Addiction (2001) 96, 1589–1601

RESEARCH REPORT

Alcohol use, drug use and alcohol-related problems among men who have sex with men: the Urban Men's Health Study

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Abstract

Aims. *To measure the prevalence and independent associations of heavy and problematic use of alcohol and recreational drugs among a household-based sample of urban MSM (men who have sex with men).* **Design.** *Cross-sectional survey.* **Participants.** *Men who identified as being gay or bisexual or who reported sex with another man in the prior 5 years were included in this analysis (*n = *2172).* **Setting.** *A probability telephone sample of MSM was taken within Zip Codes of four large American cities (Chicago, Los Angeles, New York and San Francisco) estimated to have total concentrations of at least 4% of all households with one resident MSM.* **Measurements.** *Standard measures of alcohol use, problems associated with alcohol use, and recreational drug use were administered by trained telephone interviewers.* **Findings.** *Both recreational drug (52%) and alcohol use (85%) were highly prevalent among urban MSM, while current levels of multiple drug use (18%), three or more alcohol-related problems (12%), frequent drug use (19%) and heavy–frequent alcohol use (8%) were not uncommon. The associations of heavy and/or problematic substance use are complex, with independent multivariate associations found at the levels of demographics, adverse early life circumstances, current mental health status, social and sexual practices and connection to gay male culture.* **Conclusions.** *The complex pattern of associations with heavy and/or problematic substance use among urban MSM suggests that heavy and/or problematic substance use is grounded in multiple levels: the individual, the interpersonal and the socio-cultural.*

Introduction

Although the scientific literature on alcohol and drug use among men who have sex with men (MSM) has grown considerably in size over the past decade, we have much to learn about how MSM use recreational drugs, the kinds of problems that they experience with such use and the characteristics of the men who use in problematic ways. Nevertheless, sufficient commonalities exist within this literature to conclude that some

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Submitted 14th December 1999; initial review completed 21st March 2000; final version accepted 3rd May 2001.

ISSN 0965–2140 print/ISSN 1360–0443 online/01/111589–13

Carfax Publishing, Taylor & Francis Limited
DOI: 10.1080/09652140120080723

basic findings regarding drug and alcohol use within this population are rather firm.

First, data collected over the past 20 years among samples of gay and bisexual men drawn from three continents show consistently that non-intravenous drug and alcohol use are common within this population (Stall & Wiley, 1988; Bergmark, 1999; Knox *et al.*, 1999; see also Bux, 1996 and Stall & Purcell, 2000 for reviews). In addition, the existing literature provides some clues that may be helpful in constructing a profile of MSM problem drinkers or drug users. For example, heavy drinking has been related to AIDS loss (Martin *et al.*, 1989), lower self-esteem (Ghindia & Kola, 1996), negative affect and anti-gay discrimination (McKirnan & Peterson, 1989), and employment in service and sales occupations (Greenwood *et al.*, 2000). Multiple drug use has been associated with HIV seropositivity or unknown HIV serostatus (Greenwood *et al.*, 2000). Recent drug use was associated with high socio-economic status and greater gay community involvement in an Australian study (Knox *et al.*, 1999). Factors associated with both multiple drug and heavy alcohol use have included a family history of substance abuse (Ghindia & Kola, 1996), positive tension-reduction expectancies, greater gay bar attendance (McKirnan & Peterson, 1989; Greenwood *et al.*, 2000), younger age (Stall & Wiley, 1988) and multiple sex partners (Greenwood *et al.*, 2000). This set of findings supports the conclusion that a complex set of individual and cultural factors may affect problematic drug and alcohol use among MSM.

We report here data measuring alcohol use, alcohol-related problems, multiple drug use and frequent drug use from a household-based sample of MSM ($n = 2172$) who reside in four of the largest urban centers of the United States (Chicago, Los Angeles, New York and San Francisco). This paper has two primary objectives: (1) to describe the prevalence of alcohol use, drug use and alcohol-related problems among urban MSM and (2) to identify the independent associations of heavy and/or problematic levels of substance use among urban MSM.

Methods

Sample composition

The Urban Men's Health Study (UMHS) conducted a telephone survey of a stratified probability sample of men who have sex with men (MSM) drawn from selected zip codes within the city limits of San Francisco, New York, Chicago and Los Angeles (including West Hollywood and Beverly Hills). In these four cities the proportion of households with telephones is approximately 95% (US Bureau of the Census, 1997; Anderson, Nelson & Wilson, 1998). A more detailed description of the UMHS sample design has been published elsewhere (Catania *et al.*, 2001). In brief, mapping of MSM-relevant health, commercial and census data for each city resulted in estimations of MSM residential density by zip code (i.e. postal service areas identified by a five-digit number). Telephone exchanges covering the selected zip codes were identified and then stratified by estimated cost per interview (Binson *et al.*, 1996). Disproportionate sampling and adaptive sampling techniques (Hansen, Hurwitz & Meadow, 1953; Sudman, 1976; Kalton, 1993; Blair, 1999) were used to construct a random digit dial (RDD) sample for the designated areas in each city. The obtained MSM household prevalence ranged widely from a low of 1.3% to a high of 30.8%. Across all zip codes in the UMHS sample frame, 8.5% of identified households contained an MSM. Sample weights were developed to reflect probability of selection (including the disproportionate sampling approach and stratification built into the sample frame), and adjusted for non-response (of households that were called) and non-coverage (of households within the selected zip codes that were not called), while maintaining proportionality between cities based upon the estimated size of each city's MSM population.

Interviewing procedures

Prior to fielding the UMHS survey, community awareness programs were conducted in each of the four cities. Between November 1996 and February 1998 over 195 000 telephone numbers were dialed and over 63 000 households were screened successfully. Households were screened initially to determine if they were located within one of the selected zip codes and contained at least one male resident age 18 or older. An adult male informant was then used to screen the household for MSM eligibility. Any adult male who had same gender sexual contact since age 14 or who self-identified as gay or bisexual was eligible to be interviewed. For households containing more than one MSM, one eligible house-

hold member was selected randomly for the interview. From the 3700 MSM-eligible households 2881 interviews were obtained, a participation rate of 78%. Utilizing computer-assisted telephone interviewing (CATI), interviews were conducted in English and Spanish ($n = 17$) at a time of the respondent's choosing, and lasted an average of 75 minutes.

One concern with screening respondents on sexual behavior over the telephone is that of honest self-disclosure of a stigmatized behavior. To reduce self-disclosure bias in the screening interview, we used only male interviewers because men have been found to be more likely to disclose same-gender sexual behavior to male interviewers in methodological experiments (Catania *et al.*, 1996). We also instituted procedures that past experience had shown would make respondents feel more comfortable with questions of a sensitive nature (e.g. privacy and study credibility assurances; enhanced introductions).

Independent variables

We included for analysis variables from a variety of domains that were expected to be significant correlates of heavy substance use. In general, categorical variables were compressed to avoid small group sizes and/or to create more meaningful demarcations. Continuous variables were divided into categories to ease interpretation of results and to allow for possible curvilinear relationships with the dichotomous outcome variables. In the case of counts (e.g. number of partners, number of visits to a venue, etc.) categories were defined by observed breakpoints in the distribution. Scale scores (e.g. wellbeing, affiliation, etc.) were divided into quartiles. The variables are listed below by major content areas.

Demographics [city of residence, age, educational attainment, household income, race/ethnicity, and self-reported HIV status; reporting a current primary relationship with a male (defined as someone with whom they are currently in love or have a special sense of commitment, *and* with whom they have had sex in the prior 12 months)].

Early adverse life events [presence of parental drug or alcohol abuse, a pattern of parent-on-parent physical abuse before age 17, a pattern of parent-on-respondent physical abuse before age 17, experience of childhood sexual abuse; any history of harassment by age 16 for being gay/bisexual].

Current mental health status [CES-D scale (Radloff, 1977), categorized as "not depressed" (scoring less than or equal to 15), "distressed" (scoring 16–21) and "depressed" (scoring at or above 22); psychological wellbeing (Ryff & Keyes, 1995, originally a 16-point scale, Cronbach's alpha = 0.8), divided into quartiles for analysis].

Social and sexual practices [all originally measured as the number of times respondents participated in the activity in the prior 12 months: attended a bar, night club or dance club; had sex with men with whom sex only happened once; attended a sex club or bathhouse; attended another kind of public sex venue (i.e. public park); had unprotected anal sex with a non-primary partner].

Connection to gay culture [a variety of different measures were used, including three measures originally in a continuous form that were categorized for analysis: a seven-item scale (Cronbach's alpha = 0.78) tapping affiliation with the gay community, and a scale assessing perceived exclusion (of older men, non-white men) within the gay community (Cronbach's alpha = 0.58). A separate continuous variable counted the number of people in the respondent's intimate social circle (lovers, former lovers, close friends or family members) living with HIV. Six dichotomous measures were also included: being "out" as gay/bisexual to half or fewer vs. all or almost all family members and friends (two separate measures); having less than half, about half or more of one's close friends being gay/bisexual; reading a local gay publication (newspaper or magazine) at least monthly within the prior 3 months; any experiences in the prior 12 months of physical violence (e.g. having been physically attacked, chased or assaulted with a weapon) or of verbal violence (having been verbally insulted or threatened, or harassed by the police) due to being perceived as gay)].

Dependent variables

The dependent variables, listed below by major content areas, included not only use of recreational drugs and alcohol, but also four measures of current (prior 6 months) heavy or problematic substance use.

Frequent/heavy alcohol use [5+ drinks at a sitting at least once a week].

Three or more alcohol-related problems [positive endorsement of at least three of the following drinking problems: fear of dependence on alcohol, needing to have a few drinks to change a mood, loss of control once drinking starts, drinking to relieve a hangover, conflicts with a lover or close friend due to drinking, or loss of a job due to drinking, after Cahalan, 1970].

Multiple drug use [three or more drugs used from the list given in Table 1, excluding alcohol].

Frequent drug use [use of one or more recreational drugs at least once per week].

Statistical analysis

As a methodological experiment, a subsample of men were randomly selected to answer one section of the questionnaire using "telephone automated computer-assisted self-interview" technology (T-ACASI). In T-ACASI mode, instead of a live interviewer, a recorded voice read the questions and response categories to the respondent who then answered by using the buttons on his touch-tone telephone. This section of the interview included the questions on substance use as well as income, HIV status, early adverse life events, depression, "outness" and anti-gay victimization. Since prior analysis of data from this sample shows mode differences (CATI vs. T-ACASI) in reporting greater use of some (but not all) drugs under the T-ACASI mode (Gribble *et al.*, 2000), we restricted all analyses to respondents who answered questions only in CATI mode ($n = 2329$). In general, one can interpret the results reported here as conservative estimates of alcohol and drug use practices in the urban MSM population.

In light of the highly inclusive definition used for MSM in UMHS (sex with a man since age 14), we further restricted the analyses to "current MSM" which we operationally defined as having had sex with a man in the prior 5 years or labeling oneself as gay/bisexual ($n = 2207$). After eliminating respondents with missing data on all four dependent variables, the final sample included 2172 cases.

Because the data were collected via a sampling scheme employing stratification, clustering and sampling weights, the use of standard statistical methods would result in invalid estimates of standard errors, confidence intervals and significance levels (Lohr, 1999). To prevent this problem, the Stata statistical software's survey estimation commands (StataCorp, 1999), which adjust for the complex nature of the sampling scheme by using "linearization"-based variance estimators, were used to estimate population rates of substance use, construct corresponding confidence intervals and perform tests of hypotheses regarding the association between substance use and other variables. For example, tests of independence employing the Rao & Scott second-order correction were used in place of standard chi-square tests of independence.

The analyses evaluated the significance of variables assessing both protective and risk-inducing aspects of the MSM experience for predicting heavy substance use, when controlling for demographic, childhood hardship and mental health variables. Separate multivariate logistic regression models were developed for each of the four dependant variables: three or more alcohol problems in the prior 6 months, current heavy alcohol use, current frequent drug use, and current multiple drug use. This was accomplished by entering the independent variables hierarchically in blocks representing the five domains discussed above (demographics, early adverse life events, current mental health status, social and sexual practices, connection to gay culture) in that order. After an initial analysis in which all independent variables were entered, the same hierarchical regression was repeated for three iterations with each iteration further restricting what variables qualified for inclusion. The goal was to identify the most parsimonious model while simultaneously maximizing goodness-of-fit (as assessed by the Hosmer–Lemeshow goodness-of-fit test). For the first iteration, only variables that were statistically significant ($p < 0.05$) in univariate tests with the dependent variable or reached near significance ($p < 0.10$) at any point in the initial all-variable analysis qualified for inclusion. The second iteration included only those variables that at least reached near significance ($p < 0.10$) at any point in the first iteration analysis. The final iteration model was composed of all variables that at least reached near significance in the final step of the second iteration analysis (when all five domains had been entered). Each of the final models contained at least one variable that did not achieve the traditional standard for statistical significance ($p < 0.05$), because the data showed that remov-

ing these variables had a detrimental effect on goodness-of-fit.

Results

The sample reported a broad range of age, educational attainment, relationship status and ethnicity characteristics. Men ranged in age from 18 to well past 80, with a modal concentration (37%) of men in their 30s and 16% of the sample aged 50 or greater. About two-thirds (70%) of the men held a college degree or at least some postgraduate education, and 21% of the sample were drawn from a broad range of non-white ethnic minorities. About 40% of the sample earned US $40 000 or less (middle-class wages or less for these large urban areas), while about a quarter of the men earned more than US $80 000. Nearly half of the men (46%) reported having a current primary partner. The overall rate of HIV seropositivity for the entire sample was 17% (95% CI 15–19%), ranging from 14% in Chicago and New York to 20% in Los Angeles and San Francisco (Catania *et al.*, 2001).

Table 1 shows that the prevalence of recreational substance use is high among urban MSM. Alcohol use was especially common, with nearly nine of 10 men in this sample reporting at least some drinking in the prior 6 months. Drug use was somewhat less common, with 52% (95% CI 49.6–55.0%) of the overall sample reporting any drug use and 88% (95% CI 85.9–89.4%) reporting any drug or alcohol use during the prior 6 months. Of the drugs reported, marijuana was used by nearly half of the sample during the prior 6 months, while about ine in five men reported use of poppers, one in six reported use of powder cocaine, and one in 10 used "Ecstasy" (MMDA/MDMA), "speed" (methamphetamines or other forms of amphetamines) or "downers" (barbiturates, sedatives or tranquilizers).

There were significant regional differences in the use of marijuana, cocaine and amphetamines. Marijuana use was especially common among San Franciscans, who reside adjacent to the major marijuana-growing "emerald triangle" region of Northern California. Cocaine was used by about one in five New Yorkers, while speed use was more common among men in the West Coast cities (see also Center for Disease Control and Prevention, 1995; Gorman *et al.*, 1997). Since men in New York may have been using cocaine for many of

Table 1. *Prevalence of alcohol and drug use, prior 6 months, among men who have sex with men in four large american cities, prevalence estimates (in bold) and 95% confidence intervals*

	San Francisco ($n = 733$)	New York ($n = 617$)	Los Angeles ($n = 534$)	Chicago ($n = 300$)	Total ($n = 2184$)
Alcohol	**91.7**	**86.0**	**86.0**	**90.9**	**87.7**
	89.3, 93.7	82.4, 89.0	82.2, 89.0	86.5, 93.9	85.9, 89.4
Marijuana**	**50.2**	**43.1**	**34.2**	**39.9**	**42.4**
	45.8, 54.7	38.6, 47.8	29.3, 39.5	33.8, 46.4	39.7, 45.0
Poppers	**21.1**	**19.8**	**16.2**	**26.1**	**19.8**
	17.9, 24.7	16.3, 24.0	12.6, 20.7	20.3, 32.8	17.7, 22.0
Cocaine**	**9.7**	**21.3**	**11.5**	**10.5**	**15.2**
	7.3, 12.7	17.6, 25.5	8.7, 15.0	7.4, 14.7	13.3, 17.4
Crack Cocaine	**2.7**	**3.9**	**1.9**	**2.1**	**3.0**
	1.7, 4.4	2.3, 6.7	1.0, 3.5	1.0, 4.2	2.1, 4.2
Ecstasy (MDMA)	**11.4**	**13.4**	**11.1**	**4.8**	**11.7**
	8.9, 14.6	10.3, 17.2	7.7, 15.8	2.9, 8.1	9.9, 13.7
Speed*	**13.3**	**7.2**	**11.2**	**5.4**	**9.5**
	10.6, 16.7	4.9, 10.3	7.9, 15.6	3.3, 9.0	7.9, 11.3
Downers	**10.6**	**9.6**	**6.7**	**5.1**	**8.8**
	8.2, 13.7	7.2, 12.6	4.4, 10.0	3.1, 8.4	7.4, 10.4
Psychedelics	**6.4**	**3.6**	**3.7**	**3.1**	**4.2**
	4.6, 8.9	2.1, 5.9	1.9, 6.7	1.7, 5.4	3.3, 5.5
Opiates	**3.0**	**4.2**	**2.5**	**1.2**	**3.2**
	1.9, 4.6	2.6, 6.5	1.4, 4.4	0.5, 3.2	2.4, 4.3
Other uppers	**1.9**	**2.7**	**1.6**	**1.7**	**2.2**
	1.0, 3.6	1.5, 4.9	0.8, 3.0	0.8, 3.7	1.5, 3.1

*Design-based F *$p < 0.01$; **$p < 0.001$.

Table 2. *Multivariate associations with frequent/heavy drinking and alcohol-related problems*

	Frequent/heavy drinking		3+ Alcohol-related problems	
	Prevalence	Odds ratios 95% CIs	Prevalence	Odds ratios 95% CIs
Demographics				
Education				
<College grad	12.7%*	**2.3** (1.1–4.9)		
College grad	6.8	1.3 (0.6–2.7)		
Post-grad degree	4.9	1.0		
Race				
White			11.9%	1.0
African American			12.5	1.1 (0.5–2.5)
Hispanic			18.3	1.7 (1.0–2.7)
Asian			4.9	0.4 (0.1–1.1)
Native American			17.2	1.5 (0.6–3.6)
Early life adversities				
Parental substance abuse	12.4%*	**2.1** (1.3–3.4)	18.1%	**1.7** (1.2–2.5)
No parental SA	6.4	1.0	9.9	
Harassed because gay				
4+	6.9%	1.0		
2–3 events	8.9	1.7 (0.9–3.1)		
Never, once	8.9	**2.1** (1.3–3.5)		
Parent-on-parent abuse				
≥2			19.7%*	1.5 (1.0–2.4)
0–1 events			11.2	
Sexual abuse				
Never	6.6%†	1.0		
Before age 18	10.7	1.6 (0.9–2.7)		
After age 18	10.8	1.7 (0.9–3.0)		
Current mental health				
Well-Being				
Low			18.0%*	**3.1** (1.8–5.2)
Moderate			14.1	**1.8** (1.0–3.2)
High			10.0	1.4 (0.8–2.4)
Very high			7.1	1.0
Social and sexual practices				
Sex club/bath visits				
0			10.9%†	**2.3** (1.1–4.6)
1–2 times			18.9	**3.2** (1.4–7.1)
3–11 times			17.3	**2.7** (1.2–6.0)
12 or more times			9.4	1.0
Bar attendance				
None	2.9%*	1.0	6.1%*	1.0
1–11 times	2.6	0.9 (0.3–2.6)	8.4	1.7 (0.9–3.4)
12–26 times	4.7	2.5 (0.8–7.5)	10.0	**2.1** (1.0–4.3)
27–52 times	11.6	**5.4** (1.9–15.6)	16.3	**4.6** (2.3–9.2)
53 or more times	21.6	**13.3** (4.8–36.6)	23.6	**7.0** (3.6–13.8)
Connection to gay male culture				
Gay affiliation				
Low	9.6%†	**2.3** (1.2–4.3)		
Moderate	4.6	1.0		
High	9.4	**2.3** (1.1–4.6)		
Very high	9.7	**2.3** (1.1–4.7)		
Gay exclusivity				
Low			13.6%	**1.9** (1.1–3.1)
Moderate			8.6	1.0
Somewhat high			12.2	1.4 (0.8–2.3)
High			14.4	1.3 (0.7–2.3)
Out to family				
All			10.9%	1.0
Almost all			12.6	1.0 (0.6–1.7)
Half or less			14.5	1.4 (1.0–2.1)

Table 2.—*continued*

	Frequent/heavy drinking		3 + Alcohol-related problems	
	Prevalence	Odds ratios 95% CIs	Prevalence	Odds ratios 95% CIs
Verbal harassment	17.8%†	1.7 (1.0–2.9)	17.8%†	**1.5** (1.0–2.3)
None	11.1	1.0	11.1	1.0
Read local gay media				
0–2	9.3%	**2.3** (1.4–3.8)	14.2%	**1.9** (1.3–2.8)
3 or more times	7.6	1.0	11.7	1.0
Friends with HIV				
None	6.4%	1.9 (0.7–5.3)		
1–2 friends/family/lovers	10.0	**3.1** (1.2–8.4)		
3–5 friends/family/lovers	8.9	2.5 (0.8–7.4)		
6–10 friends/family/lovers	8.5	2.3 (0.7–7.5)		
11 + friends/family/lovers	5.2	1.0		

Univariate chi-square p-values using Stata corrections; †$p < 0.05$, *$p < 0.001$. Note: it may appear to the reader that some odds ratios are inappropriately marked as significant (boldfaced) because the lower limit of their 95% confidence interval is 1.0, whereas other odds ratios have the same lower limit but are not marked as significant. This is purely a function of rounding. In the former case the lower limit is actually slightly above 1 and in the latter case it is slightly below 1. In both cases rounding to a single decimal place results in a lower limit of 1.0.

the same purposes that lead West Coast men to use speed, we examined whether there were any differences in use of any of a number of stimulant drugs (i.e. cocaine, crack cocaine, methamphetamine, other amphetamines and Ecstasy) by region. We found that use of these stimulant drugs was highly prevalent among gay men, with 23% of the sample (95% CI 20.9–25.6%) reporting any such use over the prior 6-month period. No significant difference in point prevalence between cities in use of this group of stimulant drugs was detected. Current injection drug use was rare: only 1.3% (95% CI 0.8–2.1%) of the sample reported drug injection in the prior year, with no significant regional differences.

Prevalence estimates were computed for four different measures of current (prior 6 months) problematic or heavier substance use: three or more alcohol-related problems (12.4%, 95% CI 10.8–14.3%), frequent/heavy alcohol use (8.0%, 95% CI 6.6–9.8%), frequent drug use (18.9%, 95% CI, 16.8–21.1%) and multiple drug use (18.2%, 95% CI 16.2–20.5%). Together these figures suggest that while the oft-cited 33% cross-sectional alcoholism rate for urban MSM (Saghir & Robins, 1973; Fifield, Latham & Phillips, 1977; Lohrenz *et al.*, 1978) appears to be an overestimate of the actual extent of alcohol-related problems in this population, alcohol-related problems were not uncommon. In addition, nearly one in every five men in the overall sample reported either using at least three drugs in the prior 6 months or at least weekly use of some recreational drug(s). Regional differences were detected only in the case of current multiple drug use (designed-based F $p < 0.01$), with men in San Francisco and New York more likely to report multiple drug use.

Table 2 displays the final logistic regression models for frequent/heavy drinking and the experience of at least three alcohol-related problems. Significant odds ratio estimates ($p < 0.05$) are given in bold text, while a blank entry means that that variable was not in the final model for that dependent variable. There was some overlap in the detected associations with frequent/heavy drinking and having three or more current alcohol-related problems, with parental substance abuse, frequency of bar attendance and frequency of reading local gay media being significantly associated in both multivariate models. In addition, the directions of association of significant multivariate relationships were replicated across both measures of alcohol use. These associations should be interpreted to mean that men whose families of origin were characterized by parental substance abuse, who attended bars or clubs more frequently and who read local gay media less frequently were significantly more likely to report drinking at the frequent/heavy level and/or experiencing three or more alcohol-related problems.

Four variables were significant correlates of

Table 3. *Multivariate associations with multiple (3+) drug use and frequent (weekly) drug use*

	Multiple drug use		Frequent drug use	
	Prevalence	Odds ratios 95% CIs	Prevalence	Odds ratios 95% CIs
Demographics				
City				
Chicago	10.7%†	1.0	13.5%	1.0
San Francisco	19.7	**2.6** (1.5–5.3)	20.8	**1.8** (1.1–2.8)
New York	21.2	**2.8** (1.7–4.7)	19.9	1.6 (1.0–2.7)
Los Angeles	14.2	1.3 (0.8–2.3)	17.1	1.3 (0.8–2.2)
Income				
≤ $40 000	18.6%	1.0	20.5%†	1.4 (0.9–2.1)
$40 001–$80 000	21.4	1.4 (1.0–2.0)	21.0	**1.6** (1.1–2.5)
>$80 000	13.3	1.0 (0.6–1.5)	13.5	1.0
Age				
18–29	25.2%*	**2.6** (1.4–4.7)		
30–39	21.8	**2.1** (1.2–3.6)		
40–49	13.7	1.1 (0.6–1.9)		
50+	7.4	1.0		
HIV status				
HIV+	27.1%*	**2.8** (1.3–6.2)	29.5%*	**1.7** (1.2–2.5)
HIV−	17.2	1.9 (0.9–3.7)	16.6	1.0
Never tested	10.1	1.0	17.0	1.2 (0.7–2.1)
Male primary partner	14.5%†	1.0		
No steady male partner	21.6	**1.4** (1.0–2.0)		
Early life adversities				
Parental substance abuse			26.7%*	**1.5** (1.1–2.1)
No parental SA			15.7	1.0
Parent-on-parent abuse				
≥2	18.7%	1.0		
0–1 events	18.1	**1.8** (1.1–3.0)		
Parent-on-respondent abuse	16.6%†	1.0		
2+ events	24.0	**1.6** (1.0–2.5)		
Sexual abuse				
Never	14.8%*	1.0		
Before age 18	25.9	**1.6** (1.0–2.0)		
After age 18	21.9	**1.7** (1.1–2.7)		
Harassed because gay				
4+	19.2%	1.0		
2–3 events	19.0	1.4 (0.9–2.1)		
Never, once	16.3	1.4 (1.0–2.1)		
Current mental health				
CES-D				
Not depressed	15.6%*	1.0	16.1%*	1.0
Distressed	25.3	**1.9** (1.2–3.0)	26.7	**2.0** (1.3–3.1)
Depressed	24.0	**1.5** (1.0–2.3)	24.6	**1.8** (1.2–2.6)
Well-Being				
Low			18.2%	1.0
Moderate			20.9	1.4 (1.0–2.2)
High			20.9	**1.7** (1.1–2.5)
Very high			15.2	1.1 (0.7–1.7)
Social and sexual practices				
Gay bar attendance				
None	3.6%*	1.0	11.9%*	1.0
1–11 times	11.1	1.9 (0.8–4.3)	13.5	1.0 (0.6–1.7)
12–26 times	20.8	**2.7** (1.2–6.4)	19.8	1.4 (0.8–2.6)
27–52 times	23.5	**3.1** (1.3–7.1)	21.0	1.4 (0.8–2.5)
53 or more times	34.3	**4.6** (1.9–10.8)	31.2	**2.3** (1.3–4.1)
Sex club/bath visits				
0	10.8%*	1.0		
1–2 times	30.0	**1.6** (1.0–2.5)		
3–11 times	34.5	**1.8** (1.1–2.8)		
12 or more times	43.2	**2.4** (1.4–4.2)		

Table 3.—*continued*

	Multiple drug use		Frequent drug use	
	Prevalence	Odds ratios 95% CIs	Prevalence	Odds ratios 95% CIs
One night stands				
0	8.1%*	1.0	14.1%*	1.0
1–2 men	15.0	1.0 (0.6–1.6)	12.8	0.7 (0.4–1.1)
3–5 men	22.5	1.5 (0.9–2.6)	17.2	0.8 (0.5–1.2)
6–10 men	30.8	1.5 (0.8–2.9)	29.8	1.6 (1.0–2.8)
11 or more men	42.0	**2.2** (1.3–3.9)	34.4	**1.7** (1.1–2.6)
Public sex cruising				
0	13.2%*	1.4 (0.8–2.3)	14.8%*	1.0
1–2 times	32.6	**3.1** (1.7–5.5)	24.9	1.5 (0.9–2.5)
3–11 times	21.6	1.1 (0.6–1.9)	19.7	0.9 (0.6–1.5)
12 or more times	26.1	1.0	31.6	1.5 (1.0–2.4)
High risk sex				
0	12.3%*	1.0		
1 or more times	38.9	**2.0** (1.4–2.8)		
Connection to gay male culture				
Out to friends				
All	19.8%†	**2.0** (1.1–3.7)		
Almost all	17.8	**2.2** (1.1–4.2)		
Half or Less	8.9	1.0		
Friends with HIV				
None			12.7%*	1.0
1–2 friends/family/lovers			17.4	1.3 (0.8–2.0)
3–5 friends/family/lovers			22.3	**1.6** (1.0–2.5)
6–10 friends/family/lovers			27.3	**2.0** (1.2–3.3)
11+ friends/family/lovers			26.1	**1.5** (0.9–2.5)

Univariate chi-square p-values using Stata corrections; †$p < 0.05$, *$p < 0.001$. Note: it may appear to the reader that some odds ratios are inappropriately marked as significant (boldfaced) because the lower limit of their 95% confidence interval is 1.0, whereas other odds ratios have the same lower limit but are not marked as significant. This is purely a function of rounding. In the former case the lower limit is actually slightly above 1 and in the latter case it is slightly below 1. In both cases rounding to a single decimal place results in a lower limit of 1.0.

frequent heavy drinking but not of having three + alcohol-related problems. Men with less education were about twice as likely to report frequent/heavy drinking as men at the highest educational levels. The inverse relationship between being harassed for being gay prior to the age of 16 and reporting frequent/heavy drinking was unexpected. The relationship between gay community affiliation and frequent heavy alcohol use was more complex, in that it is the men at the moderate levels of affiliation who reported the lowest levels of heavy drinking, possibly reflecting men with mixed gay and non-gay social outlets that are in turn characterized by lower alcohol-use profiles. Men at the middle range of number of friends, lovers or family members living with HIV were more likely to drink at the frequent/heavy level.

Variables that were uniquely associated with having three or more current alcohol-related problems, but not frequent/heavy alcohol use, included a lower sense of wellbeing, fewer visits to sex clubs or bathhouses, lower perceived exclusivity on the part of gay culture and experiences of anti-gay verbal harassment. The inverse relationship between sex club/bathhouse patronage and reporting three or more alcohol-related problems might indicate a preference for drug use over alcohol (data shown below) and/or a preference for such venues over gay bars (with a corresponding drop in problematic alcohol use).

Table 3 displays the final logistic regression models for multiple (three + drugs in the prior 6 months) and frequent (weekly) drug use. This multivariate models of multiple and frequent drug use are comparable. In both models, city of residence, positive HIV status, CES-D scores, greater bar/club attendance and number of one-time sexual partners were significantly related to both dependent measures. That is, men who

resided in San Francisco or New York, were HIV positive, were distressed or depressed, patronized bars more frequently and with greater numbers of one-time sexual partners were more likely to be frequent or multiple drug users. In both analyses the directions of associations were replicated across models.

Some variables were associated with only one of the drug use variables. Younger age, not being in a steady male relationship, more visits to bathhouses or sex clubs, some participation in public sex cruising, having unprotected anal intercourse with a secondary partner and being "out" to a greater proportion of friends were associated with a greater probability of being a multiple drug user, but not being a frequent drug user. The relationships between being raised in an abusive environment were complex: men who reported a pattern of parent-on-parent violence were less likely to report multiple drug use; men who reported a pattern of parent-on-respondent violence and/or sexual abuse were more likely to report multiple drug use.

The final multivariate model, explaining frequent (at least once a week) drug use, also yielded some unique associations. Men at middle income ranges were more likely to report frequent drug use (but not multiple use). In addition, men raised by parents who abused substances, men with a high sense of well-being, and men with greater numbers of friends, family members or lovers living with HIV were more likely to be frequent drug users.

Discussion

The data reported here support the view that drug and alcohol use are highly prevalent among urban men who have sex with men. In addition, current problems attributed to drug or alcohol use were not uncommon, and measurement strategies that use lifetime measures of such problems are likely to raise such estimates even further (i.e. Remien *et al.*, 1995). Thus, while these data provide additional evidence to show that the oft-cited 33% point prevalence rate for alcoholism among gay men is probably an overestimate, they also support the conclusion that heavy substance use may none-the-less represent an important threat to the physical and social health of urban MSM.

How do these prevalence rates compare to those reported for general population samples of men? In responding to this question, it should be noted first that use of large national data bases to compare drug or alcohol use patterns to those reported by this sample are methodologically suspect for a number of reasons. First, national samples of men include residents of geographic areas not sampled in this study. Other reasons include possible interview mode effects (i.e. telephone vs. face-to-face interviews), differential time periods of measurement and the failure to measure sexual identity in nearly all large scale epidemiological research on substance use (which means that the samples of men in comparative samples almost certainly include subsamples of men who have sex with men). None the less, we compared rates of drug and alcohol use as measured in two large national samples and found that, in general, rates of overall alcohol use among the MSM in this sample were roughly comparable to those among American men aged 12 or greater sampled from the general population (DHHS, 1999 reports that 9.1 of sampled men reported taking five or more drinks at one sitting for at least 5 days of the prior 30 days). However, the MSM in this sample reported much higher rates of drug use than did American men past the age of 12 drawn from a national sample (estimates for any use in the prior year, marijuana, 10.8% [95% CI, 10.0, 11.6%]; cocaine 2.3% [95% CI, 1.9–2.7%]; stimulants 0.9% [95% CI, 0.6–1.3%]; DHHS, 2000). The general conclusion that it is drug rather than alcohol use that most distinguishes MSM substance use patterns replicates findings reported in the only population-based comparison of drug and alcohol use patterns of heterosexual and homosexual men (Stall & Wiley, 1988).

These conclusions about the point prevalence of substance use among urban MSM populations should be interpreted with the limitations of this study in mind. First, all the data described here were self-reported; no biological or partner data to confirm use (or non-use) of drugs or alcohol were collected. The fact that we report here only the interviewer-administered data, and not the data collected through the T-ACASI, means that the prevalence of some types of drug use reported here should be regarded as lower-bound estimates. The cross-sectional design restricts our analysis to the identification of correlational relationships only, making causal attributions impossible. Although participation

of self-identified MSM in this study was higher than for many comparable studies (78%), the refusal of some men to participate in the study none the less may have introduced sample biases. In addition, it is also important to consider that some subpopulations of MSMs were not sampled (or undersampled) for this study. These include (by definition) MSM who reside in low-density urban, suburban or rural areas, men without personal telephones and men unwilling to disclose information about same-gender sexual behaviors. The inclusion of such undersampled groups could affect prevalence estimates.

The multivariate analyses reported here have implications for the creation of a gay male-specific theoretical model of substance use and abuse. First, it is clear that the associations of substance use among MSM are complex, with independent relationships found at the level of demographics, adverse early life circumstances, current mental health status, social and sexual practices and connection to gay male culture. The multivariate models describing problematic and heavy drug and alcohol use illustrate this general conclusion most effectively. We found that education is significantly associated with frequent/heavy drinking at the multivariate level. Parental substance abuse was found to be an independent predictor for both of the alcohol-dependent variables and frequent drug use. In addition, childhood sexual abuse was related to multiple drug use in the multivariate model; a separate paper from this dataset explores childhood sexual abuse and later life outcomes for gay men (Paul *et al*, 2001). Depression was independently associated with both measures of heavy drug use, such that depressed men were more likely to be problematic or heavier substance users. Findings that may be more specific to the experience of MSM were the very consistent associations with heavy or problematic substance use found at the level of social and sexual practice. An understanding of heavy or problematic substance use among MSM requires an understanding of MSM sexual cultures, perhaps as an expression of a conjoined "high-risk" or "sensation-seeking" life-style. However, it should be noted that these relationships were not always in the expected direction: for example, greater participation in public sex environments such as bathhouses and sex clubs was associated with fewer alcohol problems (although independently associated with greater multiple drug use). Finally, variables measuring affiliation with gay male culture predicted frequent heavy alcohol use (both low and high sense of affiliation, having some friends, family or lovers currently living with HIV, less exposure to gay print media), alcohol-related problems (experiencing anti-gay verbal harassment, less exposure to gay media) frequent drug use (greater number of friends, family or lovers living with HIV) and multiple drug use (being "out" to a greater proportion of friends). These associations suggest that connection to gay male culture functions in both protective and risk-inducing ways.

These findings have implications for continuing research on substance use and abuse among MSM populations. First, ongoing surveillance is needed to chart new trends in problematic drug or alcohol use patterns among MSM such as the rise and fall in popularity of new "designer" drugs and the problems associated with them. Next, community-level prevention trials designed to lower problematic substance use among MSM might also be considered (Kelly *et al.*, 1989; Kegeles, Hays & Coates, 1996). Treatment outcomes research should also be designed to measure the effects of specific approaches to substance abuse treatment for MSM. Although some work using uncontrolled designs has been conducted (i.e. Paul *et al.*, 1996), controlled evaluation designs to identify the "best practices" in treating substance-abusing gay men have not yet been attempted. The importance of both the sexual and gay-culture-specific variables in this analysis supports the need to design gay-specific prevention and treatment modalities. Finally, the models developed for MSM might also provide a useful guide to a parallel prevention, treatment and research program for women who have sex with women.

Acknowledgements

Construction of the random digit dial (RDD) sample frame for this study was conducted by the Survey Research Center (SRC) at the University of Maryland (UMD), in collaboration with Dr Graham Kalton at Westat and University of California investigators. The cooperation of local City Health Departments, the US Census Bureau, the Centers for Disease Control, an anonymous commercial agency, local AIDS community-based organizations and local informants in providing relevant data was invaluable.

Dr Jim Dilley, of the UCSF AIDS Health Project, directed the procedures by which men who were tested through the OraSure™ device received their test results. Primary support for this study was provided by NIMH Grant no. MH54320, NIAAA Grant no. AA 10194, NIMH Grant no. MH42459 (The Center for AIDS Prevention Studies) and supplemental support from the Centers for Disease Control and Prevention, Division of HIV/AIDS Prevention. Interviewing procedures (and verbal informed consent procedures) were reviewed and approved by the University of California, San Francisco Committee on Human Research.

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