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High Prevalence of Substance Use Among Men Who have Sex with Men in Buenos Aires, Argentina: Implications for HIV Risk Behavior

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Abstract Five hundred gay and other men who have sex with men (G&MSM) from Buenos Aires, Argentina completed an assessment regarding substance use and sexual behavior. During the past 2 months, 78 % of participants consumed alcohol and 61 % drugs. Over 20 % of participants reporting alcohol, marijuana, cocaine sulfate, or tranquilizer use, did so daily. Heavy alcohol use was more likely among participants with greater mood reactivity (AOR = 1.64) and less likely among those who identified as gay (AOR = 0.38). Weekly drug use was less likely among older (AOR = 0.98), and gay-identified participants (AOR = 0.50), but more likely among participants with greater mood reactivity (AOR = 1.49). Drug use was correlated with unprotected anal and vaginal intercourse with men, women, and transvestites among non-gay identified participants ($r = 0.22$). Findings highlight the need to reduce substance use and sexual risk behavior in this population.

Resumen Quinientos hombres gay y otros hombre que tienen sexo con hombres (G&HSH) de Buenos Aires, Argentina, completaron un cuestionario sobre consumo de sustancias y comportamiento sexual. Durante los últimos dos meses, 78 % de participantes consumieron alcohol y 61 % drogas. Mas del 20 % de los participantes que reportaron usar alcohol, marihuana, pasta base o tranquilizantes, lo hizo diariamente. El consumo excesivo de alcohol fue mas probable entre participantes con mas reactividad en el estado de ánimo (AOR = 1.64) y menos probable entre los que se identifican como gay (AOR = 0.38). El uso semanal de drogas fue menos probable entre participantes mayores (AOR = 0.98), y los que se identifican como gay (AOR = 0.50) pero mas probable entre los que tienen mas reactividad en el estado de ánimo (AOR = 1.49). El uso de drogas se correlacionó con las relaciones sexuales anales y vaginales no protegidas con hombres, mujeres y travestis entre los participantes no identificados como gay (r = 0.22). Los hallazgos del estudio resaltan la necesidad de reducir el uso de sustancias y las prácticas sexuales de riesgo en esta población.

Keywords Gay men · Drug use · Alcohol use · Latin America

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Introduction

Numerous epidemiological studies in the United States have found that rates of alcohol and drug use among gay and bisexual men are higher than in the general population [1–7]. For example, results from the National Epidemiologic Survey on Alcohol and Related Conditions (N = 34,653) estimate that among gay-identified men (N = 190), approximately 18 % engaged in heavy alcohol use, 25 % used marijuana, and 17 % used other drugs during the past 12 months; 17 % met criteria for alcohol dependence. The figures were similar among bisexually identified men (N = 90), with the exception of marijuana use, which was half the rate presented above [6]. The Urban Men's Study, which used stratified probability sampling to recruit 2,172 gay and other men who have sex

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with men (G&MSM) from four major US cities in 1996–1998 found that, during the past 6 months, 88 % of participants consumed alcohol, 42 % marijuana, 20 % poppers (amyl nitrates), and 15 % cocaine; use of ecstasy, speed, and barbiturates was reported by approximately 10 % of respondents, while less than 5 % reported using crack, psychedelics, and opiates [7]. The Explore study, which recruited 4,295 HIV-negative G&MSM from five major US cities from 1999 to 2000 for a behavioral HIV risk-reduction intervention, found that among their sample, use of alcohol, marijuana, cocaine, amphetamines, and heroin was similar to the Urban Men's Study results, but the percent of respondents reporting use of poppers (37 %) and hallucinogens (24 %) was higher [1]. These findings are concerning due to the effects of substance use on the physical and mental health of G&MSM and the well-established association between substance use and HIV risk behavior [1, 2, 8–15]. In fact, rates of substance use are greater in high risk groups of G&MSM, such as men who engage in bareback sex [16, 17].

Much of the literature on substance use among G&MSM has focused on the US and other Western countries. However, the limited research available on substance use among G&MSM in South Africa and Asian countries is showing interesting differences across countries. Lane et al. [18], found that three-fourths of the G&MSM in the Soweto Men's Study reported heavy drinking and one-fourth used marijuana, but use of substances such as cocaine, ecstasy, heroin, methamphetamine, and GHB (Gamma-Hydroxybutyric acid) was reported by very few participants. Studies in Asian countries [19–21] have found low levels (0.7–2.0 %) of drug use, although alcohol use was higher (42–70 %), with one study from Thailand [17] reporting that 63 % of participants met criteria for binge drinking (5 + drinks at one sitting) during the previous 3 months. However, a recent survey of Taiwanese G&MSM who use the Internet to seek sexual partners found that 16 % of their participants had used at least one type of recreational drug during the past 6 months, although the types of substances used were not reported [22]. These studies point to clear national differences among G&MSM in terms of patterns of alcohol and drug use, whether by preference or availability.

There are no published studies to date that present an overview of the prevalence of alcohol and drug use, types of drugs used, patterns of use, or predictors of substance use among G&MSM in Latin America. The limited data available comes from studies focused on HIV risk behavior which have included an assessment of alcohol and drug use to explore the relationship between substance use and HIV risk behavior. In general, these studies have found that alcohol and drug use increases the probability of HIV risk behavior and infection [23, 24]. For example, in a study of G&MSM in seven Latin American countries, using marijuana, cocaine, heroin, and injecting drugs was found to be associated with HIV infection [23]. A follow-up study which compared predictors of HIV infection across the seven countries found that drug use was a significant predictor of HIV infection among MSM in Paraguay, Uruguay, and Bolivia, but not among MSM in Colombia, Ecuador, Peru, or Argentina [24].

In Argentina, where a literature on HIV and G&MSM is building, data on substance use among this population remains limited. In the largest study of G&MSM in Buenos Aires to date, Pando et al. [25], found that 41.4 % of respondents reported not drinking currently, 43.2 % reported drinking less than once per week, and 15.4 % more than 2–7 times per week. In terms of drug use, 18.2 % of the participants reported lifetime drug use, 16.3 % reported marijuana use, and 6.5 % reported lifetime cocaine use. In this study, cocaine use, but not overall drug use, was a predictor of HIV infection, although a cohort study of G&MSM in Buenos Aires did not find that cocaine or marijuana were risk factors for HIV infection [26]. These studies, however, used convenience samples composed predominantly of middle and upper-middle class, gay-identified men with high educational levels, which is not representative of the G&MSM population of the Greater Buenos Aires area. Furthermore, the studies explored the use of only alcohol, marijuana, cocaine, and injecting drug use. An in-depth nationally representative study of prevalence of alcohol and drug use [27] that is conducted bi-annually in Argentina (N = 12,589 in 2010 study) does not inquire about the sexual orientation of the respondent, impeding the ability to compare rates of substance use between sexual minority men and women and their heterosexual counterparts.

Understanding patterns of alcohol and drug use among G&MSM in Argentina is important in order to assess the need for prevention and treatment programs aimed at this population. Furthermore, if the association between substance use and HIV risk behavior seen in other countries is replicated in Argentina, programs addressing this association will be essential, especially given both the high HIV prevalence of 17 % (31 % in men who only have sex with men) and incidence of 4.53/100 person-year (5.60/100 person-year in men who only have sex with men) in this population [28].

This paper aims to address this gap in the literature by presenting data on the epidemiology of substance use among G&MSM in the greater Buenos Aires area as well as how substance use in this population is related to HIV sexual risk behavior.

Methods

This research study received approval from the Institutional Review Board of the New York State Psychiatric

Institute in the US and the Independent Ethics Committee of the School of Medicine at the University of Buenos Aires, in Argentina. Written consent was obtained from all participants prior to enrollment in the study.

Data Collection

For a detailed discussion of the formative qualitative work that preceded data collection and details regarding the use of Respondent Driven Sampling (RDS) [29, 30] in this study, such as how the network size of participants was assessed, recruitment yields by seed, and weighting process for the data, we refer the reader to Carballo-Dieguez et al. [31].

To be eligible for the study, potential participants needed to identify as a man, be 18 years of age or older, have had sex with another man or a male-to-female (MTF) transvestite (transvestite rather than transgender is the term used in Buenos Aires; the category includes both pre- and postoperative individuals) in the prior 6 months, have had sex at least 10 times with a man or MTF transvestite in his lifetime, reside in the Buenos Aires metropolitan area, have a recruitment coupon received from a prior participant (except for seeds), and agree to provide a blood sample for HIV and STI testing. Participants were given a monetary incentive equivalent to US$20 (which was equivalent to the cost of 5 movie tickets in Buenos Aires) for completing the study procedures and US$5 for each person they referred that qualified for the study.

During recruitment, 16 seed were enrolled and given three coupons to recruit fellow participants. Seven of these seeds did not recruit any participants and four recruited only one. At the end of recruitment, 89 % of the participants could be traced back to a single seed after 22 waves of referrals. Participant's personal network size ranged from 1 to 50, with a median of 3. Since a primary aim of the study was to estimate HIV prevalence, homophily was assessed based on HIV status and was relatively high (.44 among HIV+ and .36 among HIV−).

Participants

Participants in this study were mostly young, with almost half under the age of 25 and approximately 90 % under the age of 45. Over three-fourths were single and two-thirds had not completed high school. Almost two-thirds were unemployed or temporarily employed, and three-fourths earned less than $1000 Argentine pesos per month (approximately US$350), which would be considered low income. When asked to select the word they used to describe their sexual identity, 123 (24.5 %) identified as gay, 181 (36.2 %) identified as bisexual, 109 (21.9 %) as heterosexual, and 87 (17.4 %) as "Other" (i.e. "macho," "passive," "man"). Further details regarding the differences in demographic characteristics across the classifications of sexual identity are provided in Carballo-Dieguez et al. [31].

Instruments

Participants completed a Web-based survey lasting approximately 60–75 min. Participants unable to use the computer received help from a research assistant who read the questions verbatim and entered the responses. The survey inquired about demographic characteristics, sexual orientation, sexual behavior with men, women, and male-to-female (MTF) transvestites over the past 2 months, childhood sexual experiences before the age of 13 with a partner that was at least 4 years older, substance use, and mood.

For the alcohol and drug use assessment, participants were presented with a list of different substances one-by-one, beginning with alcohol. If the participant indicated ever using a particular substance, a Likert-type item was then asked regarding the frequency of use in the past 2 months, with possible answers ranging from 0 (Never/None) to 6 (More than once a day). Only for alcohol were participants asked about their typical level of intoxication when drinking. Possible answers to this question included 0 ("Too little to feel any effect"), 1 ("Enough to feel it a little"), 2 ("Enough to feel it a lot"), 3 ("Enough to get drunk"), and 4 ("Enough to feel like you might pass out"). Heavy alcohol use was defined as drinking once per week or more and usually to the point of feeling it a lot, getting drunk, or feeling like they might pass out. Heavy drug use was defined as using an illicit drug once per week or more.

To assess mood, we used the Mood Survey [32] which has two subscales, Mood Level and Mood Reactivity. The former assesses a respondent typical mood, such as happy, sad, or somber. The latter assesses the intensity and frequency with which a respondent reacts to a mood experience. Reliability analyses were conducted on the mood subscales. Two original items from the Level score and 1 item from the Reactivity score were removed due to low correlations with the rest of the scale. The alphas remained modest for both subscales: .689 for the 7-item Level scale and .668 for the 8-item Reactivity scale.

Statistical Analyses

Data were weighted prior to analyses using SPSS. Weights were calculated as the inverse of the participant's personal network size (PNS). This value was then multiplied by the sample size (N) divided by the sum of weights (Σw). The weighting formula is then:

$$(1/\mathrm{PNS}) * (\mathrm{N}/\Sigma \mathrm{w})$$

This formula is based on the RDS II estimator [33] and produces results that reflect the original sample size of 500. One limitation of these analyses may be the sample size. The original sample size of 500 was proposed based on power analyses specifying a design effect of 2.0. However, it has been suggested that, in some simulations, RDS may require a design effect of 10 or higher [34], so caution should be used in interpreting these findings as the true population values. In addition, weighting data based on a single network size value, may not achieve unbiased estimates. As an RDS study, all results presented in the tables are based on weighted data. However, in order to identify findings that were affected by data weighting, all statistical comparisons were repeated using unweighted data, and any differences are reported in the results.

Logistic regression analyses were used to predict heavy alcohol and drug use. Simple logistic regressions, one for each independent variable, were conducted followed by multiple logistic regressions with all independent variables in the regression model simultaneously. Descriptive data for sexual behaviors and the correlations between those sexual behaviors and substance use were calculated separately for gay and non-gay identified men. Since sexual behavior frequencies typically had a skewed distribution, log-transformed variables were used for the correlations.

Results

Prevalence and Predictors of Substance Use

Alcohol Use

As per Fig. 1, over 75 % of participants consumed alcohol during their lifetime and during the past 2 months. In results not displayed in the figure, a total of 121 participants (32 % of those who drank in the last 2 months, and 25 % of the entire sample) were considered to be heavy drinkers. As per Table 1, simple regression analyses revealed that heavy alcohol use was less likely among participants who were employed (AOR = 0.82; 95 % CI 0.67–1.00) and those who identified as gay (AOR = 0.32; 95 % CI 0.18–0.58) and more likely among those with greater mood reactivity (AOR = 1.53; 95 % CI 1.21–1.95). Multiple regression analyses revealed that heavy drinking was more likely among participants with greater mood reactivity (AOR = 1.64; 95 % CI 1.25, 2.16), and less likely among those who identified as gay (AOR = 0.38; 95 % CI 0.20, 0.73).

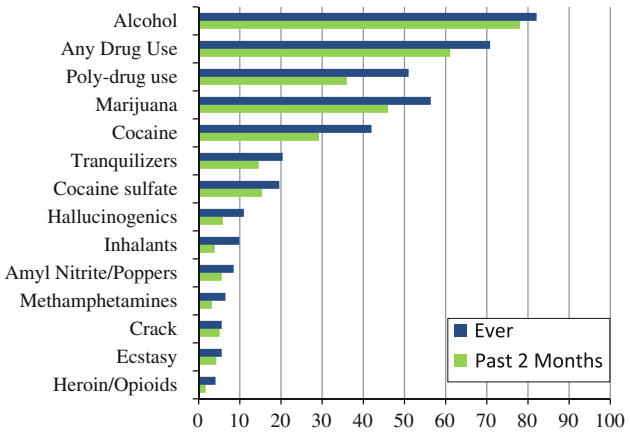

Fig. 1 Prevalence (%) of substance use among G&MSM in Buenos Aires, Argentina

Table 1 Predictors of heavy substance use

Predictor	Simple logistic regressions[a]		Multiple logistic regression[b]	
	OR	95 % CI	AOR	95 % CI
Heavy alcohol use[c]				
Age	1.00	0.98–1.02	1.01	0.99–1.03
Education	0.82*	0.67–1.00	0.92	0.73–1.17
Employed	0.90	0.59–1.36	0.91	0.58–1.43
Mood reactivity	1.53***	1.21–1.95	1.64***	1.25–2.16
Mood level	0.94	0.74–1.18	1.08	0.82–1.41
Age-discordant childhood sexual experience	0.67	0.38–1.18	0.65	0.35–1.19
Tested HIV+ prior to study	0.43	0.18–1.01	0.44	0.18–1.10
Gay sexual identity	0.32***	0.18–0.58	0.38**	0.20–0.73
Drug use 1+ times/week				
Age	0.97***	0.95–0.98	0.98*	0.96–1.00
Education	0.72***	0.60–0.86	0.87	0.71–1.08
Employed	0.69*	0.48–0.99	0.86	0.57–1.28
Mood reactivity	1.55***	1.26–1.92	1.49***	1.18–1.87
Mood level	0.72**	0.59–0.89	0.87	0.69–1.09
Age-discordant childhood sexual experience	0.98	0.62–1.56	0.93	0.56–1.55
Tested HIV+ prior to study	0.50*	0.26–0.98	0.78	0.37–1.63
Gay sexual identity	0.28***		0.38***	0.21–0.63

OR odds ratio, *CI* confidence interval, *AOR* adjusted odds ratio

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$

[a] Simple regressions show statistics with only 1 predictor in the regression

[b] For multiple regressions, all variables for multiple regressions are in the model simultaneously

[c] Heavy alcohol use = drinking once per week or more and usually to the point of "feeling it a lot", "getting drunk", or "passing out"

Drug Use

As per Fig. 1, well over half the participants reported using drugs and approximately 40 % reported poly-drug use. Marijuana and cocaine were the most frequently used drugs, with approximately half the participants reporting marijuana use over their lifetime and over the past 2 months, while approximately 40 % reported ever using cocaine and 30 % reported using it during the past 2 months. Use of cocaine sulfate (known in Argentina as *pasta base*) and tranquilizers was reported by a significant portion of respondents, with approximately 20 % of participants using them during their lifetime and 15 % using them over the past 2 months. Each of the other substances assessed were used by less than 5 % of participants. As Fig. 2 demonstrates, the rate of use for the most frequently used substances was high: 60 % of respondents who reported using alcohol and marijuana did so at least weekly, as did approximately 45 % of those who reported using cocaine sulfate, tranquilizers, and cocaine. Over 20 % of participants who reported using alcohol, marijuana, cocaine sulfate, or tranquilizers, did so once or more per day.

As seen in Table 1, simple regression analyses revealed that heavy drug use was less likely among participants who were older (AOR = 0.97; 95 % CI 0.95, 0.98), had higher levels of education (AOR = 0.72; 95 % CI 0.60, 0.86), were employed (AOR = 0.69; 95 % CI 0.48, 0.99), had higher mood level (AOR = 0.72; 95 % CI 0.59, 0.89), were HIV positive (AOR = 0.50; 95 %

CI 0.26, 0.98), and identified as gay (AOR = 0.28; 95 % CI 0.17, 0.45). Participants with greater mood reactivity were more likely to engage in heavy drug use (AOR = 1.55; 95 % CI 1.26, 1.92). In multivariate analyses, heavy drug use was less likely among participants who were older (AOR = 0.98; 95 % CI 0.96, 1.00), and

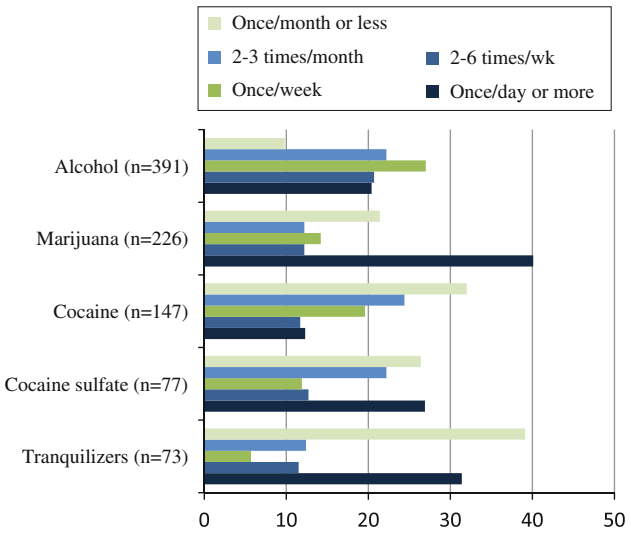

Fig. 2 Frequency of substance use in past 2 months among G&MSM in Buenos Aires, Argentina

those that identified as gay (AOR = 0.50; 95 % CI 0.26, 0.98), and more likely among participants with greater mood reactivity (AOR = 1.49; 95 % CI 0.69, 1.09).

Sexual Risk Behavior and Substance Use

Because the regression analyses showed that non gay-identified men were more likely to engage in heavy alcohol and drug use than gay identified men, we used this dichotomy to compare participants in terms of their sexual risk behavior and its relation to their substance use.

Sexual Risk Behavior

As presented in Table 2, this is a sample with high rates of sexual risk behavior across partner types. Gay-identified

Table 2 Sexual risk behavior in past 2 months by sexual identity

Sexual risk behavior	N[a]	%[b]	Mean[c]	SD	Range
Gay identified men					
# of oral, vaginal, or anal sex partners	122	N/A	6.72	12.16	0–200
Frequency of UAI or UVI with men, women, or transvestites	123	N/A	7.43	19.46	0–200
Receptive UAI with men	118	48	3.89	10.24	0–100
Insertive UAI with men	117	51	3.71	11.64	0–100
UVI	5	75	1.68	1.66	0–4
UAI with a woman	5	47	0.47	0.56	0–1
Receptive UAI with transvestites	11	17	0.17	0.39	0–1
Insertive UAI with transvestites	11	34	0.51	0.91	0–3
Non gay identified men					
# of oral, vaginal, or anal sex partners	375	N/A	11.45	17.82	0–275
Frequency of UAI or UVI with men, women, or transvestites	371	N/A	5.28	10.21	0–92
Receptive UAI with men	309	11	0.53	3.43	0–60
Insertive UAI with men	308	41	1.58	4.66	0–50
UVI	305	61	2.25	5.92	0–92
UAI with a woman	302	48	1.41	3.34	0–40
Receptive UAI with transvestites	207	7	0.15	0.70	0–7
Insertive UAI with transvestites	206	35	0.81	1.97	0–15

UAI unprotected anal intercourse, *UVI* unprotected vaginal intercourse

[a] N is the number of men who engaged in the specified behavior

[b] % is the percentage of men with that partner type that report engaging in the specified behavior

[c] M is the mean number of partners or occasions of a sexual risk behavior

participants had a mean of seven (*SD* 12.16) sexual partners during the past 2 months, with approximately seven (*SD* 19.46) occasions of unprotected anal intercourse (UAI) or unprotected vaginal intercourse (UVI). Among the participants who reported having sex with a man in the past 2 months, 48 % reported engaging in UAI. Only five gay-identified participants reported engaging in sex with women, and eleven with transvestites, during the past 2 months. But, over half reported engaging in UAI or UVI with their female sex partners, while approximately one-third reported engaging in insertive UAI and almost one-fifth engaged in receptive UAI with a transvestite.

Participants who were not gay-identified had, on average, eleven sexual partners (*SD* 17.82), with five occasions (*SD* 5.21) of UAI or UVI over the past 2 months. A much greater percentage of these men engaged in insertive, versus receptive, UAI with other men during the past 2 months. Approximately half engaged in UAI or UVI with a woman during this time frame, while a third engaged in insertive UAI with a transvestite. Few engaged in receptive UAI with a transvestite.

Sexual Risk Behavior and Substance Use

Table 3 presents correlations between frequency of alcohol and drug use and frequency of specific sexual risk behaviors among participants who reported engaging in sex with a particular type of partner (i.e. men, women, transvestites). Among gay identified men, frequency of alcohol or drug use was not related to sexual risk behavior. Among non-gay identified men, lower alcohol use was correlated to greater frequency of receptive UAI with men ($r = -0.18$; $p \leq .01$) and with transvestites ($r = -0.24$; $p \leq .01$). Also among these non-gay identified men, higher frequency of drug use was related to more sex partners ($r = 0.11$; $p \leq .05$), and higher frequency of UAI and UVI, including higher frequency of insertive UAI with men ($r = 0.12$; $p \leq .05$), insertive UAI and UVI with women ($r = 0.18$; $p \leq .01$ and $r = 0.24$; $p \leq .01$, respectively), and insertive UAI with transvestites ($r = 0.15$; $p \leq .05$).

Unweighted Results Unweighted results were compared to the weighted values reported in Tables 1 and 3. Overall, the pattern of significant results was similar, but there were a few differences. In Table 1, regarding heavy alcohol use, having tested positive prior to the study is significantly associated ($p = .023$) in the unweighted simple logistic regression. Regarding drug use, two significant associations become non-significant when the data are not weighted: prior HIV+ test in the unweighted simple logistic regression and age in the multiple logistic regression. In Table 3, three non-significant correlations become significant when using unweighted data. Among gay participants, alcohol use is significantly correlated with frequency of UAI or UVI ($r = .187$, $p = .027$), receptive UAI ($r = .182$, $p = .036$), and insertive UAI ($r = .223$, $p = .010$).

Discussion

This study, the broadest assessment of substance use among G&MSM conducted to date in the greater Buenos Aires, Argentina area, presents a worrisome picture, with high rates of alcohol and drug use among this population. Findings that a third of the G&MSM who drink do so

Table 3 Correlation between sexual behavior and frequency of substance use, past 2 months

Sexual risk behavior	Alcohol use				Drug use			
	Gay		Non-gay		Gay		Non-gay	
	N[a]	*r*	N	*r*	N	*r*	N	*r*
# of oral, vaginal, or anal sex partners	120	.15	350	−.06	120	.18	363	.11*
Frequency of UAI or UVI with men, women, and transvestites	120	.13	345	.04	120	−.07	358	.22**
Receptive UAI with man	118	.14	296	−.18**	118	−.11	308	−.03
Insertive UAI with man	117	.17	294	−.01	117	−.04	307	.12*
UVI with a woman	5	−.50	294	.07	5	−.45	304	.24**
UAI with a woman	5	.18	291	.08	5	.50	301	.18**
Receptive UAI with a transvestites	11	−.17	196	−.24**	11	.00	207	.03
Insertive UAI with a transvestites	11	−.25	197	−.01	11	.20	206	.15*

UAI unprotected anal intercourse, *UVI* unprotected vaginal intercourse

* $p \leq .05$

** $p \leq .01$

[a] N is the number of participants that reported that type of sexual partners in the past 2 months

excessively and 40 % are poly-drug users are concerning. Use of marijuana, cocaine, cocaine sulfate, and tranquilizers is not only prevalent, but also frequent among those who use them, suggesting possible dependence and increased potential for physical and mental health sequelae. The rates of drug use found in this study are generally comparable to those found in the same population in the US [1, 7, 8] but much higher than those found in G&MSM populations in developing countries [18–22].

The nationally representative study on substance use conducted biannually in Argentina [27] showed that lifetime prevalence of alcohol, marijuana, and cocaine among 18–49 year olds (the ages encompassing more than 90 % of our participants) was approximately 80, 14, and 5 % respectively, while past year use was approximately 66, 6, and 2 %. Lifetime use of cocaine sulfate, crack, heroin, ecstasy, hallucinogenics, tranquilizers, and inhalants, was reported by less than 4 % of respondents and past year use was less than 2 %.While the findings from this study are not directly comparable to those of the national study in Argentina, our findings suggest that rates of alcohol and drug use among G&MSM are much higher than among the general Argentine population.

Higher rates of substance use and other mental health disorders among sexual minority men have often been attributed to being part of a stigmatized, minority group which results in increased stress [6, 35–38] as well as community socialization in settings such as gay bars which facilitate alcohol and, possibly, drug consumption [9]. Our findings that heavy alcohol and drug use was higher among the participants who were not gay-identified replicate findings from another recent study in Latin America [39]. There might be numerous reasons for this difference. First, the higher rates of alcohol and drug use among this subpopulation may be related to coping with internalized homophobia regarding same sex attraction or behavior. There might also be an underlying sensation seeking trait that may account for non-gay identified men having occasional sex with men or transvestites as well as frequently using alcohol or drugs, independently of internal conflict regarding same sex attraction or behavior. These factors have been found to be related to increased alcohol and drug use among Latino MSM in the US [2].

In general, these results clearly highlight the need for substance abuse prevention and treatment programs targeting and tailored to G&MSM, who may be hesitant to access treatment programs due to fears of discrimination or not being understood [40–42] and who fare better in treatments tailored to them [43].

Findings regarding the association between substance use and sexual risk behavior were surprising in a number of ways given results from previous studies which have found the two to be associated. Among the unexpected findings was that increased alcohol and drug use was not associated with increased sexual risk behavior among the gay-identified participants. Thus, in this sample, while the majority of the gay-identified participants reported engaging in UAI, it does not appear to be facilitated by alcohol or drug use. However, given that knowledge of being HIV positive was associated with lower alcohol and drug use, this finding may also be attributed to the higher rates of HIV infection in the gay-identified men.

Also striking were findings regarding the non-gay identified men, including the inverse relationship between alcohol use and receptive UAI with men or transvestites. These findings have to be considered cautiously as only 11 % of the non-gay identified men reported engaging in receptive UAI with another man, and 7 % reported doing so with a transvestite. Further exploration into these findings revealed that although few non-gay identified participants engaged in receptive UAI with male or transvestite partners and if they did, it was infrequent, there was a subset of participants who reported frequent receptive AI with male and transvestite partners, including some who appeared to have a regular partner with whom they engaged in this practice. These participants also reported very little alcohol use. Thus, it appears that while alcohol use can disinhibit non-gay identified men to occasionally engage in receptive AI with men or transvestites, there is a subset of these men for whom this behavior is part of their sexual repertoire and does not require substance use related disinhibition, especially if the male or transvestite partner is a regular partner. Thus, our approach to analyzing this data, which explored overall substance use and sexual behavior among the sample versus individual differences may have also contributed to this finding.

More expected was the finding that frequency of drug use was associated to increased sexual risk behavior among men who do not identify as gay. Among these men, the drugs may produce a disinhibitory effect that facilitates sexual encounters with other men or transvestites, especially in the context of homophobia. That the association between drug use and UVI and UAI was strongest with female partners is concerning. Given the low prevalence of HIV among the general population in Argentina, which is currently at 0.4 % [44] these men may not perceive sex with women as putting them at risk of HIV infection, which may result in more infrequent use of condoms for sex, especially if the partner is practicing another method of birth control. But, with HIV prevalence among this subgroup of participants at approximately 12 % [28], they can act as a bridge between MSM and the general population [45, 46].

While this study provides the most comprehensive assessment of substance use and its relation to sexual risk behavior among G&MSM in Argentina, there are a number of

limitations that must be considered. First, although RDS minimizes some of the biases present in other recruitment methodologies used to recruit G&MSM, we cannot be assured that this is a representative sample of G&MSM in Buenos Aires. Second, our general approach to assessing the relationship between substance use and sexual risk behavior may obscure associations that may be found if we had assessed the relationship through other means that explored the temporal relationship between substance use and sexual risk behavior. Lastly, it must also be considered that the data presented are based on self-report and subject to recall and social desirability biases as well as dependent on the accurate reporting of the participant. Nonetheless, we believe the findings significantly contribute to understanding the epidemiology of substance use among G&MSM in Buenos Aires as well as to how substance use relates to sexual risk behavior in this population. And, we believe the findings begin to address the gaps in knowledge of substance use among G&MSM in Latin America.

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References

1. Colfax G, Vittinghoff E, Husnik MJ, et al. Substance use and sexual risk: a participant and episode-level analysis among a cohort of men who have sex with men. Am J Epidemiol. 2004;159(10):1002–12.
2. Dolezal C, Carballo-Diéguez A, Nieves-Rosa LE, Diaz F. Substance use and sexual risk behavior: understanding their association among four ethnic groups of Latino men who have sex with men. J Subst Abuse. 2000;11(4):323–36.
3. Drabble L, Midanik LT, Trocki K. Reports of alcohol consumption and alcohol-related problems among homosexual, bisexual and heterosexual respondents: results from the 2000 National Alcohol Survey. J Stud Alcohol. 2005;66(1):111–20.
4. Gilman SE, Cochran SD, Mays VM, Hughes M, Ostrow D, Kessler RC. Risk of psychiatric disorders among individuals reporting same-sex sexual partners in the national comorbidity survey. Am J Public Health. 2001;91(6):933–9.
5. King M, Semlyen J, Tai SS, et al. A systematic review of mental disorder, suicide, and deliberate self-harm in lesbian, gay and bisexual people. BMC Psychiatry. 2008;8:70. doi:10.1186/1471-244X-8-70.
6. McCabe SE, Hughes TL, Bostwick WB, West BT, Boyd CJ. Sexual orientation, substance use behaviors and substance dependence in the United States. Addiction. 2009;104(8):1333–45.
7. Stall R, Paul JP, Greenwood G, et al. Alcohol use, drug use and alcohol-related problems among men who have sex with men: the urban men's health study. Addiction. 2001;96(11):1589–601.
8. Mansergh G, Flores S, Koblin B, et al. Alcohol and drug use in the context of anal sex and other factors associated with sexually transmitted infections: results from a multi-city study of high-risk men who have sex with men in the USA. Sex Transm Infect. 2008;84(6):509–11.
9. Stall R, Purcell DW. Intertwining epidemics: a review of research on substance use among men who have sex with men and its connection to the AIDS epidemic. AIDS Behav. 2000;4(2):181–91.
10. Vanable PA, McKirnan DJ, Buchbinder SP, et al. Alcohol use and high-risk sexual behavior among men who have sex with men: the effects of consumption level and partner type. Health Psychol. 2004;23(5):525–32.
11. Woolf SE, Maisto SA. Alcohol use and risk of HIV infection among men who have sex with men. AIDS Behav. 2009;13(4):757–82.
12. Elkstrand ML, Stall RD, Paul JP, Osmond DH, Coates TJ. Gay men report high rates of unprotected anal sex with partners of unknown or discordant HIV status. AIDS. 1999;13(12):1525–33.
13. Koblin BA, Chesney MA, Husnik MJ, et al. High-risk behaviors among men who have sex with men in 6 US cities: baseline data from the EXPLORE study. Am J Public Health. 2003;93(6):926–32.
14. Ross MW, Simon Rosser BR, Bauer GR, et al. Drug use, unsafe sexual behavior, and internalized homonegativity in men who have sex with men. AIDS Behav. 2001;5(1):97–103.
15. Woody GE, Donnell D, Seage GR, et al. Non-injection substance use correlates with risky sex among men having sex with men: data from HIVNET. Drug Alcohol Depend. 1999;53(3):197–205.
16. Klein H. Substance use and abuse among men using the Internet specifically to find partners for unprotected sex. J Psychoact Drugs. 2011;43(2):89–98.
17. Halkitis PN, Parsons JT, Wilton L. Barebacking among gay and bisexual men in New York City: explanations for the emergence of intentional unsafe behavior. Arch Sex Behav. 2003;32(4):351–7.
18. Lane T, Raymond HF, Dladla S, et al. High HIV prevalence among men who have sex with men in Soweto, South Africa: results from the Soweto men's study. AIDS Behav. 2011;15(3):626–34.
19. Nguyen TA, Nguyen HT, Le GT, Detels R. Prevalence and risk factors associated with HIV infection among men having sex with men in Ho Chi Minh City, Vietnam. AIDS Behav. 2008;12(3):476–82.
20. Ruan Y, Luo F, Jia Y, et al. Risk factors for syphilis and prevalence of HIV, hepatitis B and C among men who have sex with men in Beijing, China: implications for HIV prevention. AIDS Behav. 2009;13(4):663–70.
21. Mansergh G, Naorat S, Jommaroeng R, et al. Inconsistent condom use with steady and casual partners and associated factors among sexually-active men who have sex with men in Bangkok, Thailand. AIDS Behav. 2006;10(6):743–51.
22. Ko NY, Koe S, Lee HC, Yen CF, Ko WC, Hsu ST (2012) Online sex-seeking, substance use, and risky behaviors in Taiwan: results from the 2010 Asia Internet MSM sex survey. Arch Sex Behav (Epub ahead of publication). doi:10.1007/s10508-012-9908-8.
23. Montano SM, Sanchez JL, Laguna-Torres A, et al. Prevalences, genotypes, and risk factors for HIV transmission in South America. J Acquir Immune Defic Syndr. 2005;40(1):57–64.
24. Bautista CT, Sanchez JL, Montano SM, et al. Seroprevalence of and risk factors for HIV-1 infection among South American men who have sex with men. Sex Transm Infect. 2004;80(6):498–504.
25. Pando MA, Maulen S, Weissenbacher M, et al. High human immunodeficiency virus type 1 seroprevalence in men who have sex with men in Buenos Aires, Argentina: risk factors for infection. Int J Epidemiol. 2003;32(5):735–40.

26. Segura M, Sosa Estani S, Marone R, et al. Buenos Aires cohort of men who have sex with men: prevalence, incidence, risk factors and molecular genotyping of HIV-1. AIDS Res Hum Retroviruses. 2007;23(11):1322–9.
27. Secretaria de Programación para la Prevención de la Drogadicción y la Lucha Contra el Narcotráfico y Observatorio Argentino de Drogas. Estudio nacional en población de 12 a 65 años sobre consumo de sustancias psicoactivas. Buenos Aires, Argentina (2010) 102 p. Available from: http://www.observatorio.gov.ar/investigaciones/Estudio_Nacional_sobre_consumo_en_poblacion_general-Argentina2010.pdf.
28. Pando MA, Balán IC, Marone R, et al. HIV and other sexually transmitted infections among men who have sex with men (MSM) recruited by respondent driven sampling (RDS) in Buenos Aires, Argentina: high HIV and HPV infection. PLoS ONE. 2012;7(6):1–8.
29. Heckathorn D. Respondent-driven sampling: a new approach to the study of hidden populations. Soc Probl. 1997;44(2):174–99.
30. Heckathorn D. Respondent-driven sampling II: deriving valid population estimates from chain-referral samples of hidden populations. Soc Probl. 2002;49(1):11–34.
31. Carballo-Diéguez A, Balán I, Marone R, et al. Use of respondent driven sampling (RDS) generates a highly diverse sample of men who have sex with men MSM in Buenos Aires, Argentina. PLoS ONE. 2011;21(6):1–8.
32. Underwood B, Froming WJ. The mood survey: a personality measure of happy and sad moods. J Pers Assess. 1980;44(4):404–14.
33. Volz E, Heckathorn DD. Probability based estimation theory for respondent driven sampling. J Off Stat. 2008;24(1):79–97.
34. Salganik MJ. Variance estimation, design effects, and sample size calculations for respondent-driven sampling. J Urban Health. 2006;83(S1):98–112.
35. Cochran SD, Mays VM. Relation between psychiatric syndromes and behaviorally defined sexual orientation in a sample of the US population. Am J Epidemiol. 2000;151:516–23.
36. Mays VM, Cochran SD. Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. Am J Public Health. 2001;91:1869–76.
37. Meyer IH. Minority stress and mental health in gay men. J Health Soc Behav. 1995;36:38–56.
38. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. Psychol Bull. 2003;129:674–97.
39. Kim EJ, Creswell J, GuardadoME et al (2012) Correlates of bisexual behaviors among men who have sex with men in El Salvador. AIDS Behav (Epub ahead of publication). doi: 10.1007/s10461-012-0152-y.
40. Cochran BN, Peavy KM, Cauce AM. Substance abuse treatment providers' explicit and implicit attitudes regarding sexual minorities. J Homosexual. 2007;53(3):181–207.
41. Kaufman JS, Carlozzi AF, Boswell DL, Barnes LLB, Wheeler-Scruggs K, Levy PA. Factors influencing therapist selection among gays, lesbians and bisexuals. Couns Psychol Q. 1997;10(2):287–97.
42. Liddle BJ. Gay and lesbian clients' selection of therapists and utilization of therapy. Psychother Theory Res Pract Train. 1997;34(1):11–8.
43. Senreich E. Are specialized LGBT program components helpful for gay and bisexual men in substance abuse treatment? Subst Use Misuse. 2010;45(7–8):1077–96.
44. Dirección de SIDA e ITS del Ministerio de Salud. Boletín sobre el HIV/SIDA en la Argentina. Buenos Aires, Argentina (2011). Available from: http://www.msal.gov.ar/sida/pdf/boletines-investi-publi/boletin-epidemiologico-2011.pdf.
45. Kumta S, Lurie M, Weitzen S, et al. Bisexuality, sexual risk taking, and HIV prevalence among men who have sex with men accessing voluntary counseling and testing services in Mumbai, India. J Acquir Immune Defic Syndr. 2010;53(2):227–33.
46. Tabet SR, de Moya EA, Holmes KK, et al. Sexual behaviors and risk factors for HIV infection among men who have sex with men in the Dominican Republic. AIDS. 1996;10(2):201–6.