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Unprotected Anal Intercourse Associated With Recreational Drug Use Among Young Men Who Have Sex With Men Depends on Partner Type and Intercourse Role

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Objective: **The objective of this study was to measure associations of unprotected anal intercourse (UAI) and substance use by sexual partner (regular vs. casual) and role [insertive (I) vs. receptive (R)].**

Goal: **The goal of this study was to identify determinants of the association of specific drugs and UAI.**

Study: **We conducted a prospective study of young men who have sex with men (MSM), 1997–2002. Odds ratios (ORs) for association of substance use and UAI during the previous year were adjusted for age and calendar year.**

Results: **UAI was significantly associated with sexual situation-specific use of marijuana (OR, 1.43), crystal methamphetamine (OR, 1.75), ecstasy (OR, 1.88), and ketamine (OR, 2.17); global use associations were similar. Situation-specific associations with alcohol (OR, 1.93) and γ-hydroxybutyrate (GHB; OR, 1.98) were not seen with global measures. GHB and ketamine were specifically associated with IUAI with regular partners, and methamphetamine with RUAI with casual partners.**

Conclusion: **Type of drug use measure, partner, and role are important determinants of the association of specific substances and UAI.**

A LARGE LITERATURE ATTEMPTS to associate complex patterns of alcohol and illicit drug use with high-risk sexual behaviors reported by men who have sex with men (MSM). A review of methods by Leigh and Stall examined various exposure measures that could be used (global, situation-specific and event-specific) and the limitations inherent in each when used for this purpose.[1] When using *global* measures of substance use, one cannot determine whether the drug use occurred around the time of sexual intercourse. With *situation-specific* measures, one can examine substance use during or near the time of sexual intercourse, but cannot establish a link between substance use and unsafe encounters specifically. Finally, if one uses *event-specific* measures, asking questions that concern specific sexual encounters, one can directly relate use of specific substances and subsequent sexual behaviors. Studies continue to use each of these methods to associate substance use and sexual behaviors of MSM with inconsistent results.[2–5]

Recent reports suggest possible associations of unprotected anal intercourse (UAI) with *global* measures of poppers,[3,6–8] marijuana, amphetamines,[3] cocaine,[3,9] hallucinogens,[3,7] methamphetamine,[10–14] ecstasy,[12–16] GHB, ketamine, and Viagra.[12–14] However, these associations were not observed in all studies.[15,17–21] Using HIV seroconversion as an end point, associations have been reported for global measures of the use of poppers,[22–26] cocaine,[22,23,26] amphetamines,[24,26] marijuana, and heavy alcohol.[23,26] Studies examining *situational* drug use among MSM have found associations of UAI and poppers,[27,28] cocaine,[29] alcohol,[28] methamphetamines,[30] and intoxication in general.[4,5,9,28,31] Unfortunately, there is inconsistency among these studies as well, some reporting no association.[32–34] Importantly, the few *event-specific* studies have reported null findings for alcohol and drug use.[2,35,36] Although *event-specific* data are perhaps the most compelling for describing a causal pathway, the collection of data are labor-intensive for participants, because it requires diary-keeping or other frequent methods of follow up.

Addiction and substance abuse remain important factors to study in relation to risky sexual behavior of MSM. If substance use is causally associated with UAI engaged in by HIV-seronegative and -seropositive men, it is important to establish the contexts in which specific substances are associated with specific types of UAI [insertive (I) vs. receptive (R)] and to identify those drugs that influence use of condoms. With this goal in mind, we performed a direct comparison of global versus sexual situation-specific measures of substance use in relation to UAI and extended our analyses to examine how these measures compare by type of anal intercourse (insertive vs. receptive) and by type of partner (regular vs. casual).

Methods

Study Population

The Vanguard project is a prospective cohort of young MSM in Vancouver, British Columbia, initiated to study trends in HIV-1 seroincidence and risky behaviors in this population.[6,37] Starting in 1995, young men between the ages of 18 and 30 were recruited for the study, providing they had not previously tested positive for HIV-1 and they self-identified as bisexual or gay or had sex with other men.[6] As part of a larger study of substance use and sexual risk trends,[38] we have identified a stable group of HIV-negative

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participants who attended study visits at least once in each 2-year period: 1997–1998, 1999–2000, and 2001–2002. For the present analyses, we excluded men with a history of injection drug use.

Annual follow-up visits for participants included serologic testing for HIV infection and a self-administered questionnaire for return by mail that covered a variety of topics, including sexual experiences and substance use.

Measures of Sexual Risk Behavior

At each study visit, UAI was evaluated in 3 ways: 1) any unprotected anal intercourse, 2) any unprotected insertive anal intercourse (IUAI), and 3) any unprotected receptive anal intercourse (RUAI). For each of these end points, analyses were restricted to men who had engaged in that specific type of intercourse (ie, any, insertive, or receptive). In identifying correlates of UAI, studies of RUAI generally include study participants who do not report receptive anal intercourse; however, the referent category can be further restricted to individuals who engage in receptive (but not unprotected) anal intercourse. We used the latter approach in *all* analyses to distinguish drug effects that influence condom use from drug effects that influence adoption of specific roles in sexual encounters.

Measures of Drug Use

At each study visit, drug use was assessed in 2 ways in the questionnaire. We asked general questions about the *global* use of particular drugs and the frequency of use of each. Participants were asked "Since your last visit, have you used any of the following substances?" and were subsequently asked to indicate "what kind or how?" by checking next to the appropriate box as well as "how often or how much?" by filling in a number per day, per week, per month, or per year. We also asked about the *situation-specific* drug use, defined as drugs used during or within 2 hours of sexual intercourse. Here, participants were asked "Since your last visit, have you used any of the following drugs either during sex or within 2 hours before sex?" and were instructed to check the appropriate box next to each drug. Data on *event-specific* drug use were not collected. We did not measure the average weekly use of drugs during sex, preventing a comparison of the associations of global use or sex-situational use frequencies and UAI. Both assessments asked separately about use of alcohol, poppers, marijuana, cocaine, crack, acid (LSD), heroin, crystal methamphetamine, ecstasy, γ-hydroxybutyrate (GHB), and ketamine (special K). The latter 2 drugs were not included in the 1997 version of the questionnaire because these were new introductions to the "drug scene"; analyses pertaining to these drugs were therefore restricted to study visits that occurred during or after 1998.

Statistical Methods

Odds ratios with 95% confidence intervals were used to measure associations between UAI and drug use. Relative risk estimates were computed using generalized estimating equations (GEE), with an exchangeable correlation matrix; the method accounts for intrasubject correlations across multiple study visits. The method is analogous to logistic regression and is required here as a result of the nonindependence of these repeated measures.[39] The 3 outcome measures (any UAI, RUAI, and IUAI) were examined first overall, then stratified by partner type (casual vs. regular). Casual partners were defined in the questionnaire as those who the participant had sex with less than once a month during the previous year. Regular partners were defined as those the participant had sex with on a regular basis (at least once a month) during the previous year.

Three regression models to predict outcomes were run for each drug: 1) any (global) use of a specific drug versus no use of that drug; 2) use of a specific drug in nonsexual settings only versus no use of that drug; and 3) any use of a specific drug in sexual settings versus no use of that drug. All models were adjusted for age at baseline and calendar year of the study visit.

Results

Characteristics of Study Population

The total number of study visits contributed by the 261 eligible study participants was 1262 (87%) out of a possible 1447 scheduled study visits. The median number of visits was five (interquartile range, 4–5) out of a possible 6. Compared with cohort members ineligible for the present analysis, eligible members were significantly less likely to be Canadian Aboriginal (5% vs. 12%, $P = 0.028$), live in unstable housing (1% vs. 13%, $P < 0.001$), be unemployed (10% vs. 24%, $P < 0.001$), or have an annual income under $10,000 Canadian (16% vs. 25%, $P = 0.011$).

Table 1 describes the 261 participants at enrollment. Most men were white, in their mid-20s, had completed high school, and reported employment. Over the course of the study period, a total of 253 of the participants reported sexual intercourse with a regular partner, with 234 reporting receptive intercourse and 232 reporting insertive intercourse. A total of 248 of the participants reported sexual intercourse with a casual partner, with 195 reporting receptive intercourse and 215 reporting insertive intercourse. Table 2 describes the proportion of individuals using each of the drugs assessed and the median weekly use reported at the last study visit. The proportion of use during sex was consistently lower than global use. Approximately one third or less of those using a drug also reported its use during sex, with the exception of alcohol, marijuana, and crystal methamphetamines, which were used during sex by approximately half of users, and poppers, which were used during sex by nearly two thirds of those reporting global use. Of note, the median weekly use of most drugs during the previous year was quite low, with the exception of crack cocaine (10 hits per week), although the latter frequency was based on only 6 users (Table 2). As a result of the low number of crack and heroin users, these 2 drugs were not analyzed further.

Associations of Drug Use With Any Unprotected Sex

Table 3 displays odds ratios for the association of specific drugs with UAI. Significant associations were observed between UAI

TABLE 1 Enrollment Characteristics of 261 Young Gay Men in Vancouver, British Columbia

Characteristic	Median (IQR)
Age	27 (24–30)
Ethnicity	N (%)
Other	46 (18)
White	197 (77)
First Nations	14 (5)
Stable housing	255 (99)
College graduate	136 (58)
Employment	234 (90)
Income <10 K	40 (16)
Sex trade—ever	13 (5)
Year of enrollment	
1995	86 (33)
1996	99 (38)
1997	48 (18)
1998	28 (11)

TABLE 2 Substance Use and Frequency of Use Among 261 Young Men Who Have Sex With Men in Vancouver, British Columbia, at Last Study Visit in 2001 or 2002

	Sex-situation Use	Global Use	
Drug	Proportion* N (%)	Proportion* N (%)	Median use/wk (IQR)† among users at last visit
Alcohol	139 (54)	239 (92)	2.00 (0.90, 6.00)
Poppers	45 (18)	69 (27)	0.52 (0.10, 2.00)
Marijuana	56 (22)	132 (51)	0.23 (0.06, 2.00)
Coke	18 (7)	48 (19)	0.08 (0.04, 0.38)
Crack	1 (0.4)	5 (2)	10.70 (0.20, 23)
LSD	7 (3)	26 (10)	0.04 (0.02, 0.04)
Heroin	–	3 (1)	0.18 (0.17, 0.19)
Crystal Meth	10 (4)	29 (11)	0.11 (0.04, 0.69)
Ecstasy	13 (5)	48 (18)	0.08 (0.04, 0.23)
GHB	8 (3)	26 (10)	0.08 (0.04, 0.46)
Special K	4 (1.5)	29 (11)	0.12 (0.04, 0.46)

*Proportion of participants using drug at last visit in 2001 or 2002.
†Median global use of drug among those using the drug at last visit in 2001 or 2002.

and the sexual situation-specific use of 6 different drugs: alcohol, marijuana, crystal methamphetamine, ecstasy, GHB, and special K. Only 4 of these drugs (marijuana, crystal methamphetamine, ecstasy, and special K) had a similar significant association when measuring global drug use. With 1 exception, all of these associations were stronger for sexual situation-specific than for global measures of drug use. Marijuana use appeared to be associated nonspecifically: even use *not during sex* was associated significantly with UAI.

Unprotected Insertive versus Receptive Sex

Having observed significant associations between use of specific drugs and UAI, we next assessed if these associations depended on whether the UAI was receptive or insertive. Examining situation-specific drug use, crystal methamphetamine appeared to be associated specifically with RUAI, whereas GHB and special K were specifically related to IUAI. Although alcohol had a significant association with RUAI, its association with IUAI was marginally significant and the odds ratio similar. These associations of particular types of UAI with the situational use of crystal methamphetamine, GHB, and special K would not have been noted had only global use of each drug been assessed.

Unprotected Sex With Regular versus Casual Partners

Table 4 displays associations by partner type. Using situation-specific measures of drug use during sex, the associations of UAI with GHB and special K were partner-specific. Global use of special K was associated with casual partner UAI, whereas sex-situation use revealed strong associations with regular partners only. In addition, an association between sex-situational use of GHB and UAI with regular partners was not observed using global use measures.

The positive association of popper use with any UAI was specific to casual partner encounters. The association was significant with both situation-specific and global use measures but stronger with the former.

Stratification by partner type resulted in a loss of significance for the association of crystal methamphetamine with RUAI; however, odds ratios with both partner types remained elevated and similar to that observed before stratification (Table 4).

Similarly, associations of both RUAI and IUAI with ecstasy used during and outside of sexual settings were not significant after stratification by partner yet remained elevated for RUAI with both partner types (Table 4). Of note, the association of casual partner UAI and use of ecstasy in sexual and nonsexual settings was identical and thus highly nonspecific (Table 4). These results, together with qualitative data from our cohort, prompted us to determine whether the association of ecstasy and RUAI depended on the situation-specific use of crystal methamphetamine. The association of sexual situation-specific use of ecstasy and RUAI was much weaker among men who did not use crystal methamphetamine (OR, 1.50; 95% confidence interval [CI], 0.92– 2.44) than among those who did (OR, 3.54; 95% CI, 0.77–16.30).

In parallel unrestricted analyses, each drug was positively associated with both having a casual or regular partner, and with engaging in insertive or receptive intercourse (data not shown). Therefore, had our analyses not been restricted, associations would have been stronger than those reported.

Discussion

In the current study of community-recruited young MSM, the associations of the use of specific drugs with UAI depended on the type of drug use measure, partner (regular vs. casual), and role (insertive vs. receptive). Global and situational measures of specific substance use in relation to any UAI were similar; both associations implicated use of marijuana, crystal methamphetamine, ecstasy, and special K. However, sexual situation-specific measures of drugs further implicated use of alcohol and GHB. Although global and sexual situation-specific odds ratios were similar, the proportion of men reporting use of specific drugs during sex was less than half of the proportion reporting any use of that drug. Furthermore, with the exception of marijuana, sexual situation-specific measures of use of drugs were more strongly associated with UAI than were global measures. These results demonstrate the considerable potential for misclassification when global measures are used as surrogates for use of drugs in sexual contexts. Although the results of previous studies using global measures should not be disregarded, our results strongly suggest that future efforts need to consider the contexts and use situation-specific drug use measures.

TABLE 3 Odds Ratios (95% confidence intervals)*† for Unprotected Anal Intercourse (UAI) in Relation to Use of Specific Drugs Among 261 Young Men Who Have Sex With Men, 1997–2002, by Sexual Role (Insertive, IUAI vs. Receptive, RUAI)

	Any Partner		
Drug	IUAI	RUAI	Any UAI
Alcohol			
During sex	1.77 (0.98–3.21)	**1.83‡ (1.00–3.34)**	**1.93 (1.08–3.47)**
Use, not during sex	1.14 (0.62–2.13)	1.26 (0.68–2.36)	1.21 (0.66–2.21)
Any use	1.45 (0.83–2.53)	1.53 (0.87–2.70)	1.57 (0.90–2.72)
Popper			
During sex	0.96 (0.71–1.31)	0.99 (0.73–1.34)	1.15 (0.83–1.58)
Use, not during sex	1.40 (0.82–2.37)	0.92 (0.55–1.54)	1.20 (0.71–2.05)
Any use	1.06 (0.79–1.40)	0.97 (0.73–1.29)	1.15 (0.86–1.54)
Marijuana			
During sex	1.22 (0.86–1.75)	1.40 (0.98–2.01)	1.43 (0.99–2.07)
Use, not during sex	**1.73 (1.23–2.43)**	1.24 (0.89–1.72)	**1.96 (1.39–2.79)**
Any use	**1.44 (1.07–1.93)**	1.27 (0.95–1.70)	**1.64 (1.22–2.22)**
Coke			
During sex	0.79 (0.50–1.24)	0.70 (0.44–1.10)	0.83 (0.52–1.31)
Use, not during sex	0.85 (0.56–1.30)	1.02 (0.67–1.55)	1.12 (0.73–1.70)
Any use	0.84 (0.60–1.18)	0.91 (0.65–1.27)	1.01 (0.71–1.43)
LSD			
During sex	0.98 (0.41–2.33)	1.26 (0.54–2.97)	1.52 (0.61–3.78)
Use, not during sex	0.55 (0.31–0.96)	1.09 (0.63–1.88)	0.93 (0.53–1.62)
Any use	0.63 (0.39–1.02)	1.10 (0.68–1.77)	1.01 (0.62–1.64)
Crystal Meth			
During sex	1.26 (0.76–2.10)	**1.74 (1.05–2.91)**	**1.75 (1.00–3.05)**
Use, not during sex	1.19 (0.70–2.01)	1.03 (0.61–1.73)	1.34 (0.77–2.31)
Any use	1.25 (0.84–1.86)	1.40 (0.95–2.07)	**1.56 (1.02–2.38)**
Ecstasy			
During sex	**1.53 (1.01–2.33)**	**1.85 (1.22–2.79)**	**1.88 (1.20–2.95)**
Use, not during sex	1.08 (0.73–1.60)	**1.53 (1.04–2.27)**	1.41 (0.93–2.12)
Any use	1.25 (0.91–1.72)	**1.69 (1.23–2.32)**	**1.57 (1.12–2.19)**
GHB			
During sex	**2.14 (1.13–4.03)**	1.43 (0.80–2.54)	**1.98 (1.01–3.87)**
Use, not during sex	0.64 (0.30–1.36)	0.86 (0.41–1.78)	0.89 (0.42–1.90)
Any use	1.37 (0.83–2.27)	1.15 (0.71–1.86)	1.43 (0.85–2.43)
Special K			
During sex	**2.05 (1.09–3.87)**	1.63 (0.90–2.95)	**2.17 (1.08–4.33)**
Use, not during sex	1.47 (0.73–2.96)	1.84 (0.93–3.66)	1.61 (0.78–3.34)
Any use	**1.76 (1.06–2.90)**	1.60 (0.99–2.58)	**1.80 (1.06–3.08)**

*Adjusted for age at baseline and calendar year.
†Reference category is no use of the drug in question.
‡Numbers in bold indicate $p \leq 0.05$.

The global measure associations of marijuana, crystal methamphetamine, ecstasy, and special K with UAI that we observed are consistent with the results of other studies.[3,11–16,40] However, we did not observe associations between UAI and global measures of the use of poppers, LSD, or cocaine, as other studies have shown.[3,6,9,25,40–42] On the other hand, sexual situation-specific measures of popper use were associated with UAI with casual partners here as elsewhere.[28,42] Other sexual situation-specific associations with UAI, including the use of alcohol, marijuana, crystal methamphetamine, ecstasy, GHB, and special K, are also consistent with other studies.[4,12–14,42,43]

A unique contribution of our study is the observation that in many instances, associations with specific drugs depended on whether the UAI was insertive or receptive. Crystal methamphetamine was associated with RUAI, GHB and special K were associated solely with IUAI, and poppers were strongly associated with RUAI with casual partners. Furthermore, the positive association of GHB with IUAI would not have been observed using global measures, and sexual situation-specific measures suggest that the use of special K is more directly associated with IUAI than RUAI. To our knowledge, there have been no previous studies that have reported role-specific associations for GHB and special K. These findings have importance for the future study of specific drugs in relation to HIV acquisition versus transmission.

An intriguing result in our study was the observation that, when stratifying by partner type, GHB and special K were associated with UAI with regular partners only, and then more strongly for IUAI. These results were markedly different from those obtained using global measures, which suggested that only special K was associated with UAI with both regular and casual partners. There have been reports concerning drug use in the gay club scene and at circuit parties that suggest these drugs have a disinhibiting effect on sexual behavior.[12–14,44,45] Our results underscore the importance of examining separately the behaviors engaged in with regular partners and casual partners at such venues.

An important limitation of our study and most others is that our survey contained general questions about drug use during sex but did not specify drug use during particular encounters that were

TABLE 4 Odds Ratios (95% confidence intervals)*† for Unprotected Anal Intercourse (UAI) in Relation to Use of Specific Drugs Among 261 Young Men Who Have Sex With Men, 1997–2002, by Sexual Role (Insertive, IUAI vs. Receptive, RUAI)

	Regular partner			Casual partner		
Drug	IUAI	RUAI	Any UAI	IUAI	RUAI	Any UAI
Alcohol						
During sex	1.55 (0.82–2.92)	1.39 (0.74–2.63)	1.43 (0.76–2.72)	1.35 (0.59–3.08)	1.06 (0.41–2.69)	1.23 (0.58–2.65)
Use, not during sex	1.11 (0.55–2.22)	1.24 (0.63–2.48)	0.99 (0.49–1.98)	0.74 (0.32–1.68)	0.84 (0.31–2.28)	0.73 (0.33–1.61)
Any use	1.32 (0.72–2.43)	1.23 (0.67–2.25)	1.20 (0.65–2.23)	1.11 (0.52–2.40)	1.06 (0.42–2.70)	1.11 (0.54–2.30)
Popper						
During sex	**0.64‡ (0.45–0.92)**	0.75 (0.53–1.06)	0.70 (0.49–1.01)	**1.53 (1.06–2.22)**	**2.00 (1.29–3.10)**	**1.79 (1.25–2.56)**
Use, not during sex	1.07 (0.57–2.00)	0.96 (0.52–1.75)	1.35 (0.71–2.59)	1.65 (0.88–3.09)	1.54 (0.72–3.33)	1.21 (0.64–2.28)
Any use	0.74 (0.53–1.04)	0.79 (0.57–1.09)	0.81 (0.58–1.13)	**1.57 (1.11–2.21)**	**1.83 (1.21–2.76)**	**1.65 (1.18–2.30)**
Marijuana						
During sex	1.06 (0.71–1.57)	1.42 (0.92–2.10)	1.39 (0.93–2.08)	1.43 (0.92–2.22)	1.53 (0.92–2.56)	1.42 (0.93–2.17)
Use, not during sex	**1.80 (1.22–2.66)**	**1.52 (1.04–2.22)**	**2.23 (1.48–3.35)**	1.16 (0.75–1.78)	1.13 (0.67–1.90)	1.27 (0.85–1.92)
Any use	1.34 (0.97–1.85)	**1.41 (1.02–1.95)**	**1.67 (1.20–2.33)**	1.21 (0.83–1.75)	1.24 (0.79–1.95)	1.27 (0.89–1.82)
Coke						
During sex	0.83 (0.49–1.40)	0.70 (0.42–1.18)	0.86 (0.50–1.46)	1.21 (0.72–2.04)	1.49 (0.83–2.65)	1.15 (0.69–1.91)
Use, not during sex	1.13 (0.70–1.86)	1.14 (0.70–1.86)	1.21 (0.73–2.04)	0.72 (0.42–1.27)	0.88 (0.47–1.68)	0.90 (0.55–1.49)
Any use	0.99 (0.67–1.45)	0.91 (0.62–1.34)	1.03 (0.69–1.53)	0.87 (0.57–1.32)	1.15 (0.72–1.85)	0.94 (0.63–1.40)
LSD						
During sex	0.78 (0.31–2.01)	1.11 (0.44–2.79)	1.16 (0.45–3.03)	1.30 (0.48–3.58)	2.78 (0.90–8.61)	1.98 (0.74–5.24)
Use, not during sex	0.67 (0.35–1.32)	1.40 (0.72–2.71)	1.26 (0.63–2.52)	0.73 (0.37–1.45)	1.64 (0.81–3.31)	1.13 (0.61–2.09)
Any use	0.68 (0.38–1.19)	1.26 (0.72–2.20)	1.17 (0.66–2.10)	0.84 (0.46–1.51)	1.75 (0.93–3.27)	1.25 (0.73–2.16)
Crystal meth						
During sex	1.04 (0.58–1.83)	1.43 (0.81–2.54)	1.32 (0.71–2.43)	1.17 (0.67–2.04)	1.75 (0.95–3.21)	1.35 (0.79–2.31)
Use, not during sex	1.14 (0.62–2.09)	1.55 (0.85–2.84)	1.62 (0.83–3.16)	1.08 (0.57–2.03)	0.85 (0.38–1.91)	1.03 (0.56–1.91)
Any use	1.09 (0.70–1.70)	1.46 (0.94–2.28)	1.39 (0.86–2.24)	1.16 (0.74–1.82)	1.37 (0.82–2.28)	1.23 (0.80–1.90)
Ecstasy						
During sex	1.22 (0.77–1.94)	1.55 (0.98–2.45)	1.40 (0.86–2.29)	1.26 (0.78–2.03)	1.57 (0.92–2.68)	1.42 (0.89–2.24)
Use, not during sex	0.84 (0.54–1.33)	1.25 (0.80–1.95)	1.03 (0.65–1.63)	1.08 (0.67–1.71)	1.56 (0.91–2.68)	1.29 (0.82–2.02)
Any use	1.01 (0.71–1.44)	1.35 (0.95–1.93)	1.14 (0.79–1.65)	1.11 (0.76–1.62)	**1.57 (1.02–2.42)**	1.32 (0.92–1.90)
GHB						
During sex	**2.07 (1.03–4.13)**	1.71 (0.89–3.26)	**2.62 (1.16–5.93)**	1.68 (0.87–3.22)	1.37 (0.66–2.85)	1.42 (0.74–2.70)
Use, not during sex	0.67 (0.27–1.65)	0.73 (0.30–1.73)	0.93 (0.37–2.28)	0.71 (0.27–1.83)	1.16 (0.42–3.17)	0.99 (0.42–2.36)
Any use	1.46 (0.83–2.58)	1.27 (0.74–2.20)	1.73 (0.93–3.24)	1.30 (0.74–2.28)	1.26 (0.67–2.38)	1.28 (0.74–2.22)
Special K						
During sex	**2.12 (1.03–4.38)**	1.91 (0.95–3.82)	**2.87 (1.20–6.85)**	1.48 (0.77–2.85)	1.62 (0.79–3.33)	1.39 (0.73–2.64)
Use, not during sex	1.23 (0.54–2.81)	1.46 (0.65–3.25)	1.38 (0.58–3.31)	2.01 (0.93–4.34)	2.05 (0.87–4.85)	**2.33 (1.07–5.05)**
Any use	1.69 (0.95–3.01)	1.60 (0.91–2.80)	**1.91 (1.01–3.64)**	1.65 (0.96–2.84)	1.74 (0.95–3.16)	1.68 (0.99–2.86)

*Adjusted for age at baseline and calendar year.
†Reference category is no use of the drug in question.
‡Numbers in bold indicate $p \leq 0.05$.

unprotected, and did not distinguish drug used situationally with casual versus regular partners. Therefore, we cannot establish with certainty that the drugs associated with casual partner UAI were actually used with casual partners. Similarly, neither the type of UAI occurring when drugs were used nor the combinations of drugs used during UAI can be definitively determined. A consequence of this limitation is an inability to adjust for potential confounding effects of polydrug use. However, in an exploratory subanalysis, we found that the association of UAI with casual partners and use of ecstasy could be confounded by use of crystal methamphetamine. There is a possibility that significant results could have occurred by chance given the multiple comparisons performed; therefore, specific results should be interpreted with caution and are best viewed as hypothesis-generating. Clearly, our results indicate the need for future studies to examine specific contexts of the drug–sex relationship. Finally, the results from the current study of a stable cohort of young HIV-seronegative MSM may not generalize to older or HIV-seropositive MSM or to MSM who cannot be stably followed.

Despite these limitations, our large number of study visits and simultaneous measurement of both global and sexual situation-specific use of drugs permits a comparison that is rarely available. It should be noted that although the longitudinal nature of the data adds considerable strength, the multiple stratifications and the low proportions using specific drugs during sex could place some limits on the power to detect differences in some cases. Previous studies that have examined both types of drug use measures have only examined a single substance, poppers or cocaine,[9,28] or have failed to distinguish among multiple substances. Few have examined these associations stratified by type of partner and type of intercourse. Moreover, we restricted analyses to individuals engaging in particular types of anal intercourse to assess disinhibiting effects of each substance. Most previous studies have not performed this restriction, and if specific substances influence the propensity (or ability) to adopt a particular role in intercourse, the associations reported could be confounded (exaggerated or attenuated).

In summary, we found that sexual situation-specific use of marijuana, crystal methamphetamine, ecstasy, special K, alcohol, and GHB were positively associated with UAI reported by young, HIV-seronegative MSM. The results of this study suggest that

global and situation-specific measures of substance use yield similar associations with any UAI, although situation-specific use measures are associated more strongly. Our study is 1 of the first to demonstrate the merit in analyzing situation-specific drug use within the context of casual versus regular partnerships and in terms of IUAI versus RUAI. Further delineation of complex pathways of drug use in relation to sexual behaviors related to acquisition and transmission of HIV among MSM requires a fuller understanding of the contexts of drug use, sexual partnerships, and anal intercourse role.

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