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Drug and Alcohol Dependence 66 (2002) 115–125

**ALCOHOL
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MDMA ('ecstasy') use, and its association with high risk behaviors, mental health, and other factors among gay/bisexual men in New York City

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Received 3 March 2001; received in revised form 14 August 2001; accepted 14 August 2001

Abstract

This study assesses patterns of use of methylenedioxymethamphetamine (MDMA or 'ecstasy'), and the characteristics of users, in a sample of 733 men who have sex with men (MSM) in New York City. Among respondents, 13.7% reported using MDMA in the past 6 months, with mean frequency of use of 6.24 times in that period. MDMA users were found to be younger, less educated, to have had more male partners, more one night stands with men, more visits to bars or clubs and sex clubs or bathhouses, to have unprotected anal sex with a male, to be likely to have been the victim of physical domestic violence, to have more gay/bisexual friends, to have disclosed their sexual orientation to more friends, family members, and coworkers, and to have higher levels of gay community participation and affiliation. Among MDMA users, higher frequency of MDMA use was associated with being younger, having more visits to bars or clubs, more gay/bisexual friends, and having an HIV negative test result or never having been tested. MDMA users thus constitute a group at risk for sexually transmitted diseases, including HIV, and other problems. The data suggest that MDMA use is associated with being more 'out', which may be advantageous in helping gay men deal with harmful psychological effects of stigma, but may place individuals in settings that expose them to MDMA. These men have also presumably already been well exposed to safer sex messages within the gay community, thus raising challenges for interventions aimed at prevention, as well as opportunities (e.g. MSM and community specific interventions) that need to be further explored. © 2002 Elsevier Science Ireland Ltd. All rights reserved.

Keywords: Methylenedioxymethamphetamine (MDMA); Men who have sex with men (MSM); Sexual behavior; HIV; Domestic violence

1. Introduction

Methylenedioxymethamphetamine (MDMA or 'ecstasy') use has been reported as rising rapidly in Western industrialized countries around the world, but has received very little systematic study. In 1999, the percentage of 12th grade males in the US who reported using the drug at least once rose to 8.0% from 5.8% in 1998 (National Institute on Drug Abuse, 2000). The only prevalence estimate of 'current usage' we were able to find in the US indicated that, of 369 students sur-

veyed at Stanford University, 39% had taken the drug at least once in the prior year (Peroutka, 1987). MDMA use has also received particular attention in Australia (Solowij et al., 1992) and Great Britain (Henry, 1992).

MDMA use is of particular concern given the drug's neurotoxicity and evidence of resulting cognitive impairment. MDMA and its metabolite, 3,4-methylenedioxyamphetamine (MDA), produce neurotoxic effects in animals (Ricaurte et al., 1985; Schmidt et al., 1986; Stone et al., 1986). In humans, MDMA had been found to cause long lasting neurotoxicity (McCann et al., 1998) and cognitive impairment, particularly impaired memory (Krystal et al., 1992; Parrott and Lasky, 1998) and attention deficits (McCann et al., 1999). In addi-

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tion, individual clinical case reports have suggested that MDMA can cause psychiatric symptoms, including depression, anxiety (McGuire et al., 1994), and paranoia (McCann and Ricaurte, 1991), even after abstinence from the drug (Green et al., 1995). Anecdotal reports from MDMA users suggest that ingestion of the drug results in euphoria, increased energy, sexual arousal (Henry, 1992), and ‘warmth and openness’, making users feel closer to those around them—leading some to call it the ‘love drug’ (Randall, 1992) or ‘hug drug’. Since 1985, the drug has been classified as an illegal, Schedule I substance in the US. This combination of ‘sexual arousal’ (Henry, 1992) with neurocognitive deficits and psychiatric symptoms may put people at increased risk of having unsafe sex.

Media reports suggest that MDMA use is particularly prevalent in the gay community (Signorile, 1997). Indeed, in a prior study we found that among 169 gay and bisexual men recruited from three dance clubs in New York City, 34% had used MDMA in the past month. About half (52%) had used MDMA in the past year, and those MDMA users were 2.8 times more likely than non-users to have had unprotected anal sex in the past year (Klitzman et al., 2000). In fact among recreational drugs, only MDMA was found to be associated with unsafe sex in this sample. Since this sample was recruited from gay clubs where MDMA use may be highest, these findings may be limited in their generalizability. Moreover, only one item in the questionnaire examined sexual behavior, and other important variables were not assessed, such as the HIV status of participants’ partners. Unprotected sex in such situations is of particular risk for transmission of HIV.

The use of other drugs has also been related to high-risk sexual behavior (Dolezal et al., 1997, 2000; Leigh and Stall, 1993; Mulry et al., 1994) and HIV seroconversion (Chesney et al., 1998), and gay men have been found to have higher rates of drug and alcohol use than heterosexual men (Ostrow et al., 1990; Stall and Wiley, 1988). However, patterns of drug use have recently been shifting, with new drugs such as MDMA becoming increasingly prevalent. Moreover, attitudes toward unsafe sex among gay/bisexual men have been changing as demonstrated by increasing rates of HIV infection, in part due to the advent of improved treatments such as protease inhibitors for HIV (Kelly et al., 1998). For example, in San Francisco, among a sample of young gay and bisexual men aged 18–29, 19% were HIV positive, although 25% of these infected men did not know that they were infected (Hays et al., 1997). Research has shown that incidence of HIV seroconversion is approximately 2–3% per year among this group (Osmond et al., 1994). In short, MDMA users remain a group whose characteristics have not yet been systematically studied, and may constitute a ‘hidden population’ at risk for HIV transmission or other problems.

Prior research has shown that use of other substances among men who have sex with men (MSMs) is associated with a variety of psychosocial factors, including negative affect, anti-gay discrimination and greater gay bar attendance (McKirnan and Peterson, 1989). Yet none of these factors have been examined with regard to use of MDMA. Moreover, published reports have not examined the relationship between substance use among gay men and factors such as domestic violence, how open participants are in revealing their sexual preferences, and how much they participate in the gay community.

We sought to explore several research questions. How common is MDMA use in a large probability sample of gay men? What are the characteristics of MDMA users in terms of sociodemographic variables; high risk sexual behaviors; and psychosocial problems such as mental distress; domestic violence; disclosure of sexual orientation to others, and degree of involvement in the gay community? Do high versus low frequency users of MDMA vary in any of these characteristics? Our analyses focus on gay men living in New York City, which prior research has identified as having the highest rate of MDMA use by MSM among the four cities with the largest populations of MSM (Stall et al., 2001). Our intent was to explore these questions in a way that would generate further hypotheses and avenues for possible research in the future.

2. Methods

The data reported here were collected as part of the Urban Men’s Health Study (UMHS), a stratified probability telephone sample of MSM, constructed in four cities—New York, San Francisco, Los Angeles, and Chicago. 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 Graham Kalton at Westat and UMHS investigators. Information contributing to sample frame development was obtained from local City Health Departments, the US Census Bureau, the Centers for Disease Control and Prevention, an anonymous commercial agency, local CBOs, and informants.

A more detailed explanation of the methodology of this study has been reported elsewhere (Catania et al., 2001). In brief, investigators mapped data on MSM AIDS cases, addresses from an MSM commercial mailing list, 1990 census data on MSM partnered households (unmarried male partner households), MSM business/services, and areas designated as MSM neighborhoods by informants in each city (Binson et al., 1996). Investigators then selected for inclusion in the sampling frame those zip codes with an MSM residen-

tial density judged sufficient to allow for sampling at a reasonable cost (operationalized as < \$1000 per completed interview). After identifying phone exchanges that covered the selected zip code areas in each city, investigators then estimated the costs of sampling these phone exchanges. The exchanges were then stratified by estimated cost per completed interview (which includes the costs of screening ineligible out of the study) and removed extremely high cost exchanges (> \$1000 per interview) from the sample frame. Excluded exchanges accounted for < 4% of estimated MSM households in selected zip codes. (Note: This process resulted in three strata in New York City, with the potential to cover 98.2% of all MSM households in the selected zip codes). Disproportionate sampling techniques (Kalton, 1993) were used to sample each 'cost stratum' within each city. Given fixed data collection costs, the sampling was allocated in inverse proportion to the square root of the mean estimated cost per interview for each stratum following Hansen et al. (1953), Sudman (1976). That is, less expensive exchanges were sampled more heavily, but more expensive exchanges were still sampled, albeit sparsely, to maintain representativeness. To further reduce costs, an adaptive sampling approach was employed (Blair, 1999); that is, sample performance early in the study informed later allocation of study resources.

Prior to conducting the survey, community awareness programs were conducted with leaders of local health, HIV, and gay/bisexual oriented organizations. Advertisements were placed in local gay print media informing the readership that a study was about to begin. Telephone numbers were randomly selected within the selected exchanges in sufficient number to meet sample size goals for each stratum. In New York City, between 7 February 1997 and 1 March 1998 UMHS successfully screened over 15 000 households and obtained 800 interviews with MSM, which constituted 81% of all identified eligible households. Interviews were conducted using computer-assisted telephone interviewing technology (CATI) in Spanish and English at a time of the respondents' choosing and lasted an average of 75 min. Several procedures that past studies have shown to increase disclosure of same-sex sexual behavior within the context of an anonymous telephone survey were employed. These included extensive callbacks (minimum 30 attempts) to resolve unscreened households (Capell and Schiller, 1989), gender-matched (i.e. male only) interviewers, and enhanced introductions to sensitive questions (Catania et al., 1996). Households were screened first for geographic eligibility (i.e. zip code) and then for gender eligibility (i.e. at least one male age 18 or older). An adult male informant was then used to screen the household for MSM eligibility by asking him a series of three questions, (1) did he identify as gay or bisexual or had sex

with a man since age 14; (2) regardless of his self-identification did he occasionally have sex with men; and (3) did any other adult male in the household meet these criteria. If more than one adult male qualified for the study then one was randomly selected to be the respondent. In cases where the selected respondent was not the informant, the respondent's eligibility was confirmed by asking him the first two MSM screening questions.

Sample weights were developed to reflect probability of selection (including the disproportionate sampling noted above), non-response (of households that were called), and non-coverage (of households within the selected zip codes that were not called). All data presented in this paper are weighted.

We examined MDMA use in two ways: prevalence of use (i.e. use at least once in the past six months); and frequency of use, comparing high frequency users (those who used more frequently than the median use) with low frequency users (those who used as frequently as, or less than the median use).

2.1. Demographic variables

These included: age, ethnicity, education, and income. Age was assessed by decades (18–29, 30–39, 40–49, and 50 and older). Ethnicity was assessed as white vs. non-white. Education was categorized as high school degree or less, college degree, and advanced degree. Income was categorized as \$40 000 or less, \$40 001–\$80 000, and greater than \$80 000.

We included the following variables which we considered to be potential correlates of MDMA use. We categorized variables to include roughly equal numbers of participants in each subgroup.

2.2. HIV status

Self-reported HIV status was categorized as HIV-positive versus HIV-negative or never tested.

2.3. Sexual practices

These were assessed by a series of items concerning sexual behavior in the past 12 months, specifically, unprotected receptive or insertive anal sex occurring with a male partner in the past year. A separate variable noted whether such behavior occurred with the four most recent partners when these partners were serodiscordant or of unknown HIV status (i.e. HIV-positive respondents who had unprotected insertive anal sex with a male partner who is HIV-negative or of unknown status; and HIV-negative or never tested respondents who had unprotected receptive anal sex with a male partner who is HIV-positive or of unknown status).

Other variables included the number of male partners in the past year (which we categorized as less than 3, 3–10, and more than 10); the number of one night sexual encounters with men (which we categorized as 0, 1–10, and greater than 10); the number of visits to bars or clubs (which we categorized as less than 13, 13–50, and greater than 50); and the number of visits to bathhouses or sex clubs (which we categorized as 0, 1–2, and three or more visits).

2.4. *Physical domestic violence*

We assessed domestic violence through a question concerning physical violence, asking whether a partner or boyfriend hit the participant with a fist or open hand, pushed or shoved, kicked or hit with an object.

2.5. *Gay community identification*

We assessed gay community identification in several ways, through the number of gay or bisexual friends (which we categorized as less than half, half, and greater than half), the number of family members to whom the participant disclosed his sexual orientation ('come out') (which we categorized as half or more, less than half, and none), the number of friends to whom the participant had come out (which we categorized as all, almost all, and half or less), the number of employers to whom the participant had come out, (which we categorized as all, almost all, less than half, and none), the number of coworkers to whom the participant had come out (which we categorized as all or not all), and the number of neighbors to whom the participant had come out (which we categorized as all, half or more, and less than half).

2.6. *The community participation scale*

We assessed participation in the gay/lesbian community using a community participation scale, which counted how many types of activities respondents participated in that are gay/bisexual/lesbian specific, plus whether or not participants had read a national or local gay publication in the last 3 months.

2.7. *Affiliation with the gay community*

We assessed affiliation with the gay community with a scale developed for the purposes of this study. The scale consists of seven items (Cronbach's $\alpha = 0.78$). Items included the degree to which participants agree or disagree with a series of statements, such as "You feel a part of New York's gay community," "You feel a bond with other men who are gay or bisexual" and "I feel that any problems faced by New York's gay community are also my problems." Higher scores on this

scale represent greater perceived affiliation with the gay community.

2.8. *The Center for Epidemiologic Studies Depression Scale (CES-D, Radloff, 1977)*

We assessed depressive symptomatology using the Center for Epidemiologic Studies Depression Scale, a self-report scale designed to measure depressive symptomatology in the general population. We trichotomized scores as 0–15 ('normal'), 16–21 ('distressed'), and 22–60 ('depressed'), to assess the presence of depressive symptoms. We trichotomized this scale since subclinical states of 'depression' may exist and be prevalent in this population, that would not appear if we merely dichotomized the scale as 'depressed' and 'not depressed.'

To determine which variables were associated with MDMA use, we conducted logistic regression analyses for the dichotomous variable contrasting MDMA users (past 6 months) with non-users; and we contrasted high frequency from low frequency users among those who had ingested MDMA. As the number of users in the second set of analyses was considerably lower than the comparison between users and non-users, we dichotomized all of the variables except affiliation with the gay community for the purposes of analysis.

Since the data to be analyzed were collected via a sampling scheme employing stratification, clustering, and sampling weights, the use of standard statistical methods would result in invalid estimates of S.E., confidence intervals and significance levels (Lohr, 1999). Instead, we used Stata statistical software's survey estimation commands (Stata Corp., 1999), which adjust for the complex nature of the sampling scheme by using 'linearization'-based variance estimators, 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 and Scott second-order correction were used in place of standard chi squares tests of independence.

3. Results

A total of 733 MSM who answered the MDMA usage question were interviewed for the data reported here. Respondents' mean age was 40.5 years old (± 11.6) and their ethnicity was 80.5% Caucasian, 7.7% Latino, 5.2% African-American, 3.9% Asian/Pacific Islander, 2.4% Native American, and 0.4% Other. In the past 6 months, 13.7% of MSM respondents in New York City reported using MDMA. Among users, the frequency of use varied from 1 to 30 times, with a mean of 6.24 (± 7.09) times in the past 6 months.

MDMA users (i.e. those who used it in the past 6 months), as compared with non-users (see Table 1), were younger (when comparing each decade of age with the oldest reference group, and also when using each of the other age groups as reference groups), were less educated, were more likely to have unprotected insertive and receptive anal intercourse with a male partner, were more likely to report high numbers of male partners, had more one night stands with men, made more visits to bars or clubs and sex clubs or bathhouses, reported more than half their friends are gay/bisexual, had come out to more friends, had come out to more family members and more coworkers, had higher levels of gay community participation, and had higher levels of affiliation with the gay community. There was a trend for users to come out to more employers. They were also more likely to have been the victim of domestic violence. There was no significant difference in reported HIV status or depression symptomatology between MDMA users and nonusers.

Higher frequency of MDMA use (see Table 2) was found to be associated with being younger, making more visits to a bar or club, reporting that more than half of one's friends are gay/bisexual, and having an HIV-negative test result or never having been tested (as opposed to being HIV positive). Ethnicity was not found to be related to either presence or frequency of MDMA use.

In order to assess the importance of the correlates, each of the two measures of MDMA use was analyzed using multiple logistic regression. Since no a priori model was being tested, and the number of independent variables was large, stepwise procedures were used in an iterative fashion. In each iteration both forward stepwise (i.e. the initial model contains only the constant and the most significant variable at a given step is entered) and backward stepwise (i.e. the initial model contains all the variables and the least significant variable at a given step is removed) procedures were executed. Multiple iterations allowed for careful investigation of effects and informed decision-making concerning removal of correlates from the model. Such a process provides for the fact that the analysis sample size increases as variables are removed from consideration, and simultaneously gives all correlates the maximum chance to be included in the final model.

In the analysis of ecstasy use both forward stepwise and backward stepwise procedures arrived at the same final model containing five variables, which minimized sample loss ($N=725$) and achieved excellent fit as assessed by the Hosmer-Lemeshow goodness of fit test ($P=0.76$). Having used ecstasy in the past 6 months was associated with younger age, having had unprotected anal intercourse with a male partner, having gone to bars or clubs more often, having been the victim of physical domestic violence, and having more than half of one's friends be gay/bisexual (see Table 3).

In the analysis of frequency of ecstasy use, the small sample size created instability in the variable selection process as the stepwise procedures tended to arrive at different models. Since sample loss was minimal, decisions for the final model were based on the results of the backward stepwise procedure. The final model ($N=96$) contains five variables and achieved good fit ($P=0.44$). High frequency of ecstasy use was associated with having gone to bars and clubs more often, being out to less than half of one's family members, being out to less than all friends, participating in fewer activities in the gay community, and reporting fewer symptoms of depression (see Table 4).

4. Discussion

In a sample of MSMs in New York City, a substantial proportion (13.7%) have used MDMA in the past 6 months, with mean use of about once a month (i.e. 6.24 times in the past 6 months). Compared with nonusers, MDMA users were found to be younger; more likely to engage in high risk sexual behaviors, and report domestic violence, and have more commonly disclosed their sexual orientation to family, friends and co-workers ('more out').

The association between MDMA use and age may be related to the fact that MDMA use often occurs at late night clubs that are busiest between 02:00 and 06:00 h, a time at which older men may feel less comfortable (or are already asleep in bed). Indeed, we found that the proportion of men reporting weekly visits to bars and clubs declined linearly with age, from a high of 37% among 18–29 year-olds to a low of 7% among respondents age 50+ ($\chi^2=98.02$, $df=6$, $P<0.001$), lending more credence to our hypothesis about where and when MDMA use is taking place. However, it should be noted that in the multivariate model both age and bar/club attendance have independent significant relationships with ecstasy use. Thus, as is the case in much of behavioral research, age is probably a proxy for a host of other significant effects.

The fact that MDMA is particularly used by young gay men and those who are more sexually active is of concern, given increasing rates of HIV among this population. Those who use higher frequencies of MDMA were less out, possibly because they represent a different group of individuals who use MDMA less as part of socialization within the gay community. They may also be more likely to be risk takers. It is of note that in the multivariate analysis, higher level of use was associated with less depression. Recent qualitative interviews we are conducting with MDMA users indicate that many only use MDMA once every few weeks because of feelings of depression that they experience several days following use. Those who use MDMA

Table 1
 Characteristics of MDMA users versus non-users

	Users of ecstasy in past 6 months	Non-users of ecstasy in past 6 months	High users versus low users of ecstasy in past 6 months		
	Frequency (n/N)	Frequency (n/N)	O.R.	95%CI	P
<i>Age</i>					
18–29	45.0% (45/100)	14.8% (94/633)	64.43	8.53–486.43	0.000
30–39	42.0% (42/100)	36.7% (232/633)	24.48	3.28–182.53	0.000
40–49	12.0% (12/100)	27.8% (176/633)	9.12	1.16–71.75	0.000
> 50	1.0% (1/100)	20.7% (131/633)	–	–	–
<i>Education</i>					
<High school	25.0% (25/100)	21.2% (134/633)	2.79	1.28–6.07	0.009
College degree	61.0% (61/100)	45.5% (288/633)	3.21	1.65–6.27	0.001
Advanced degree	14.0% (14/100)	33.3% (211/633)	–	–	–
<i>Ethnicity</i>					
White	83.8% (83/99)	82.0% (515/628)	1.19	0.60–2.08	n.s.
Persons of color	16.2% (16/99)	18.0% (113/628)	–	–	–
<i>Income</i>					
\$40000 or less	30.3% (30/99)	36.4% (228/627)	1.59	0.88–2.86	n.s.
\$40001–80000	42.4% (42/99)	32.2% (202/627)	1.05	0.55–1.99	n.s.
More than \$80000	27.3% (27/99)	31.4% (197/627)	–	–	–
<i># gay/bi friends</i>					
Less than half	9.0% (9/100)	20.9% (132/633)	–	–	–
Half	21.0% (21/100)	34.0% (215/633)	1.37	0.54–3.47	n.s.
More than half	70.0% (70/100)	45.2% (286/633)	3.47	1.54–7.79	0.003
<i># family out to</i>					
Half or more	69.4% (68/98)	71.6% (443/619)	3.26	1.07–9.86	0.03
Less than half	26.5% (26/98)	14.5% (90/619)	6.17	1.80–21.15	0.004
None	4.1% (4/98)	13.9% (86/419)	–	–	–
<i># friends out to</i>					
All	74.7% (74/99)	69.0% (431/625)	5.32	0.95–29.66	0.05
Almost all	22.2% (22/99)	17.9% (112/625)	6.20	1.04–36.74	0.04
Half or less	3.0% (3/99)	13.1% (82/625)	–	–	–
<i># employers out to</i>					
All	67.0% (63/94)	82.5% (296/540)	2.04	0.97–4.29	0.06
Almost all- less than half	17.0% (16/94)	18.5% (100/540)	1.57	0.69–3.59	n.s.
None	16.0% (15/94)	26.7% (144/540)	–	–	–
<i># co-workers out to</i>					
All	64.9% (63/97)	51.6% (298/577)	1.74	1.01–3.02	0.04
Not all	35.1% (34/97)	48.4% (279/577)	–	–	–
<i># neighbors out to</i>					
All	47.8% (44/92)	46.2% (264/571)	1.67	0.85–3.29	n.s.
Almost all/half	32.6% (30/92)	21.9% (125/571)	2.40	1.08–5.36	0.03
<Half/None	19.6% (18/92)	31.9% (182/571)	–	–	–
<i>Community participation scale</i>					
0–1 activity	14.0% (14/100)	31.5% (199/632)	–	–	–
Two activities	22.0% (22/100)	25.8% (163/632)	1.91	0.88–4.14	0.09
Three activities	23.0% (23/100)	20.4% (129/632)	2.46	1.14–5.30	0.02
4–8 activities	41.0% (41/100)	22.3% (141/632)	4.03	1.94–8.34	0.000
<i>Affiliation with gay community</i>					
Low	11.0% (11/100)	22.7% (143/629)	–	–	–
Moderate	24.0% (24/100)	24.3% (153/629)	1.94	0.80–4.73	n.s.
High	33.0% (33/100)	24.8% (156/629)	2.59	1.07–6.28	0.03
Very high	32.0% (32/100)	28.1% (177/629)	2.24	0.96–5.23	0.06
<i># bar/club visits</i>					
< 13	9.1% (9/99)	58.4% (369/632)	–	–	–
13–50	34.3% (34/99)	26.4% (167/632)	8.52	4.05–17.91	0.000
> 50	56.6% (56/99)	15.2% (96/632)	24.36	11.30–52.49	0.000

Table 1 (Continued)

	Users of ecstasy in past 6 months	Non-users of ecstasy in past 6 months	High users versus low users of ecstasy in past 6 months		
	Frequency (n/N)	Frequency (n/N)	O.R.	95%CI	P
<i># sex club/bathhouse visits</i>					
0	42.0% (42/100)	74.4% (472/634)	–	–	–
1–2	17.0% (17/100)	11.0% (70/634)	2.73	1.39–5.33	0.003
3+	41.0% (41/100)	14.5% (92/634)	5.07	2.80–9.16	0.000
<i># one night sexual encounters with men</i>					
0	24.0% (24/100)	51.5% (325/631)	–	–	–
1–10	38.0% (38/100)	34.4% (217/631)	2.37	1.29–4.35	0.005
>10	38.0% (38/100)	14.1% (89/631)	5.83	3.06–11.12	0.000
<i># male partners in past year</i>					
<3	19.0% (19/100)	51.6% (325/630)	–	–	–
3–10	37.0% (37/100)	30.6% (193/630)	3.29	1.71–6.36	0.000
>10	44.0% (44/100)	17.8% (112/630)	6.80	3.57–12.93	0.000
<i>Unprotected anal sex with any male</i>	60.0% (60/100)	33.5% (155/629)	2.96	1.80–4.88	0.000
<i>Unprotected anal sex with four most recent partners of opposite or unknown HIV status</i>	9.3% (9/97)	4.0% (24/600)	2.39	0.86–6.65	n.s.
<i>Self-reported HIV test result</i>					
HIV+	14.0% (14/100)	13.7% (86/626)	3.04	0.81–11.40	0.09
HIV–	82.0% (82/100)	72.5% (454/626)	3.47	1.00–11.51	0.04
Never tested	4.0% (4/100)	13.7% (86/626)	–	–	–
<i>Physical domestic violence</i>	45.0% (45/100)	19.2% (121/631)	3.47	2.08–5.79	0.000
<i>CES-D scores, trichotomized</i>					
22–60 (depressed)	21.0% (21/100)	14.9% (94/632)	1.60	0.88–2.91	n.s.
16–21 (distressed)	14.0% (14/100)	12.8% (81/632)	1.21	0.56–2.58	n.s.
0–15 (normal)	65.0% (65/100)	72.3% (457/632)	–	–	–

n.s., not significantly different between MDMA users and non-users.

more frequently may be less predisposed to such feelings, and hence may be able to use the drug more frequently. It is also of concern that MDMA users were more likely to be victims of domestic violence, which may be a cause or a result of such drug use, or may be related to other factors such as inclinations toward self-destructive behavior. Further research is clearly needed to assess the relationships between these variables. The finding that MDMA use was not related to HIV positivity may be due to the fact that the drug is used more by younger gay men who overall may have lower seroprevalence than older gay men. Older gay men are more likely to have had sexual experiences before safer sex messages had been developed, and may thus still be infected though they are currently less sexually active. In short, these findings support several avenues for future research efforts.

The study has several potential limitations. As it employed a structured instrument, more detailed information about the relationships between the variables under study was not possible to gather. For example, it is not clear whether those who did not use MDMA in the past 6 months may have used it previously. Social desirability was not examined either. Thus the rates of behaviors perceived as possibly undesirable—such as

unsafe sex and MDMA use—may be underreported. Consequently, the rates of such behaviors reported here may represent lower estimates of their prevalence in this population. However, in general, telephone interviews may provide additional privacy over face-to-face interviews that may, in turn, enhance reporting of sensitive behaviors (Catania et al., 1995). It is of note that these reported levels of unsafe sex and drug use were as high as they were. Moreover, these rates are not inconsistent with those reported in other populations—either nationally or our study of MSMs recruited at gay clubs, cited above. Furthermore, the present study found that self-reported HIV status is remarkably consistent with results acquired through biological testing. A random subset of UMHS respondents were sent HIV oral home test kits, and laboratory results revealed 100% of self-reported HIV-positives tested positive, but <2% of self-reported HIV-negatives and men who had never been tested also came up positive (Osmond et al., 2000). In addition, it is possible that bias may have occurred in the estimation of the relationships found between variables. However, as we did not measure social desirability, it was impossible in this study to assess its impact on the data collected (e.g. to control for it as a variable). Moreover, these relationships between drug

Table 2
 Characteristics of high versus low MDMA users

	High users of ecstasy in past 6 months	Low users of ecstasy in past 6 months	High users versus low users of ecstasy in past 6 months		
	Frequency (n/N)	Frequency (n/N)	O.R.	95%CI	P
<i>Age</i>					
<40	95.8% (46/48)	78.8% (41/52)	7.43	1.81–30.54	0.006
>40	4.2% (2/48)	21.2% (11/52)	–	–	–
<i>Education</i>					
College degree	89.4% (42/47)	82.7% (43/52)	1.51	0.43–5.30	n.s.
Advanced degree	10.6% (5/47)	17.3% (9/52)	–	–	–
<i>Ethnicity</i>					
White	85.4% (41/48)	82.7% (43/52)	1.24	0.34–4.49	n.s.
Persons of color	14.6% (7/48)	17.3% (9/52)	–	–	–
<i>Income</i>					
\$80 000 or less	65.2% (30/46)	78.8% (41/52)	1.96	0.66–5.78	n.s.
More than \$80 000	34.8% (16/46)	21.2% (11/52)	–	–	–
<i># gay/bi friends</i>					
Half or less	25.5% (12/47)	34.6% (18/52)	1.53	0.58–4.04	n.s.
More than half	74.5% (35/47)	65.4% (34/52)	–	–	–
<i># family out to</i>					
Half or more	56.3% (27/48)	80.4% (41/51)	3.23	1.07–9.73	–
Less than half	43.8% (21/48)	19.6% (10/51)	–	–	–
<i># friends out to</i>					
All	68.1% (32/47)	80.4% (41/51)	1.97	0.61–6.37	n.s.
Not all	31.9% (15/47)	19.6% (10/51)	–	–	–
<i># employers out to</i>					
Any	82.2% (37/45)	85.7% (42/49)	1.29	0.28–5.80	n.s.
None	17.8% (8/45)	14.3% (7/49)	–	–	–
<i># coworkers out to</i>					
All	60.9% (28/46)	68.0% (34/50)	1.33	0.51–3.49	n.s.
Not all	39.1% (18/46)	32.0% (16/50)	--	–	–
<i># neighbors out to</i>					
Half or more	70.5% (31/44)	89.4% (42/47)	3.40	1.00–11.57	0.05
Less than half	29.5% (13/44)	10.6% (5/47)	–	–	–
<i>Community participation scale</i>					
0–3 activities	63.8% (30/47)	55.8% (29/52)	1.38	0.55–3.43	n.s.
4–8 activities	36.2% (17/47)	44.2% (23/52)	–	–	–
<i>Affiliation with gay community^a</i>					
Low/moderate	36.2% (17/47)	34.6% (18/52)	1.07	0.35–3.32	n.s.
High	31.9% (15/47)	32.7% (17/52)	.95	0.31–2.86	n.s.
Very high	31.9% (15/47)	32.7% (17/52)	–	–	–
<i># bar/club visits</i>					
<52	21.7% (10/46)	63.5% (33/52)	–	–	–
>52 (>weekly)	78.3% (36/46)	36.5% (19/52)	6.39	2.47–16.55	0.000
<i># sex club/bathhouse visits</i>					
0	60.4% (29/48)	57.7% (30/52)	1.11	0.42–2.92	n.s.
>1	39.6% (19/48)	42.3% (22/52)	–	–	–
<i># one night sexual encounters with men</i>					
<11	53.2% (25/47)	69.2% (36/52)	2.01	0.66–6.09	n.s.
>11	46.8% (22/47)	30.8% (16/52)	–	–	–
<i># male partners in past year</i>					
<3	14.9% (7/47)	21.2% (11/52)	1.49	0.41–5.35	n.s.
>3	85.1% (40/47)	78.8% (41/52)	–	–	–
Unprotected anal sex with any male	61.7% (29/47)	59.6% (31/52)	1.02	0.39–2.65	n.s.
Unprotected anal sex with four most recent partners of opposite or unknown HIV status	4.3% (2/46)	13.7% (7/51)	3.75	0.54–25.69	n.s.

Table 2 (Continued)

	High users of ecstasy in past 6 months	Low users of ecstasy in past 6 months	High users versus low users of ecstasy in past 6 months		
	Frequency (n/N)	Frequency (n/N)	O.R.	95%CI	P
<i>Self-reported HIV test result</i>					
HIV +	6.4% (3/47)	21.2% (11/52)	–	–	–
HIV – /Never tested	93.6% (44/47)	78.8% (41/52)	3.87	1.14–13.16	0.03
Physical domestic violence	40.4% (19/47)	48.1% (25/52)	1.34	0.49–3.67	n.s.
<i>CES-D scores, Dichotomized</i>					
22–60 (depressed)	12.8% (6/47)	28.8% (15/52)	2.75	0.76–9.91	n.s.
0–21 (normal-distressed)	87.2% (41/47)	71.2% (37/52)	–	–	–

n.s. = not significantly different between more frequent and less frequent MDMA.

^a Odds ratios reflect comparison with Very high level of affiliation with gay community. Further analyses between low–moderate and high affiliation revealed OR: 1.12, 95% CI: 0.38–3.30, n.s.

use and high risk sexual activity are similar to those found for other drugs as well. Another potential limitation is the possible effect of multiple comparisons. The significance levels presented are not corrected for the effects of multiple comparisons (approximately 44 in the initial analyses). Chance associations may have occurred due to the number of comparisons, particularly when we assessed comparisons of marginal statistical significance. However, classical Bonferroni corrections often tend to be overly conservative in research such as this. In addition, a consistent overall pattern emerged broadly across variables. We present the findings without correction, allowing readers to judge the results for themselves. These findings can be pursued more rigorously in future studies.

The fact that the sample was 80.5% Caucasian may underrepresent minority MSM citywide. In addition, the minority men in the sample may not be representative. The study sampled men from zip codes estimated to be sufficiently MSM-dense as to allow recruitment of

a probability sample of MSM in a cost-efficient manner. To the extent that minority MSM live in other regions of the New York City area that have lower MSM densities, those minority MSM are underrepresented when extrapolating to New York City as a whole. Subsequent research can investigate MDMA use among samples of MSM that include more minorities as well, or exclusively among minority MSM. However, such studies have always involved nonrepresentative samples of opportunity in order to avoid the prohibitive costs of securing probability samples from these subpopulations.

The reader should keep in mind that the sample in the present study is obtained from the residential population of MSM living in selected zip codes in New York City. Consequently, the findings cannot be directly inferred to residential MSM living outside these zip codes nor extended to non-residential MSM (e.g. the homeless, transients, and MSM in prison). Representative samples of MDMA users that include these sub-

Table 3
Multiple regression—variables significantly associated with MDMA users versus non-users

	Odds ratio	95% confidence interval	P value
<i>Age</i>			
18–29 versus 50+	20.58	2.59–163.16	0.004
30–39 versus 50+	9.12	1.19–69.91	0.03
18–29 versus 40–49	4.42	1.91–10.23	0.001
18–29 versus 30–39	2.25	1.17–4.32	0.01
<i>Unprotected anal sex with any male</i>	2.34	1.30–4.20	0.004
<i># bar/club visits</i>			
13–50 versus <13	4.42	1.98–9.85	0.000
> 50 versus <13	9.99	4.51–22.15	0.000
> 50 versus 13–50	2.25	1.20–4.24	0.01
<i>Physical domestic violence</i>	2.28	1.27–4.07	0.005
<i># of gay/bi friends</i>			
>half versus <half	2.52	1.08–5.83	0.03

Table 4
Multiple regression—variables significantly associated with high frequency of MDMA use versus low frequency

	Odds ratio	95% confidence interval	P value
# of bar/club visits <52 versus >52	8.57	3.20–22.98	0.000
# family out to <half versus >half	3.42	0.94–12.40	0.06
# friends out to <all versus all	3.71	0.99–13.80	0.05
Community participation scale 0–3 versus 4–8 activities	3.55	0.97–12.98	0.05
CES-D scores 0–21 versus 22–60	3.94	0.96–16.10	0.06

populations may well yield different results, although they would need to assess sexual orientation to yield comparable findings.

In short, MDMA users are a group at risk that are young, are engaging in high risk sexual behaviors that may expose them to HIV or other STDs, are victims of domestic violence, and are using MDMA which may cause neurotoxicity. MDMA users as a group thus may face several important threats to their health. Part of the public health problem may lie in the fact that MDMA may be perceived as being safe because it is non-addicting. Clearly, there is a need to research perceptions of the drug as safe or unsafe, and in what ways it is or is not seen as posing risks.

MDMA use presents particular challenges in terms of possible interventions. MSM users are more out and involved in the gay community than MSM non-users. Being 'out' can thus be psychologically advantageous in terms of dealing with stigma, but may also place individuals in settings in which MDMA is used. Indeed, for many men, MDMA use may be part of a process of entry and socialization into gay culture itself. As active members of the gay community, these individuals have presumably been exposed to safer sex messages, yet do not wholly follow these guidelines. However, as this population is more involved in the gay community, it may also be more reachable through further interventions than some others. Interventions targeting this population will have to be designed to accommodate these MSM-specific social and socializing influences. In addition, it is of concern that heavy MDMA users are less out, suggesting that they may be more difficult to reach through interventions. In short, a multifaceted intervention is needed, with attention to different patterns and possible subsets of users, and to problems associated with use such as comorbidity, and domestic violence. Gay-specific and community-based interven-

tions and treatment models may be helpful in addressing these issues in this population.

In sum, this study represents the first report of MDMA use among a probability sample of MSM, and the first to assess the relationship between MDMA use and depression, domestic violence, and several critical parameters of sexual activity. These findings are thus important as little is known about MDMA, yet it is of increasing use among MSMs and others. The data suggest that MSM MDMA users represent a group at risk for the transmission of HIV and other STD's, and for domestic violence, yet they have received little attention, and require further investigation and attention to address these concerns.

Acknowledgements

We would like to acknowledge Joseph Catania and the team of the Urban Men's Health Study (UMHS) at the Center for AIDS Prevention Studies and the AIDS Research Institute, University of California, San Francisco. This work was primarily supported by NIMH Grant No. MH54320 with supplementary support from the National Institute on Aging and the Centers for Disease Control and Prevention's Division(s) of HIV/AIDS. This work was also supported by the National Institute of Mental Health through grant P50-MH43250 to the HIV Center for Clinical and Behavioral Studies at Columbia University, and K08-MH01420-01.

References

- Binson, D., Moskowitz, J., Mills, T., Anderson, K., Paul, J., Stall, R., Catania, J., 1996. Sampling Men Who Have Sex With Men: Strategies for a Telephone Survey in Urban Areas in the United States. *Proceedings of the Section on Survey Research Methods, American Statistical Association*, 68–72.
- Blair, J., 1999. A Probability Sample of Gay Urban Males: The Use of Two-Phase Adaptive Sampling. *J. Sex Res.* 36, 39–44.
- Capell, F.J., Schiller, G., 1989. Efficiency of general population screening for persons at an elevated risk of HIV infection: Evidence from a statewide telephone survey of California adults. In: Fowler, F.J., ed. *Fifth Conference on Health Survey Research Methods*, Keystone, CO: U.S. Department of Health and Human Services, 167–172.
- Catania, J.A., Binson, D., Canchola, J., Pollack, L.M., Hauck, W., Coates, T.J., 1996. Effects of interviewer gender, interviewer choice, and item wording on responses to questions concerning sexual behavior. *Pub. Opin. Quart.* 60, 345–375.
- Catania, J., Binson, D., van der Straten, A., Stone, V., 1995. Methodological research on sexual behavior in the AIDS era. In: Rosen, R., Davis, C., Ruppel, H. (Eds.), *Annual Review of Sex Research*, vol. 6. The Society for the Scientific Study of Sexuality, Mt. Vernon, IA, pp. 77–125.
- Catania, J.A., Stall, R.D., Osmond, D., Pollack, L., Paul, J.P., Blower, S., Binson, D., Canchola, J.A., Mills, T.C., Fisher, L., Choi, K-H., Porco, T., Turner, C., Blair, J., Henne, J., Bye, L.L.,

- Coates, T.J., 2001. The continuing HIV epidemic among men who have sex with other men. *Am. J. Public Health* 91 (6), 907–914.
- Chesney, M.A., Barrett, D.C., Stall, R., 1998. Histories of substance use and risk behavior: precursors to HIV seroconversion in homosexual men. *Am. J. Pub. Health* 88 (1), 113–116.
- Dolezal, C., Carballo-Diéguez, A., Nieves-Rosa, L., Diaz, F., 2000. Substance use and sexual risk behavior: Understanding their association among four ethnic groups of Latino men who have sex with men. *J. Subst. Abuse* 11 (4), 323–336.
- Dolezal, C., Meyer-Bahlburg, H.F.L., Remien, R.H., Petkova, E., 1997. Substance use during sex and sensation seeking as predictors of sexual risk behavior among HIV+ and HIV- gay men. *AIDS Behav.* 1 (1), 19–28.
- Green, A.R., Cross, A.J., Goodwin, G.M., 1995. Review of the pharmacology and clinical pharmacology of 3,4-methylenedioxymethamphetamine (MDMA or 'Ecstasy'). *Psychopharmacology* 119, 247–260.
- Hansen, M., Hurwitz, W., Madow, W., 1953. *Survey Methods and Theory Vol II Methods and Applications Vol 11 Theory*. Wiley, New York.
- Hays, R.B., Paul, J., Ekstrand, M., Kegeles, S.M., Stall, R., Coates, T.J., 1997. Actual versus perceived HIV status, sexual behaviors and predictors of unprotected sex among young gay and bisexual men who identify as HIV-negative, HIV-positive and untested. *AIDS* 11, 1495–1502.
- Henry, J.A., 1992. Ecstasy and the dance of death. *Br. Med. J.* 305, 5–6.
- Kalton, G., 1993. Sampling considerations in research on HIV risk and illness. In: Ostrow, D.G., Kessler, R.C. (Eds.), *Methodological Issues in AIDS Behavioral Research*. Plenum Press, New York, pp. 53–74.
- Kelly, J.A., Hoffman, R.G., Rompa, D., Gray, M., 1998. Protease inhibitor combination therapies and perceptions of gay men regarding AIDS severity and the need to maintain safer sex. *AIDS* 12, F91–F95.
- Klitzman, R.L., Pope, H.G. Jr, Hudson, J.I., 2000. MDMA ('Ecstasy') abuse and high-risk sexual behaviors among 169 gay and bisexual men. *Am. J. Psychiatry* 157, 1162–1164.
- Krystal, J.H., Price, L.H., Opsahl, C., Ricaurte, G.A., Heninger, G.R., 1992. Chronic 3,4-methylenedioxymethamphetamine (MDMA) use: Effects on mood and neuropsychological function. *Am. J. Drug Alcohol Abuse* 18, 331–341.
- Leigh, B., Stall, R., 1993. Substance use and risky sexual behavior for exposure to HIV. *Am. Psychol.* 48 (10), 1035–1045.
- Lohr, S.L., 1999. *Sampling: Design and Analysis*. Brooks/Cole, Pacific Grove, CA.
- McCann, U.D., Ricaurte, G.A., 1991. Lasting neuropsychiatric sequelae of (+)-methylenedioxymethamphetamine ('Ecstasy') in recreational users. *J. Clin. Psychopharmacol.* 11, 302–305.
- McCann, U.D., Mertl, M., Eligulashvili, V., Ricaurte, G.A., 1999. Cognitive performance in (+/–) 3,4-methylenedioxymethamphetamine (MDMA, 'ecstasy') users: A controlled study. *Psychopharmacology* 143, 417–425.
- McCann, U.D., Szabo, Z., Scheffel, U., Dannals, R.F., Ricaurte, G.A., 1998. Positron emission tomographic evidence of toxic effect of MDMA ('Ecstasy') on brain serotonin neurons in human beings. *Lancet* 352, 1433–1437.
- McGuire, P.K., Cope, H., Fahy, T.A., 1994. Diversity of psychopathology associated with use of 3,4-methylenedioxymethamphetamine ('Ecstasy'). *Br. J. Psychiatry* 165, 391–395.
- McKirnan, D.J., Peterson, P.L., 1989. Psychosocial and cultural factors in alcohol and drug abuse: An analysis of a homosexual community. *Addict. Behav.* 14, 545–553.
- Mulry, G., Kalichman, S., Kelly, J., 1994. Substance use and unsafe sex among gay men: Global versus situational use of substances. *J. Sex. Ed. Therapy* 20 (3), 175–184.
- National Institute on Drug Abuse, 2000. Ecstasy. <http://www.nida.gov/Infobox/ecstasy.html>.
- Osmond, D.H., Catania, J., Pollack, L., Canchola, J., Jaffe, D., MacKellar, D., Valleroy, L., 2000. Obtaining HIV test results with a home collection test kit in a community telephone sample. *J. Acquir. Immune Defic. Syndr.* 24 (4), 363–368.
- Osmond, D.H., Page, K., Wiley, J., Garrett, K., Sheppard, H.W., Moss, A.R., Schragar, L., Winkelstein, W., 1994. HIV infection in homosexual and bisexual men 18 to 29 years of age: the San Francisco Young Men's Health Study. *Am. J. Public Health* 84 (12), 1933–1937.
- Ostrow, D.G., Van Raden, M.J., Fox, R., Kingsley, L.A., Dudley, J., Kaslow, R.A., 1990. Recreational drug use and sexual behavior change in a cohort of homosexual men. *AIDS* 4, 759–765.
- Parrott, A.C., Lasky, J., 1998. Ecstasy (MDMA) effects upon mood and cognition: Before, during and after a Saturday night dance. *Psychopharmacology* 139, 261–268.
- Peroutka, S.J., 1987. Incidence of recreational use of 3,4-methylenedioxymethamphetamine (MDMA, Ecstasy) on an undergraduate campus. *New Engl. J. Med.* 317, 1542–1543.
- Radloff, L.S., 1977. The CES-D Scale: A self-report depression scale for research in the general population. *Appl. Psy. Meas.* 1, 385–401.
- Randall, T., 1992. Rave scene, ecstasy use, leap Atlantic. *J. Am. Med. Assoc.* 268, 1506.
- Ricaurte, G.A., Bryan, G., Strauss, L., Seiden, L., Schuster, C., 1985. Hallucinogenic amphetamine selectively destroys brain serotonin terminal. *Science* 229, 986–988.
- Schmidt, C.J., Wu, L., Lovenberg, W., 1986. Methylenedioxymethamphetamine: a potentially neurotoxic amphetamine analogue. *Eur. J. Pharmacol.* 124, 175–178.
- Signorile, M., 1997. Bareback and restless. *Out* July, 36–37.
- Solowij, N., Hall, W., Lee, N., 1992. Recreational MDMA use in Sydney: a profile of 'Ecstasy' users and their experiences with the drug. *Br. J. Addiction* 87, 1161–1172.
- Stall, R., Wiley, J., 1988. A comparison of alcohol and drug use patterns of homosexual and heterosexual men: The San Francisco Men's Health Study. *Drug Alcohol Depend.* 22, 63–73.
- Stall, R., Paul, J.P., Greenwood, G., Bein, E., Crosby, G.M., Mills, T.C., Pollack, L., Binson, D., Coates, T.J., Catania, J.A. Patterns of alcohol, drug use and alcohol-related problems among men who have sex with men: the Urban Men's Health Study. Manuscript under review.
- Stata Corp., 1999. *Stata Statistical Software: Release 6.0*, College Station, TX: Stata Corporation.
- Stone, D.M., Stahl, D.C., Hanson, G.R., Gibb, J.W., 1986. The effects of 3,4-methylenedioxymethamphetamine (MDMA) and 3,4-methylenedioxyamphetamine (MDA) on monoaminergic systems in the rat brain. *Eur. J. Pharmacol.* 128, 41–48.
- Sudman, S., 1976. *Applied Sampling*. Academic Press, New York.