearman $r = 0.55$, $p<.001$) was found between the sum total of past-year drugs used (range 0–18 drugs) and last encounter drugs used (range 0–10 drugs). However, polydrug use was reported by only 5 % of participants during the last sexual encounter, compared with 37 %of participants within the past year, thus limiting the richness of drug use clusters capable of being identified in the last sexual encounter data. For these a fore mentioned reasons, we used the past year drug use data, as it provided a more complete picture of participants' average drug use with sufficient variability. Each drug was coded

dichotomously as having been used or not. Within the past year, participants could have cumulatively consumed multiple drugs before or during separate sexual encounters.

Demographic covariates (i.e., age, race/ethnicity, income, self-reported HIV status, partner type, and number of male sexual partners in the last encounter) were compared across the predicted LCA drug use classes using Chi square tests. Given the predicted LCA drug use classes for each individual, logistic regressions controlling for the demographic covariates were used to examine associations between the drug use class and the four sexual risk behavior outcomes. Finally, the grouping of the drug categories in the Introduction section and in Table 1 are based on factor analyses conducted on this dataset in a prior analysis (Hirshfield et al., 2010).

Results

Among the 8,717 MSM, alcohol use before sex was widely prevalent (73 %) and men reported an average of 2.6 drugs before or during their last sexual encounter in the past year (Table 1). Approximately 15 % of the sample reported no drug use before sex in the past year. The best fitting LCA model based on the BIC had 6 classes; the average number of drugs used before sex increased with each subsequent latent class. With the exception of Class 1 (low/no drug use), the names of the 6 latent classes were based on their respective greater-than-average type(s) of drug use. For example, Class 2 (recreational drug use) had higher than average use of alcohol, marijuana, and poppers; Class 3 (poppers with prescription ED drug use) had higher than average poppers use and prescription erectile dysfunction drugs; and Class 6 (high polydrug use) had higher than average use of drugs in all categories.

Among the 8,717 MSM, median age was 37 (range 18–92). Most men were White, followed by African-American, Hispanic, Asian or Pacific Islander, and mixed or other race (Table 2). Almost half of the sample reported an income greater than $50,000. Among those who answered the HIV testing question (n = 7,956), 67.2 % self-reported being HIV-negative, 11.3 % self-reported being HIV-positive, and 21.5 % reported an unknown status or had never been tested. Over half (53 %) of men reported that their last sexual encounter occurred within the last 7 days; 15.5 % reported that their last encounter was on the day of the survey interview; 17.2 % reported that their last encounter occurred in the past month, with the remainder of the sample reporting their last encounter within the past year. Overall, 65.8 % of men reported having their last sexual encounter with non-main male partners and 13.4 % reported having sex with 2 or more male partners in the same encounter (i.e., group sex).

Each demographic covariate (i.e., age, race/ethnicity, income, HIV status, partner type, and number of male sexual partners in the last encounter) was significantly associated with the 6 LCA drug classes in Table 2 ($p<.01$). By age, men aged 40 years and over were overrepresented in Class 3 (poppers and prescription ED drugs) and Class 4 (poppers with prescription and non-prescription ED drugs). White men, men with higher income, and HIV-positive men tended to be over represented in Class 3, Class 5 (recreational, club and ED drugs), and Class 6 (high polydrug use). Compared with men in Class 1 (low/no drug use), men in Class 6 were significantly more likely to report being HIV-positive, aged 30–39

years, have non-main male partners, and report group sex in their last encounter. For the most part, with each increase in the latent class category (in comparison with Class 1 as the reference group), there was an increase in the odds of (1) reporting UAI with a non-main male partner in the last encounter, (2) reporting group sex in the last encounter, and (3) reporting an HIV-positive serostatus.

As the average number of drugs used before sex increased from Class 1 to 6, the odds of engaging in UAI and reporting STIs increased in direct proportion (Table 3). Men in the highest drug count class were five times more likely to report UAI in their most recent encounter than men in the lowest drug count class. Men in the highest drug count class were also four times more likely to report an STI than men in the lowest drug count class. MSM under age 30 were significantly more likely to report an STI than older MSM. Compared to White MSM, African-American MSM were significantly less likely to disclose their HIV status andless likely to know their partner's HIV status, yet more likely to engage in safer sexual practices over all four outcomes. HIV-positive men were twice as likely to engage in UAI and three times more likely to report an STI, compared to HIV-negative and men with unknown serostatus. Men reporting sexual encounters with a main partner were twice as likely to report UAI, five times more likely to disclose their HIV status and three times more likely to know their partner's HIV status; while, men with non-main male partners were twice as likely to report an STI. Men who engaged in group sex in the last sexual encounter were two times more likely to report UAI, less likely to disclose their HIV status, and less likely to know their partner's HIV status.

Classes 5 and 6 were novel as they have not been considered in the literature, due to the unique combination of recreational, club, erectile dysfunction, and injection drug use discovered using the LCA model. The impact of injection drug use, though small in proportion, became apparent when clustered with recreational, club drug, and ED drug use (Class 5), and with high polydrug use (Class 6), which predicted a subsequent increase in risk behaviors. Men that fell into Classes 5 and 6 (13 % and 6 %) reported very high levels of polydrug use, UAI, and STIs within the past year. Of note, Class 6 had the highest proportion of HIV-positive participants (38.3 %) and non-main partners (81.6 %), the highest odds of reporting UAI (OR 4.84) and group sex (36 %) in their last encounter and the highest odds of reporting an STI in the past year (OR 3.78) (Tables 2, 3). The inclusion of injection drug use, in conjunction with other drugs reported in these two classes, uncovered a subset of men reporting extremely high risk behaviors.

Discussion

In this sample of U.S. MSM recruited online, substance use prior to sex and risky sexual behaviors was common. To our knowledge, this was the first U.S. study of MSM to assess sexual risk-taking behaviors with time-related, complex patterns of polydrug use as elucidated through LCA. The LCA clustered individuals by their past-year profile of drug use and found a six-class solution, which provided a more complex, yet precise, picture of polydrug use patterns not previously elucidated in prior studies (Hirshfield et al., 2010; Ostrow et al., 2009). Analyses of demographic characteristics and behaviors reported in the most recent sexual encounter, in connection with the six-class solution, showed high

proportions of UAI and group sex with non-main partners. Past-year STI diagnoses were also common. LCA enabled usto identify clusters of men reporting patterns of polydrug use not previously considered in the literature, such as injection drug use, in combination with recreational, club drugs, and erectile dysfunction drugs. Using an empirical approach to the drug-sex relationship enabled us to develop a more comprehensive understanding of polydrug use and sexual risk in this sample of MSM.

MSM in the low/no drug use class comprised almost half of the sample and reported the lowest rates of UAI in their most recent encounter as well as STIs in the past year. Men in Classes 3 and 4 reported poppers with ED drugs, possibly due to sexual dysfunction side effects attributed to substance use before sex (Bhugra & Wright, 2007; Lau, Kim, & Tsui, 2008). In the context of the differences between Classes 2 (which included poppers but no ED drugs), 3, and 4, some men may use substances to increase sexual pleasure, while others may experience sexual problems because of those same substances and compensate by simultaneously using ED drugs (Hurley & Prestage, 2007). Club drugs, such as crystal methamphetamine and ecstasy, can inhibit an erection if used at high doses (Drumright, Patterson, & Strathdee, 2006b). Studies of ED drug use in conjunction with club drugs to counteract sexual side effects has been associated with HIV and STI transmission risk and riskier sexual behaviors, such as UAI (Fisher et al., 2006; Fisher, Reynolds, Ware, & Napper, 2011; Prestage et al., 2009b). In two online studies of MSM and HIV transmission risk, risk factors associated with crystal methamphetamine use before sex included young age, having an STI, and being HIV-positive (Hirshfield et al., 2004; Hirshfield, Remien, & Chiasson, 2006).

In the current study, two-thirds of men had UAI with non-main male sexual partners in their most recent encounter, coupled with low rates of HIV disclosure, putting themselves and their partners at risk for HIV transmission. Additionally, demographic trends showed differences in reported risky sexual behaviors among MSM under the age of 30. These younger men were less likely to report UAI than older men but significantly more likely to report an STI. This interesting finding may be a sign of HIV prevention risk reduction efforts (e.g., more condom use or less anal sex), which may suggest a shift in risky sexual behavior trends in young adults (e.g., more oral sex instead of anal sex or more male anal sex partners with condoms). These risk reduction behaviors may not necessarily increase the risk for HIV infection, but may increase the risk of acquiring STIs. Future research is needed to examine the relationship between complex drug use patterns and STItransmission risk among this subgroup of young MSM.

Limitations

Limited research exists regarding statistical modeling of complex patterns of polydrug use prior to sex in MSM in relation to sexual risk behaviors. This online study sought to measure the prevalence of self-reported risk-taking behaviors for research purposes and the findings were limited to MSM who used the online sites from which participants were recruited. Men recruited from a sex-related search engine were significantly less likely to have ever had sex and more likely to break-off from the survey than men recruited from gay-specific websites. As such, the study sample may differ by type of recruitment website, as well as by

recruitment medium (e.g., online versus offline), thus limiting general-izability of study findings.

Although online research studies tend to report higher attrition than offline research, as there are fewer social constraints (Birnbaum, 2004), a growing number of validity studies indicate higher reporting of sexual risk and substance-using behaviors with computer-based surveys compared to mail, phone, and in-person surveys (Elford, Bolding, Davis, Sherr, & Hart, 2004; Link & Mokdad, 2005; Newman et al., 2002; Perlis, Des Jarlais, Friedman, Arasteh, & Turner, 2004). For example, the elevated overall rates of drug use in the last sexual encounter (24 % for poppers and 32 % for marijuana) seem to indicate that this is a high-risk, high-substance using sample. In addition, several large-scale studies comparing online to mail survey modes have found that online surveys have lower overall response rates but yield higher item-response rates on both open- and close-ended questions, suggesting higher data quality (Bech & Kristensen, 2009 Denscombe, 2009; Kwak & Radler, 2002; Shin, Johnson, & Rao, 2012).

We did not ask about the quantity of specific drugs used or collect information on the frequency of condom use during anal sex, in general or by specific encounter. Further, we did not clinically assess substance abuse or dependence. The cumulative combination of reported drug use by participants within the past year was time-dependent, meaning that they could have either used different drugs at different sexual encounters or not used any drugs at all. While the use of LCA is novel in this field and the event-level sexual encounter provided detailed risk information, assessing only one encounter—rather than multiple encounters over time—may not have captured the type and degree of drug use and HIV transmission risk among men in this sample. However, using past-year average drug use data provided a much broader range of drug use that would have been missed in this specific event-level analysis.

Conclusions

A large percentage of U.S. MSM recruited online from gay-oriented websites reported risky sexual behaviors in connection with drug use in the past year. We did not provide any monetary incentives to complete the survey, yet it is clear that MSM who participated in this online study, as well as in our other online studies (Chiasson et al., 2007; Chiasson , Shaw, Humberstone, Hirshfield, & Hartel, 2009; Hirshfield et al., 2004, 2006, 2012), were willing to report and describe their drug use and sexual risk-taking behaviors. The use of the Internet as a medium for HIV prevention is at a somewhat early stage yet shows promise as a way to target groups athigh risk for substance use and HIV transmission. Using LCA enabled us to identify underlying patterns of polydrug use, associated with extremely high risk behaviors, which have not been considered in the literature. More work is needed to longitudinally measure complex latent classes of drug use in relation to the context of use, sexual negotiation, and risk.

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Table 1

Latent class analysis model: Prevalence and drugs counts within each class

Latent class		**1**	**2**	**3**	**4**	**5**	**6**
N	**8,717%**	**3,797%**	**2,535%**	**681%**	**133%**	**1093%**	**478%**
Recreational drugs							
Alcohol	72.7	53.8	93.2	72.5	62.6	86.2	77.9
Poppers	34.2	6.0	43.2	52.8	50.7	69.7	82.4
Marijuana	31.6	2.1	52.7	33.4	21.0	62.1	69.1
Cocaine	12.1	0	7.8	5.7	0	49.1	53.7
Downers	5.7	0.2	4.4	5.5	0	17.6	28.6
Prescription erectile dysfunction drugs							
Viagra	22.0	4.5	11.7	91.9	28.0	32.1	76.3
Cialis	8.8	0.6	1.9	45.9	15.3	7.1	51.0
Levitra	5.9	0.5	1.3	29.9	13.0	3.0	37.8
Non-prescription erectile dysfunction drugs							
Viagra	12.6	1.1	10.6	4.6	83.9	30.6	55.5
Cialis	4.3	0.3	0.6	1.4	51.3	6.9	35.8
Levitra	2.5	0.1	0	0.5	37.4	2.5	23.9
Club drugs							
Amphetamine	15.3	0.2	2.7	7.8	15.9	64.9	93.6
Ecstasy	14.4	0	5.2	3.0	0	61.3	85.2
GHB	10.5	0.2	0.5	3.9	6.8	39.7	83.5
Ketamine	7.6	0	0	0.9	0	27.9	69.1
Amphetamine injected	2.5	0	0.1	0	2.5	5.9	28.9
Injection drugs							
Cocaine injected	0.5	0	0.1	0	0	0.9	7.1
Heroin	0.4	0	0.1	0	0	0.8	4.3
Heroin injected	0.2	0	0.1	0	0	0.2	3.4
Average no. drugs used	2.6	0.7	2.4	3.6	3.9	5.7	9.7
Proportion in each class	100	43.6	29.1	7.8	1.5	12.5	5.5

Injection drugs include non-injection heroin, as it clustered with injection heroin. The grouping of the drug categories was based on factor analyses conducted on this dataset in a prior analysis (Hirshfield et al., 2010)

Table 2

Demographic and behavioral characteristics by the six latent classes

Latent classes		**1**	**2**	**3**	**4**	**5**	**6**
n	**8,583%**	**3,740%**	**2,489%**	**672%**	**131%**	**1,077%**	**474%**
Age (in years)							
18-29	26.3	33.9	26.0	4.0	6.9	21.1	15.8
30-39	32.1	32.2	32.1	17.4	30.5	37.8	40.5
40-49	29.5	24.1	30.6	46.0	40.5	32.5	33.1
50+	12.1	9.8	11.2	32.6	22.1	8.6	10.5
Race/ethnicity							
White	72.1	65.8	72.4	87.2	75.8	78.6	83.2
African American	12.9	18.7	12.7	3.1	6.0	4.0	3.5
Hispanic	9.9	10.5	10.3	5.8	9.8	10.2	7.5
Asian	1.8	2.0	1.6	1.5	2.3	2.2	1.3
Mixed/other	3.3	3.0	3.0	2.4	6.1	5.0	4.5
Income							
<$30K	23.9	28.2	24.1	11.7	17.6	19.2	19.9
$30-50K	29.2	30.6	29.0	24.2	27.2	29.0	27.3
>$50 K	46.9	41.2	46.9	64.1	55.2	51.8	52.8
HIV status							
HIV-positive	11.3	4.4	9.2	20.9	16.5	21.4	38.3
Partner type							
Main	34.2	42.6	33.2	23.3	29.3	21.4	18.4
Non-main	65.8	57.4	66.8	76.7	70.7	78.6	81.6
Number of male partners in sexual encounter							
1	86.6	92.2	88.6	83.7	80.5	75.1	64.0
2	8.2	5.2	7.7	9.3	10.5	14.3	17.4
3+	5.2	2.6	3.7	7.0	9.0	10.6	18.6

1 low/no drug use, *2* recreational drug use, *3* poppers with prescription erectile dysfunction (ED) drug use, *4* poppers with prescription and nonprescription ED drug use, *5* recreational, club, and ED drug use, *6* high polydrug use. ll variables statistically significant at the .01

Table 3

Latent class analysis model: Adjusted comparisons of main outcomes between individuals in the six latent classes

	UAI		Past-year STI		Knew partner's HIV status		Disclosed own HIV status	
	%	aOR (95 CI)	%	aOR (95 CI)	%	aOR (95 CI)	%	aOR (95 CI)
Latent classes								
1	15.4	1.00	7.1	1.00	64.9	1.00	64.0	1.00
2	20.9	1.36 (1.18, 1.55)***	10.9	1.47 (1.22, 1.77)***	62.8	0.99 (0.88, 1.11)	62.4	0.98 (0.87, 1.09)
3	35.7	2.46 (2.02, 3.00)***	12.8	1.82 (1.36, 2.43)***	68.2	1.26 (1.04, 1.53)*	66.4	1.25 (1.04, 1.52)*
4	45.5	3.84 (2.66, 5.56)***	16.2	2.36 (1.37, 4.06)**	61.2	0.86 (0.59, 1.27)	66.9	1.19 (0.80, 1.76)
5	35.9	2.49 (2.11, 2.94)***	19.9	2.39 (1.92, 2.96)***	60.1	0.97 (0.83, 1.13)	62.7	1.06 (0.91, 1.23)
6	56.1	4.84 (3.88, 6.02)***	31.6	3.78 (2.88, 4.95)***	61.8	1.10 (0.88,1.37)	64.2	1.14 (0.91, 1.42)
Age (in years)								
18-29	16.9	0.82 (0.67, 1.01)	12.3	3.85 (2.77, 5.35)***	58.8	0.89 (0.74, 1.07)	61.7	1.28 (1.07, 1.52)**
30-39	24.8	1.00 (0.84, 1.20)	12.3	2.67 (1.96, 3.64)***	64.1	1.03 (0.87, 1.21)	64.7	1.33 (1.13, 1.56)***
40-49	28.1	1.06 (0.89, 1.26)	12.3	2.19(1.61, 2.97)***	66.9	1.14 (0.97, 1.35)	65.5	1.34(1.14, 1.57)***
50+	27.2	1.00	5.9	1.00	65.4	1.00	60.0	1.00
Race/ethnicity								
White	26.2	1.00	12.2	1.00	65.5	1.00	64.7	1.00
African American	11.7	0.54 (0.44, 0.66)***	7.5	0.72 (0.56, 0.94)*	57.3	0.62 (0.54, 0.72)***	57.1	0.67 (0.58, 0.77)***
Hispanic	22.5	0.94 (0.78, 1.14)	12.5	0.99 (0.78, 1.25)	59.9	0.83 (0.70, 0.97)*	64.3	0.99 (0.84, 1.16)
Asian/PI	25.7	1.07 (0.74, 1.56)	11.1	0.83 (0.50, 1.39)	58.0	0.94 (0.68, 1.31)	60.7	0.95 (0.69, 1.31)
Mixed/other	26.3	0.98 (0.77, 1.26)	12.7	1.00 (0.72, 1.38)	63.3	1.02 (0.82, 1.26)	64.8	0.98 (0.80, 1.21)
Income								
<$30K	20.9	1.01 (0.87, 1.18)	12.0	1.12 (0.92, 1.38)	58.5	0.85 (0.74, 0.97)*	60.6	0.90 (0.79, 1.02)
$30-50K	23.4	1.00	10.7	1.00	63.4	1.00	63.7	1.00
>$50 K	26.2	1.03 (0.91, 1.16)	12.5	1.28 (1.08, 1.52)**	66.6	1.10 (0.98, 1.23)	65.4	1.06 (0.95, 1.18)
HIV status								
HIV-positive	44.8	1.87 (1.60, 2.18)***	26.9	2.71 (2.25, 3.27)***	63.8	1.13 (0.97, 1.33)	65.1	1.16 (0.99, 1.35)
Partner type								
Main	24.4	1.65 (1.46, 1.86)***	6.5	0.51 (0.42, 0.61)***	84.3	5.22 (4.62, 5.88)***	76.0	2.47 (2.22, 2.75)***
Number of partners in the last encounter								
1	21.7	1.00	10.7	1.00	65.5	1.00	64.9	1.00
2	35.3	1.79 (1.49, 2.15)***	15.9	0.95 (0.74, 1.20)	54.6	1.03 (0.87, 1.21)	56.7	0.92 (0.78, 1.08)
3+	43.3	2.09 (1.67, 2.60)***	20.4	1.01 (0.76, 1.34)	48.4	0.78 (0.63, 0.95)*	52.7	0.76 (0.62, 0.94)**

aOR adjusted odds ratio, *CI* confidence interval, *PI* Pacific Islander, *STI* sexually transmitted infection, *UAI* unprotected anal intercourse

1 low/no drug use, *2* recreational drug use, *3* poppers with prescription ED drug use, *4* poppers with prescription and non-prescription ED drug use, *5* recreational, club, and ED drug use, *6* high polydrug use

* $p<.05$

** $p<.01$

*** $p<.001$