

Epidemiology of MDMA and Associated Club Drugs in the Seattle Area

CALEB BANTA-GREEN,¹ GARY GOLDBAUM,^{2,3}
SUSAN KINGSTON,² MATTHEW GOLDEN,^{2,3}
RICHARD HARRUFF,² AND BARRY K. LOGAN⁴

¹Alcohol and Drug Abuse Institute, University of Washington, Seattle, Washington, USA

²Public Health, Seattle & King County, Washington, USA

³University of Washington, Seattle, Washington, USA

⁴Washington State Patrol, State Toxicology Laboratory, Washington, USA

Club drug use, MDMA in particular, appeared as a growing problem in the Seattle area in the late 1990s. To understand more about the patterns of MDMA use and to evaluate the current state of MDMA use, multiple data sources were examined. The seven data sources utilized included local community-based club drug surveys collected in 2003 at raves, treatment agencies, and gay-oriented bars and sex clubs; school surveys (collected in 2002); mortality data (deaths between 2000 and 2002); data from the sexually transmitted disease clinic (October 2002 to October 2003); focus groups (2003) with men who have sex with men; emergency department drug mentions (1995 to 2002); and drug treatment admissions (1999 to 2003). Taken together, these data indicate moderate levels of MDMA use and relatively low levels of mortality and acute morbidity. However, there are several areas of concern including possible mental health effects and high levels of suspected adulteration of MDMA. Some data point to a relationship between MDMA use and risky behaviors including unprotected sex. Implications for prevention, intervention, and treatment are discussed.

Keywords MDMA/Ecstasy; club drugs; drug use epidemiology; data triangulation; health consequences

Introduction

The Seattle area, like many large metropolitan areas across the United States (Johnston, O'Malley, and Bachman, 2002), saw a rise in the use of MDMA ("Ecstasy") and, to a lesser extent, other club drugs among its youth and young adults during the late 1990s (Banta-Green et al., 2003). Locally, Seattle would appear to be a magnet for club drugs because of its large urban population (563,374 in 2000), easy access by interstate freeways, role as a regional drug distribution hub, and many popular rave dance events and clubs. Club drugs are of great interest in the Seattle area due to high levels of use compared to national averages, reports of problematic behaviors, and morbidity and mortality associated with club drugs.

Address correspondence to Caleb Banta-Green, Alcohol and Drug Abuse Institute, University of Washington, 1107 NE 45th Street, Suite 120, Seattle, WA 98105, USA. E-mail: calebbg@u.washington.edu

To better understand the true scope and nature of problems associated with these substances, a community-based survey was conducted in 2003 as part of a Center for Substance Abuse Prevention, Substance Abuse and Mental Health Services Administration funded project. Detailed analyses of six additional data sources added to our understanding of club drug usage patterns and impacts. Findings have relevance for prevention, intervention, and treatment efforts. Three subpopulations were of particular interest: 1) men who have sex with men (MSM) due to anecdotal reports of club drug use in venues associated with higher rates of HIV transmission such as bars and sex clubs, 2) rave/dance club attendees because of the reported association between rave music and club drug use (Forsyth, Barnard, and McKeganey, 1995) and the City of Seattle's history of providing permits for large rave dance parties, which has raised both political and public health questions, and 3) youth in alcohol and drug treatment agencies who represented a convenient sample of those at potentially elevated risk for club drug use given their history of alcohol and other drug use.

For this paper, "club drugs" will be considered to be MDMA (3,4-methylenedioxy-methamphetamine) commonly called "Ecstasy," gamma-hydroxybutyrate (GHB), ketamine, Rohypnol[®], LSD, and research chemicals. This group of drugs represents a broad array of legal and illegal substances with varying effects: MDMA, which is illegal, is considered both a psychedelic and a stimulant; LSD is illegal and a psychedelic; GHB is a depressant and is available primarily illicitly, though it has recently been approved in prescription form for narcolepsy; analogs of GHB are also available illicitly; Rohypnol (flunitrazepam) is a benzodiazepine, not currently approved for prescription in the U.S.; and ketamine, which has legal uses as an anesthetic, and has dissociative psychological effects. Research chemicals are a broad array of chemicals that may have psychoactive effects, but are poorly studied and often used by those interested in exploring potentially new psychedelic experiences. The two most common sources of information of research chemicals include the Internet and books by Shulgin and Shulgin (1995, 1997). There are many such chemicals; two in particular were believed to be more common in 2003, "2C T7" [(2,5-dimethoxy-4-(n)-propylthiophenethylamine)] and "Foxy Methoxy" (N,N-diisopropyl-5-methoxytryptamine), and these were included as examples for the community-based survey.

Methods

Seven sources of data were compared to evaluate the prevalence of club drug use and associated risk behaviors, morbidity, and mortality. These data sources and four others not detailed in this paper are summarized in Table 1. Four data sources were not included in these analyses because of limitations related to data quality or small numbers; however, these data sources can offer valuable insights, particularly in combination with other information sources. Of the seven data sets utilized, five have not previously been analyzed with a focus on club drug use, and these include: local community-based club drug surveys, school surveys, mortality data based upon toxicology lab analyses and medical examiner investigations, data from the sexually transmitted disease (STD) clinic, and focus groups. This is the first analysis to compare each of these seven types of data to each other. Two of the data sources involving primary data collection by the authors are detailed below.

Community Survey Data

Survey data were obtained from four populations in the King County area: youth in treatment agencies, rave attendees, MSM surveyed at gay bars, and MSM surveyed at sex

Table 1
Major sources of epidemiological data on club drug use

Data name	Population	Data type	Major strengths	Major limitations	Drug terminology	Drug type determination	Included in paper
Emergency Dept., Drug Abuse Warning Network	E.D. patients (n = 1,646 for the 5 club drugs, 1995–2002)	Quantitative	Population-based estimates Annual trend data	Cannot assign causation to specific drug in multi-drug cases. Social desirability bias Reporting bias by medical providers and data coders	Specific Drug Names i.e., MDMA, GHB, LSD	Self-report	Yes
School surveys	Seattle public school students grades 6–12 (n = 9,095 in 2002)	Quantitative	Anonymous self-report survey Large sample.	Out-of-school youth not surveyed Prior years discordant terminology Social desirability bias	MDMA, Hallucinogens i.e., LSD and other psychedelics	Self-report	Yes
Community-based survey—Project STEPS	Youth in treatment, raves/clubs, gay bar and gay sexclub/bathhouses (n = 606)	Quantitative and qualitative	Specific “club drugs” used, patterns of use, and related consequences	Convenience sample One-time survey Social desirability bias	Specific drug names—detailed names & slang terms for 11 club drugs	Self-report	Yes
Focus group	Men who have sex with men (n = 50)	Qualitative	Detailed drug use and HIV risk behaviors including personal motivations and beliefs	Convenience sample Social desirability bias	Specific drug names i.e., MDMA, GHB, LSD	Self-report	Yes

(Continued on next page)

Table 1
Major sources of epidemiological data on club drug use

Data name	Population	Data type	Major strengths	Major limitations	Drug terminology	Drug type determination	Included in paper
STD clinic data	Clinic patients (n = 8,640)	Quantitative	Measures of association between drug use, STD prevalence, demographics, and risk factors	Role of drug use underlying statistical association unknown	Ecstasy	Self-report	Yes
Mortality— Medical examiner & toxicology lab	All sudden, unexpected, and unnatural deaths (13 MDMA cases 2000–2002)	Quantitative	Population-based Annual trend data	Assigning causation to specific drug in multi-drug cases Difficult to detect exogenous GHB	Precise chemical names	Laboratory analysis	Yes
Drug treatment admissions	Publicly funded treatment admissions (n = 141 hallucinogen users, 1999–2003)	Quantitative	Indication of problematic use of drugs Large population Annual trend data	Club drugs rarely a primary drug of abuse Private pay treatment admissions not included	Hallucinogens, e.g., LSD, mescaline, peyote	Self-report	Yes

Alcohol and drug helpline	All callers	Quantitative	Indication of drugs concerning public Annual trend data	Subject to historical bias as knowledge of drug increases Cannot discern drug use vs. informational calls	Specific drug names, i.e., MDMA, GHB, LSD	Self-report	No
Poison center calls	Residential and medical facilities	Quantitative	Indication of problematic drugs Annual trend data	Subject to historical bias as knowledge of drug increases Cannot discern drug use vs. informational calls	Specific drug names, i.e., hallucinogenic amphetamine, GHB and analog/precursor, LSD	Self-report	No
Fire and police departments	All incidents in the County under their jurisdiction	Quantitative and qualitative	Health and legal impacts of drug use Neighborhood level data Annual trend data	Historical bias due to changing enforcement priorities and knowledge of emerging drugs	Specific drug names, i.e., MDMA, GHB, LSD	Self-report and laboratory analysis	No
Federal law enforcement	All incidents in the County/State under their jurisdiction	Quantitative and qualitative	Drug price and purity Impacts of trafficking and distribution in drug availability and use patterns Annual trend data	Historical bias due to changing enforcement priorities and knowledge of emerging drugs Only incidents involving major drug trafficking organizations	Specific drug names, i.e., MDMA, GHB, LSD	Laboratory analysis	No

clubs/bathhouses. All subjects had to be aged 14 or older and capable of understanding and providing oral consent/assent for the brief, self-administered survey. The survey included questions about demographics; locations where subjects socialized; patterns of drug use, including specific club drugs such as MDMA, GHB, and research chemicals; safety procedures related to MDMA use; risk behaviors associated with drug use; and, for MSM, detailed questions about sexual risk behaviors. All study procedures, including obtained waivers of both written and parental consent, were approved by the Human Subject's Division at the University of Washington. Pearson's chi-square tests, Fisher's exact test, and ANOVA were utilized for data analyses.

Four youth drug-treatment agencies participated, representing a convenience sample of agencies in the King County area. Subjects were recruited either by agency staff or by research staff, whichever was most appropriate for the facility and program. All participants from these treatment agencies had a history of alcohol and/or drug use. Five gay bars, one gay bathhouse, and one gay sex club served as venues for MSM surveying, all were located in the Seattle area. Subjects were recruited and surveyed outside of bars and inside of the main entrances of the bathhouse and sex club per agreement with the management.

Interviewers attended nine raves at eight different venues, all in or near the Seattle metropolitan area, ranging from fewer than 200 up to 2800 attendees. Subjects were recruited and surveyed outside of raves and clubs. These raves represented a convenience sample, with the intent of reaching subjects at events of various sizes, with a range of musical styles and event promoters. Interviewers attempted to recruit all venue attendees. At large events such as raves with lines outside of the venues, interviewers split up into pairs and worked different parts of the line. Surveying took place in 3-hour shifts, between 9 p.m. and 2 a.m. depending upon the event.

MSM Focus Groups

In May 2003, Seattle's MSM STD (sexually transmitted disease) Task Force conducted a series of focus groups to determine the prevalence and patterns of club drug and other substance use (particularly related to sexual activity and HIV risk) among five subgroups of MSM: youth (ages 14–22), HIV-negative men, HIV-positive men, African-Americans, and men in drug treatment or early recovery. Each group involved 10 participants from a variety of race, age, HIV status, and socioeconomic backgrounds who have current or past experience with illicit drug use. Focus group questions were designed to explore: 1) the role of drugs in sex, HIV risk behavior, gay identity, and social network development; 2) community norms and beliefs about drug use and associated risks; and 3) ways to improve drug-related health messages and services for MSM. Specific drug names were not offered by focus group facilitators; rather, focus group participants were encouraged to discuss the names of specific drugs with which they were familiar.

Results

Prevalence and Patterns of Use

Demographics of the community club drug survey respondents at each venue are presented in Table 2. The median age of respondents differed substantially according to the setting in which they were surveyed. Average age by venue and MDMA use are presented in Table 3. Significant differences in the average age of respondents were seen based upon whether

Table 2
Community based survey: demographics

Survey location	Bathhouse/sex club (n = 135)	Gay bar (n = 100)	Rave (n = 310)	Youth treatment agency (n = 64)
Response rate	40%	53%	68%	97%
Median age (min-max)	40 (24–66)	37 (19–60)	20 (14–46)	17 (14–20)
Race				
White	80%	89%	72%	53%
African-American	4%	1%	3%	8%
Asian	5%	3%	8%	11%
Other race	12%	7%	17%	27%
Gender				
Male	100%	100%	58%	80%
Sexual orientation				
Straight	1%	0%	75%	84%
Gay	86%	92%	2%	6%
Bisexual	13%	7%	15%	3%
Other	0%	1%	3%	2%
Unsure	0%	0%	4%	5%

they used MDMA. MSM surveyed at bars and bathhouses/sex clubs who used MDMA were significantly younger than those who did not use MDMA, whereas those surveyed at raves who used MDMA were older than nonusers at raves. Those who had ever used MDMA were much more likely to use almost all other drugs. This finding held true regardless of the venue where subjects were recruited (Table 3). Only those surveyed at raves mentioned research chemicals with any frequency, 26% of MDMA users had ever used research chemicals significantly more than the 1% of non-MDMA users.

Raves/dances were the one location where respondents who used MDMA were consistently and significantly more likely to socialize regardless of where surveyed. Among MDMA users surveyed at gay bars, for instance, 30% reported attending raves/dances compared with 9% of non-MDMA users.

Data related to behaviors associated with MDMA in the past 6 months were collected for all groups. However, numbers were too small for analysis except for those recruited at raves. Among those surveyed at raves who reported on behaviors associated with MDMA in the prior 6 months, unprotected sex was reported by nearly a third and 38% reported driving under the influence of MDMA. The proportion who reported having “overdosed, passed out or had a bad experience” caused by MDMA was 15%. Six percent agreed that their use of MDMA was “out of control (or they) had a hard time stopping use” in the past 6 months. A larger proportion, 26%, said they agreed that they thought they might “have problems years down the road . . . such as memory or health problems” due to their MDMA use. Use of adulterated MDMA was reported by respondents in all groups, from a low of 29% among bathhouse attendees to 59% among rave attendees.

A minority of respondents reported having “ever used any anti-depressant medications like Prozac[®] or Zoloft[®] specifically to try to control the effects of Ecstasy.” Between 12% and 18% of respondents (depending on survey venue) who had ever used MDMA indicated

Table 3
Community based survey: drug use associated with MDMA use

Survey location	MSM at bathhouse/sexclub			MSM at gay bar			Rave/dance club			Youth treatment agency		
	MDMA ever (n = 33)	No MDMA (n = 102)	P-value	MDMA ever (n = 47)	No MDMA (n = 53)	P-value	MDMA ever (n = 230)	No MDMA (n = 78)	P-value	MDMA ever (n = 23)	No MDMA (n = 40)	P-value
Mean age	37	41.2	0.02	34.9	38.3	0.04	21.9	20.1	0.01	16.8	16.8	0.93
Drugs ever used %												
Alcohol	100	91	0.07 ^a	100	94	0.15 ^a	99	77	0.00	100	93	0.26 ^a
Marijuana	91	56	0.00	94	72	0.00	96	52	0.00	96	90	0.40 ^a
LSD	64	20	0.00	57	19	0.00	67	6	0.00	35	5	0.00
GHB	33	1	0.00 ^a	40	0	0.00	37	3	0.00	9	0	0.06
Ketamine	33	1	0.00 ^a	45	0	0.00	40	1	0.00	17	0	0.01 ^a
Research chemicals	6	0	0.06 ^a	9	0	0.05 ^a	26	1	0.00	9	0	0.13 ^a
Dextromethorphan	9	3	0.16 ^a	6	2	0.27 ^a	33	1	0.00	30	10	0.04
Mushrooms	73	22	0.00	68	15	0.00	80	10	0.00	74	27	0.00
Poppers	82	51	0.00	81	34	0.00	20	0	0.00	13	0	0.04 ^a
Cocaine powder	67	22	0.00	60	26	0.00	58	5	0.00	52	24	0.03
Cocaine crack	27	9	.01 ^a	15	9	0.40	22	1	0.00	17	2	0.03
Heroin	15	3	.02 ^a	11	0	0.02 ^a	14	0	0.00	13	5	0.24
Methamphetamine	61	15	0.00	51	8	0.00	50	5	0.00	35	10	0.02 ^a
Prescription opiates	18	8	.09 ^a	19	9	0.13	42	6	0.00	57	20	0.00
Benzodiazepines/ downers	27	9	.01 ^a	21	2	0.00	31	6	0.00	39	10	0.01 ^a

^aFisher exact test, cell size expected <5.

they had used antidepressants for this purpose. Use of vitamins and supplements believed to be protective against the depressant effects of MDMA were reported by respondents in response to an open-ended response item about what “other” things did they do to “try to make (their) use of Ecstasy safer”; open-ended responses to this question revealed that 16% took vitamins and 11% took 5-hydroxytryptophan (5-HTP).

Use of MDMA and hallucinogens was higher among Seattle school survey respondents for all measures of use compared to similar national data collected as part of the Monitoring the Future study (Johnston, O’Malley, and Bachman, 2002). Lifetime MDMA use was 11% among 12th graders nationally compared to 16% in Seattle, use in the prior 30 days was 2% nationally and 6% locally. Public school survey data indicate that 14.9% of 12th graders reported lifetime use of “hallucinogens,” defined as LSD and other psychedelics, with 3.6% reporting use in the prior 30 days (Seattle Public Schools, 2002). Prior 30-day use levels were particularly high for both eighth and tenth graders at 5%. MDMA use was second only to marijuana among illicit drugs. Use of MDMA is higher among those surveyed in the community-based survey in comparison to local school survey findings. Specifically, while the Seattle school survey shows that 16% of 12th graders have reported lifetime use of MDMA, community-based survey data reveal that 45% of those surveyed at youth treatment agencies and 62% of rave attendees aged 17 and 18 reported lifetime use of MDMA.

Approximately half of all groups surveyed who had ever used MDMA had not used MDMA in the past 6 months and the majority of those who did use reported use less than monthly. In contrast, only 10% to 20% of lifetime alcohol users reported no use in the past 6 months, and those who did use alcohol were most likely to report using three or more times per week. Not only are users of MDMA less likely to be active users than drinkers, those who do use do so much less frequently.

MSM Focus Group Results

With the exception of the African-American focus group, all groups described MDMA, which they often called “E,” as a “commonly used” drug. MDMA, GHB, and ketamine use in general were seen as less prevalent than that of methamphetamine, cocaine, or marijuana among Caucasian MSM over the age of 25 and as equally prevalent among younger MSM. Use of other drugs such as GHB, LSD, and other hallucinogens appeared limited to younger MSM. Ketamine is rarely used by any MSM. Internet chat rooms and phone sex lines were unanimously identified as venues in which men are introduced to or look for drugs, and the presence of drugs in these venues is growing.

Drug use and sexual activity were inextricably connected for all participants who also reported strong expectancies that MDMA and other drugs lowered inhibitions and increased courage to find sex partners, try new sexual experiences, or go to gay venues they might not otherwise frequent (e.g., bathhouses and sex clubs). Most rarely had sex without drugs. Use of club drugs remains primarily a “weekend” or “party” activity and is rarely viewed as addictive or problematic unlike stimulants, marijuana, or heroin.

Few adult MSM could articulate risks or negative consequences from club drug use, except for most HIV-positive men who knew the contraindication between MDMA and Ritonavir, an HIV medication. Youth, however, were much better informed about the potential dangers of using club drugs in combination and about the fluctuating purity of MDMA. All participants agreed they were more likely to have unprotected sex while high, although the knowledge of that risk often had little impact on individual safer-sex behavior.

Young MSM believed that drug use was an expected part of entering the adult gay community and that traditional drug prevention messages heard in school did not prepare

them for the strong cultural and sexual context of drug use found in the mainstream gay community. Youth felt that peer influence was a significant factor in drug use initiation, a protective factor against first use, and a strong motivator for changing drug behavior. Participants also voiced a strong need for more concrete, realistic prevention messages about club drugs. As one participant stated, “‘Believe in yourself’ is nice, but not useful.”

Morbidity/Mortality

Lifetime prevalence of MDMA use was 14% among MSM compared with 10% among non-MSM and 8% among women seen at Public Health-Seattle & King County’s STD clinic between October 2002 and October 2003. MDMA users were younger and less likely to be African-American (Table 4). MSM who had ever used MDMA were more likely to report unprotected anal sex and were more likely to be diagnosed with an STD than MSM who had never used MDMA. Among women, those who used MDMA had more sex partners on average.

Of the 13 deaths in which MDMA was identified, three were determined to have resulted at least partly from MDMA. Nine of the 10 cases with MDMA present, but ruled as not directly causative in the death, were due to gunshot wounds or motor vehicle accidents, with one ruled a drug overdose due to methamphetamine and amphetamine. In four of the 10 cases, MDMA was above the recreational level, yet death was ruled to be caused by physical trauma due to a gunshot wound or motor vehicle accident. Three of the deaths were suicides involving gunshots to the head, in two of these cases only MDMA was identified.

Other club drugs are rarely identified in deaths. Ketamine has been detected in one death locally in 2003; in this instance, six other drugs were also detected. GHB was detected in three deaths in 2002; in one death it was the only drug, in another it was in combination with methamphetamine, and in the third it was in combination with alcohol and fentanyl. These are the only deaths known to have involved these drugs from 1997 to 2003. Research chemicals have not been identified in any medical examiner reports during this time, though key informants in the rave community indicate two deaths believed to involve 2C T7 in 2001. Many research chemicals are very difficult to detect via toxicological analysis.

As shown in Fig. 1, from 1995 to 2002, estimated emergency department mentions for King and Snohomish counties for MDMA and GHB increased, while LSD decreased (Office of Applied Studies, 2003). LSD represented 96% of all club drug mentions in 1995, declining to 19% of all such ED mentions in 2002. At the same time, MDMA increased from 10 to 86 mentions, with a peak in 2000 of 128 mentions. GHB increased from 0 to 54 mentions. In 2002, 70% of visits in which MDMA was mentioned also involved another drug. Ketamine and Rohypnol were rarely mentioned.

MDMA users seen in area emergency departments are mostly white, with a slightly larger proportion male than female. Those aged 18–25 years represented half or more of patients for the 8-year period. LSD users were also mostly white, male, and somewhat older than MDMA users. Eighteen-to-25 year olds represented 39% of LSD mentions in 2002. From 1995 to 2002 the proportion of club drug mentions relative to all mentions for major substances of abuse, alcohol, and illicit drugs, declined from 3.1% to 1.2%.

Treatment admissions for hallucinogens as the primary drug of abuse have remained very low from 1999 to 2003 with fewer than 50 each year. Twenty-eight percent of admissions were female, 72% were white, and 52% were under age 18 during this time frame. Anecdotal reports from treatment providers indicate that clients who use club drugs rarely indicate them as primary drugs of concern or that use is problematic.

Table 4

STD clinic patients—association of any lifetime ecstasy use with demographic characteristics, reason for clinic visit, sexual behavior and STD diagnosis, October 2002–October 2003

	Women			Heterosexual men			Men who have sex with men		
	Ecstasy ever (n = 228)	No ecstasy (n = 2507)	P-value	Ecstasy ever (n = 414)	No ecstasy (n = 3913)	P-value	Ecstasy ever (n = 223)	No ecstasy (n = 1349)	P-value
Mean age	24	28	0.00	28	34	0.00	30	35	0.00
African-American	11%	23%	0.00	18%	26%	0.00	3%	9%	0.00
Reason for visit: sexual partner had STD or health dept. contacted them about exposure	15%	14%	0.52	19%	17%	0.36	24%	16%	0.00
Mean number sex partners 2 months	2.6	1.5	0.01	1.5	1.7	0.13	3.2	3.5	0.38
Any unprotected anal/vaginal sex past 2 months	71%	64%	0.07	66%	63%	0.18	58%	40%	0.00
STD ^a	6%	7%	0.59	11%	10%	0.39	26%	22%	0.04
Unprotected anal intercourse with partner unknowns or discordant HIV status past 12 months							36%	30%	0.15

^a Gonorrhea, chlamydial infection or early syphilis.

Source: Public Health-Seattle & King County, STD Clinic.

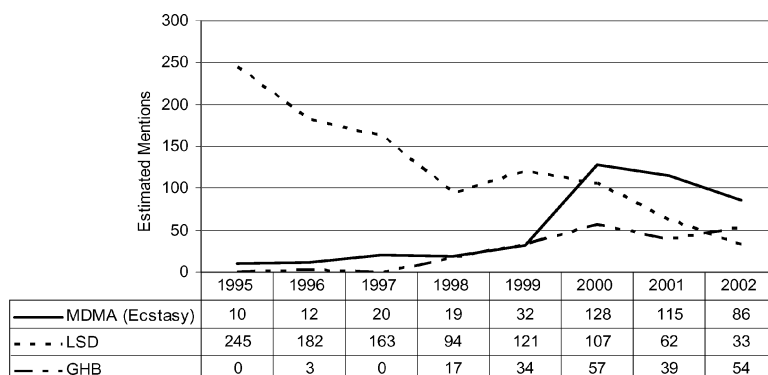


Figure 1. Emergency department estimated mentions King and Snohomish Counties 1995–2002. Adapted from Office of Applied Studies, Drug Abuse Warning Network 2003.

Discussion

Patterns of Drug Use

Among those surveyed at raves who have ever used MDMA, many have not used recently and those who have used report infrequent use. The overall frequency in any given time period for the number of people using MDMA is therefore relatively low, compared to alcohol, for instance. While similar high lifetime use levels among rave attendees has been reported elsewhere, the frequency of use in the prior 30 days in Seattle is lower than that reported in several areas including Baltimore-Washington D.C., 48% (Arria et al., 2002); Montreal, 53% (Gross et al., 2002); and Edinburgh, Scotland, 74% (Riley et al., 2001). The lower frequency of recent use in Seattle may be due to lower use levels. However, it may be due to the broad definition of “raves” used to select venues to include events identified by promoters and the rave community as raves as well as events at established facilities playing rave-type music, which likely attract more diverse participants. Lower frequency of recent use based upon survey data collected in the summer of 2003 may also be due to a temporal trend in which U.S. and Seattle indicator data appear to show a peak in MDMA use in 2000 and 2001 with a decline in subsequent years.

Demographics of MDMA users detailed in mortality, emergency department, MSM focus groups, treatment, and community survey data point to a group of primarily Caucasian users in their late teens to 20s. These demographics are similar to those surveyed in Baltimore-Washington D.C. (Arria et al., 2002) and Edinburgh, Scotland (Riley et al., 2002). Focus groups with MSM indicated use was higher among those 25 and younger for all club drugs. Settings with mixed genders in the community survey reveal that males were the majority of respondents. Community survey data from treatment agencies indicate that Latinos report significantly lower levels of lifetime use of MDMA, while STD clinic data point towards significantly lower MDMA use among African-Americans. Overall, these demographic data parallel the findings from Emergency Department mentions.

Among men recruited at gay-oriented venues, MDMA users were younger than nonusers, while for those from rave/dance club venues the relationship was inverse. This disparate finding regarding the ages of MDMA users could be due to any of several factors:

1) the rise of MDMA in recent years may be more substantial among those in early to young adulthood, i.e., this difference reflects a secular trend in MDMA use; 2) MDMA, and other club drugs, are generally used at a later age than most other drugs by survey respondents; or 3) differing age distributions across venues. These data highlight the importance of accounting for the arrival or resurgence of various drugs when examining the pattern of drug initiation across populations, age groups, and venues.

MDMA use was significantly associated with lifetime use of many other drugs among survey respondents at almost all venues. Significant associations were found for respondents at all four types of venues for LSD, ketamine, mushrooms, poppers, powder cocaine, methamphetamine, and benzodiazepines/downers. Similar findings were reported by Arria et al. (2002) and by Forsyth (1996).

Several factors appear to underlie the relatively low levels of morbidity and mortality associated with MDMA and other club drugs despite relatively high levels of use among certain populations. Most people who have ever used MDMA either no longer continue to use the drug, or use it infrequently, so that the opportunities for acute negative consequences are infrequent compared to alcohol, for instance. Among those who used in the prior 6 months, only a small minority reported acute negative consequences such as overdosing or passing out. Acute toxicity due to moderate doses of MDMA appears to be low based upon self-report data of problems associated with use and population level data that indicate low morbidity and mortality associated with MDMA use relative to the prevalence of use in the community. The number of users of other club drugs are relatively small and reported morbidity and mortality are quite low, though toxicological detection problems may result in some underreporting.

Overall, the patterns identified in this paper are similar to those identified nationally (Landry, 2002). Specifically, morbidity and mortality are low and most users are young adults. Rates of emergency department mentions and student use of MDMA are higher locally than national averages, both of which appear to have peaked in 2000 or 2001. However, if past drug trends are any indication, other drugs will come into vogue with concomitant social use patterns and associated drug using and partying venues. While MDMA use may have peaked, it has been around for many decades and shows no signs of disappearing from the scene altogether.

Problems Associated with MDMA

A minority of respondents surveyed reported that their MDMA use in the prior 6 months was “out of control or had a hard time stopping use” or that they were concerned they might have “problems years down the road” related to their MDMA use. Two factors need to be considered when interpreting these findings: 1) the low frequency of recent MDMA use and 2) that these findings are for those who had used in the past 6 months; those who had experienced substantial problems resulting from their MDMA use may well have stopped using earlier, resulting in an underreporting of problem behaviors related to MDMA use by anyone who had ever used. Feeling that their use of MDMA was “out of control” was reported by 8% of participants from raves who used at least monthly in the past 6 months compared to 1% of those who used less than monthly ($p = 0.014$). Higher levels of lifetime MDMA use have been found to be associated with more psychobiological problems among MDMA polydrug users (Parrott, Sisk, and Turner, 2000).

The overall low level of perceived short term problems related to MDMA use parallels the very small numbers who received drug treatment for a primary problem with MDMA, focus group findings with MSM, and anecdotal reports from youth treatment providers who

reported that MDMA was reported to rarely be problematic among youth in treatment for drug problems. The relative infrequency of MDMA as a primary drug of abuse among those entering treatment has been noted elsewhere (Pluddemann et al., 2004).

Cottler and colleagues (2001) have examined diagnostic criteria for addiction and dependence to MDMA among community samples with high rates of drug use. They found that among those who had used MDMA five or more times in their life that 43% were dependent per DSM-IV criteria, and 34% met abuse criteria. Von Sydow et al. (2002) examined dependence to "ecstasy/stimulant/hallucinogen" drugs in a large random, prospective, longitudinal community-based sample of adolescents and young adults and found that 88% of occasional users (one to four times), a majority of abusers, 67%, and half of those dependent upon these substances had discontinued use.

Use of antidepressant prescription medications to control the post-use depressant effects of MDMA has been reported anecdotally locally. The level of use of antidepressants reported by survey respondents is significant because it represents individuals concerned enough about the psychological effects of MDMA to use a prescription psychiatric medication not prescribed to them. Further, this is the level of use of antidepressants among those who continued to use MDMA. Potentially, those more seriously impacted by the depressant effects would have already ceased use or do not attend many of the venues in which subjects were surveyed. In addition to using prescription antidepressants, use of vitamins and supplements, including 5-HTP, were reported by users trying to increase the safety of their MDMA use. Although some MDMA users believe 5-HTP helps brain serotonin levels and prevents MDMA-associated depression, a published review of the literature on tryptophan and 5-HTP did not find convincing evidence of the antidepressant properties of these supplements (Shaw, Turner, and Del Mar, 2002). Cottler et al. (2001) found that 37% of users reported feeling depressed following MDMA use.

A majority, 59% of those surveyed at raves, reported taking adulterated MDMA at some point. Even among the group that had used MDMA the least, MSM at bathhouses/sex clubs, 29% of MDMA users reported adulterated MDMA consumption. Fatalities have been reported due to adulterants sometimes represented as MDMA (Byard et al., 2002). Focus groups with young MSM found a common understanding that the purity of MDMA fluctuated substantially. Adulterated drugs sold as MDMA have the potential to be particularly dangerous as they may include other unknown drugs with unknown potency and effects. Baggott et al. (2000) chemically analyzed 107 pills purported to contain MDMA from users throughout the United States and found that 63% contained MDMA or an analogue, and 29% contained an identifiable drug, dextromethorphan being the most common at 21%. Currently available pill testing kits cannot identify dextromethorphan, and according to the authors, co-ingestion of MDMA and dextromethorphan can increase the adverse effects of dextromethorphan. Drug test kits available to the general population are severely limited according to Winstock, Wolff, and Ramsey (2001): 1) multiple drugs may be present, but not detectable; 2) if MDMA is detected its impact on an individual cannot be predicted; and 3) strength of the drug detected cannot be determined.

Emergency department and death data reveal relatively low levels of negative health consequences due directly to MDMA (Banta-Green et al., 2002). Medical examiner and toxicology lab data highlight that deaths can be directly due to the physiological consequences of MDMA use, but also appear related to suicide, interpersonal violence, and impaired driving. Levels of use of the other club drugs appear to be even lower than MDMA, yet fatalities do occur. It is important to note that mortality data are limited due to difficulties in detecting some drugs such as GHB, which is present endogenously, and research chemicals that are difficult to detect via toxicological analysis.

Thirty-eight percent of those surveyed at raves who used MDMA in the prior 6 months reported driving while under the influence of the drug. Driving impairment due to MDMA has been documented in Washington State via a series of cases in which persons suspected of driving under the influence, and later found to have only MDMA in their blood, at low to moderate levels, failed field sobriety tests (Logan and Couper, 2001). Riley et al. (2001) report 36% of those using drugs at dance events in Scotland driving under the influence of MDMA.

Abuse and dependence of MDMA appear to be infrequent in both the general population as evidenced by treatment and community survey data. Problems managing use also appear infrequent per community club drug survey data. It is important to be mindful of the newer and still limited literature that indicates abuse and dependence problems among those who have used MDMA with some frequency (Cottler et al., 2001).

Men Who Have Sex with Men

In general, the use of club drugs appears to be most prevalent among white, socially active MSM under the age of 30, most of whose positive beliefs about the social and sexual benefits of club drugs surpass their knowledge of risks and safer-using practices according to focus group findings. The need for reliable, credible education about club drugs, especially their connection with higher-risk sexual behavior, is critically unmet in this community.

MSM use MDMA at higher levels than heterosexual men seen at the STD clinic, and their use is associated with higher levels of both unprotected sex and contracting STDs (Table 4). MSM represent a group at potentially higher risk for negative consequences from club drugs, given that the drug is often used during sex, that approximately one in seven MSM are infected with HIV in the Seattle area (Public Health-Seattle & King County, 2003), and that there has been an apparent increase in syphilis and gonorrhea incidence among MSM locally. Increases in these STDs provide secondary evidence that sexual risk taking may be increasing. These issues are of particular concern given focus group participants' statements regarding the association between drug use and social identity as well as their reports of the strong association between drug use and unprotected sex. New York City data from the Urban Men's Health Study showed that compared to non-MDMA users, MDMA users were younger, more likely to visit bars and sexclubs, and to have unprotected anal sex with a man (Klitzman et al., 2002).

Limitations

This paper presented data from many sources. However, individual level data were de-identified and not linked across-datasets. Data utilized were either cross-sectional or longitudinal population level data. Therefore, conclusions about causal relationships between prevalence in one data source and outcomes in another cannot be made. Data are generally comparable with regards to geography. Data sources covered various intervals from 1997 to 2003.

All of the data sets utilized are susceptible to reporting bias. If someone requesting an investigation, reporting on a case, or coding a drug name is more aware of particular drugs, they may be more likely to suspect or document that specific drug. This can make trend data less valid in that increases may be overstated if older data are underestimated because of reporting bias. Media reports of club drug use in recent years could contribute to this reporting bias.

Misclassification is also possible given the relative newness of several of these drugs and multiple, sometimes ambiguous drug category names including "hallucinogens,"

“psychedelics,” “club drugs” and “party drugs.” This issue of classification also decreases the ability to do trend analyses because older data sources are more likely to use one of these general categories.

Implications for Prevention, Intervention, Treatment, and Surveillance

Ramifications of these findings for prevention, intervention, and treatment efforts are many. Given the suspicion of many users regarding information from government and law enforcement sources, some of the types of information provided in this paper will be of benefit. For instance, the self report of problems associated with MDMA use, most notably depressant-related effects, would provide an excellent starting point for conversation with adolescents who may be considering using, or have already initiated use, rather than attempting to scare them with the relatively infrequent acute negative effects. Prevention and intervention efforts need to integrate updated information about abuse liability of MDMA. Findings from focus groups with MSM and risky behaviors identified in the club drug survey point to the need for prevention, intervention, and treatment efforts tailored to MSM that account for the role of drugs in sexual identity and sexual behavior for some MSM. Issues of sexual orientation and methamphetamine use in Seattle have been studied with findings pointing towards the need to integrate issues of sexual orientation directly into drug treatment approaches (Gorman et al., 1997). Drug treatment providers who learn of their client's use of MDMA should be alert to possible subtle, long-term psychological effects.

A balanced educational message is needed that accounts for the fact that the risk of acute toxicity associated with small doses of MDMA is relatively low, but that there is the potential for longer-term negative psychological consequences as well as acute risk with unknown purity, high doses, and dangerous adulterants. An educational approach is needed that accounts for the reality that most youth have encountered infrequent negative consequences due to MDMA among occasional users, along with lessons learned from heavier users, psychological problems, occasional overdoses, and deaths. Adulteration is another concrete issue to be discussed with youth. Educational programs need to make the shortcomings of drug test kits clear: they are difficult to read, do not detect all adulterants, and give no indication of the amount of drug present. The dearth of accurate comprehensive information has lead many interested in MDMA and other club drugs to the Internet where the veracity of information is often questionable (Maxwell, 2003).

Data sources presented here need to be carefully monitored, and sources of information need to be expanded to include surveys of adult use of these substances as well as greater specificity of drug names and types in current indicator data systems. Additionally, greater information is needed about initiation into club drug use, reasons for using, patterns of use across the lifespan, impacts of use, and reasons for continuing and ceasing use.

Lastly, the findings in this paper point to the importance of utilizing all possible data to understand the use of illicit drugs. Interpretation of these findings is dependent upon a thorough understanding of the data sources as well as the insight of many very different perspectives. Locally, our understanding of the use of club drugs is heightened as is our capacity to monitor club drug and other new and re-emerging drug trends in the future as a result of our collaborative efforts.

RÉSUMÉ

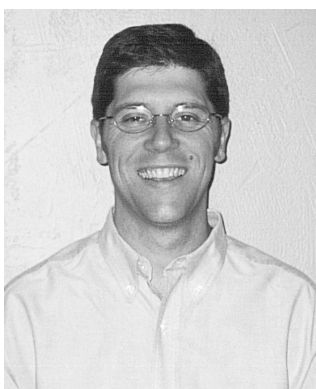
L'usage de drogue de club, MDMA, est apparu en particulier comme un problème croissant dans le secteur de Seattle dans le dernier 1990's. Pour comprendre plus des

modèles d'usage de MDMA et évaluer l'état actuel d'usage de MDMA les sources de données multiples ont été examinées. Les sept sources de données utilisées incluent la communauté locale basée sur les études de drogue de club recueillies en 2003 aux églises, à agences de traitement et à bars gai-orientés et à clubs de sexe, inscriptions des études (recueillies en 2002), données de mortalité (morts entre 2000 et 2002), données de la clinique de maladie sexuellement transmise (le 2002 octobre au 2003 octobre), groupes de foyer (2003) avec hommes qui ont sexe avec hommes, mentions de drogue de département d'urgence (1995 à 2002) et admissions de traitement de drogue (2003). Pris ensemble ces données indiquent des niveaux modérés d'usage de MDMA et relativement les bas niveaux de mortalité et de caractère morbide aigu. Cependant, il y a plusieurs secteurs d'inquiétude y compris les effets de santé et les niveaux supérieurs mentaux possibles d'altération présumée de MDMA. Quelques données indiquent à une relation entre l'usage de MDMA et aux comportements risqués y compris les rapports sexuels non protégés. Les implications pour l'empêchement, l'intervention, et le traitement sont discutées.

RESUMEN

El uso de la droga del club, MDMA en particular, apareció como un problema creciente en el área de Seattle en el tarde 1990's. Para entender más acerca de las pautas del uso de MDMA y para evaluar el estado actual del uso de MDMA múltiples fuentes de datos se examinaron. Las siete fuentes de datos utilizaron incluyó la comunidad local basó las inspecciones de la droga del club reunieron en 2003 en delirios, las agencias del tratamiento y clubes alegre-orientados de barras y sexo, educan las inspecciones (reunión en 2002), los datos de la mortalidad (las muertes entre 2000 y 2002), datos del dispensario sexualmente transmitido de enfermedad (octubre 2002 a octubre 2003), grupos (2003) de foco con hombres que tienen sexo con hombres, menciones de droga de departamento de emergencia (1995 a 2002) y admisiones de tratamiento de droga (2003). Tomado juntos estos datos indican los niveles moderados del uso de MDMA y niveles relativamente bajos de la mortalidad y la morbilidad aguda. Sin embargo, hay varias áreas de concierne inclusive efectos mentales posibles de salud y niveles altos de adulteración sospechada de MDMA. Algunos datos señalan a una relación entre el uso de MDMA y conductas arriesgadas inclusive el sexo impropetegido. Las implicaciones para la prevención, la intervención, y el tratamiento se discuten.

THE AUTHORS



Caleb Banta-Green is a research scientist at the University of Washington's Alcohol and Drug Abuse Institute. His work involves applying epidemiological research methods to drug abuse trends in urban and rural areas throughout Washington State. He has been the Seattle area representative to the National Institute on Drug Abuse's Community Epidemiology Work Group since 2001.



Gary Goldbaum is Senior Medical Epidemiologist for Public Health-Seattle & King County (PHSKC) and Associate Professor of Epidemiology and Adjunct Associate Professor of Health Services and Family Medicine at the University of Washington (UW). He has conducted research at the U.S. Centers for Disease Control and Prevention, the Washington State Department of Social and Health Services in Olympia, Washington, and at PHSKC in Seattle, Washington. He has been Health Officer for two Washington Counties, was Medical Director for the PHSKC HIV/AIDS Prevention Program from 1989 to 1999, and directed the UW Preventive Medicine Residency from 1992 to 2002.



Susan Kingston is an Educator Consultant with the Drug Use and HIV Prevention Team at Public Health-Seattle and King County. She specializes in the intersecting issues of injection drug use, HIV prevention, and substance use among men who have sex with men and is a local expert on methamphetamine.



Matthew Golden is an Associate Professor of Medicine in the Division of Infectious Diseases, University of Washington, and is the Medical Director of the Public Health-Seattle & King County STD Clinic. His research interests include STD in MSM, partner notification, and public health interventions to control STD/HIV.



Richard Harruff is board certified in Anatomic, Clinical, and Forensic Pathology by the American Board of Pathology. He has been a Medical Examiner in King County Medical Examiner's Office since 1993, and the Chief Medical Examiner since 2000.



Barry Logan is Director of the Forensic Laboratory Services Bureau of the Washington State Patrol, and State Toxicologist for the State of Washington. He has over 70 publications in the field of forensic toxicology and drug analysis. He is board certified by the American Board of Forensic Toxicology, and serves on their Board of Directors. He continues to conduct and publish research in areas including drug use and driving impairment, and postmortem toxicology.

Glossary

Rave. A dance event or party at which loud music is played often beginning late at night and ending early in the morning. A spirit of openness and a psychedelic aesthetic often permeate events. Events range from one-time parties in warehouses where alcohol is often not served so that people of all ages may attend and so that liquor licenses need not be obtained, to massive events with thousands of attendees and dozens of DJs at annual parties, to regularly scheduled events at bars and clubs that intend to be ravelike.

Ecstasy. A street term for MDMA (3,4-methylenedioxymethamphetamine). Some differentiate Ecstasy from MDMA because of the high level of adulteration of what is sold as MDMA on the street. Common adulterants include other methylated amphetamines or over-the-counter medications such as dextromethorphan. Most interview-based data sources refer to Ecstasy because of its widespread acceptance as the street term for MDMA in the United States and Washington State.

Research chemicals. A broad array of chemicals that may have psychoactive effects, but are poorly studied and often used by those interested in exploring potentially new psychedelic experiences. The two most common sources of information of research chemicals include the Internet and books by Shulgin and Shulgin (1995, 1997). Examples include: "2C T7" [(2,5-dimethoxy-4-(n)-propylthiophenethylamine)] and "Foxy Methoxy" (N,N-diisopropyl-5-methoxytryptamine).

References

- Arria, A. M., Yacoubian, G. S., Fost, E., Wish, E. D. (2002). Ecstasy use among club rave attendees. *Arch. Pediatr. Adolesc. Med.* 156:295–296.
- Baggott, M., Heifets, B., Jones, R. T., Mendelson, J., Sferious, E., Zehnder, J. (2000). Chemical analysis of ecstasy pills. *JAMA* 284(17):2190.
- Banta-Green, C., Kingston, S., Hanrahan, M., Miller, G., Jackson, T. R., Forbes, A., Wrede, A. F., Freng, S., Harruff, R., Hewett, G., Nyrop, K., McBride, M. (2003). Recent drug abuse trends in Seattle-King County. In: Proceedings of the National Institute on Drug Abuse's Community Epidemiology Work Group Report, June 2003.
- Banta-Green, C., Silverman, E., Kingston, S., Freng, S., Hanrahan, M., Miller, G., Jackson, T. R., Nyrop, K., Wrede, A. F., McBride, M., Harruff, R., Hewett, G., Forbes, A., Kabel, J., Thiede, H. (2002). Recent drug abuse trends in Seattle-King County. In: Proceedings of the National Institute on Drug Abuse's Community Epidemiology Work Group Report, December 2002.
- Byard, R. W., Rodgers, N. G., James, R. A., Kostakis, C., Camilleri, A. M. (2002). Death and paramethoxyamphetamine—an evolving problem. *Med. J. Aust.* 176(10):496.
- Cottler, L. B., Womack, S. B., Compton, W. M., Ben-Abdallah, A. (2001). Ecstasy abuse and dependence among adolescents and young adults: Applicability and reliability of DSM-IV criteria. *Hum. Psychopharmacol. Clin. Exp.* 16:599–606.
- Forsyth, A. J. M., Barnard, M., McKeganey, N. P. (1995). Musical preference as an indicator of adolescent drug use. *Scott. Med. J.* 40(6):168–171.
- Forsyth, A. J. M. (1996). Places and patterns of drug use in the Scottish dance scene. *Addiction* 91(4):511–521.
- Gorman, E. M., Barr, B. D., Hansen, A., Robertson, B., Green, C. (1997). Speed, sex, gay men, and HIV: Ecological and community perspectives. *Med. Anthropology Quarterly* 11(4):505–515.
- Gross, S. R., Barrett, S. P., Shestowsky, J. S., Pihl, R. O. (2002). Ecstasy and drug consumption patterns: A Canadian rave population study. *Can. J. Psychiatry* 47(6):546–51.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G. (2002). *Monitoring the Future: National Results on Adolescent Drug Use. Overview of Key Findings, 2001*. Bethesda, Maryland: National Institute on Drug Abuse.
- Klitzman, R. L., Greenberg, J. D., Pollack, L. M., Dolezal, C. (2002). MDMA ('ecstasy') use, and its association with high risk behaviors, mental health, and other factors among gay/bisexual men in New York City. *Drug Alcohol Depend.* 66(2):115–125.
- Landry, M. J. (2002). MDMA: A review of epidemiologic data. *Journal of Psychoactive Drugs* 34(2):163–169.
- Logan, B. K., Couper, F. J. (2001). 3,4-Methylenedioxymethamphetamine (MDMA, ecstasy) and driving impairment. *J. Forensic Sci.* 46(6):1426–1433.
- Maxwell, J. C. (2003). The response to club drug use. *Current Opinion in Psychiatry* 16:279–289.
- Office of Applied Studies. (2003). Drug abuse warning network, emergency department data 1995–2002. Substance Abuse and Mental Health Services Administration.
- Parrott, A. C., Sisk, E., Turner, J. J. (2000). Psychobiological problems in heavy 'ecstasy' (MDMA) polydrug users. *Drug Alcohol Depend.* 60(1):105–110.
- Pluddemann, A., Parry, C. D., Myers, B., Bhana, A. (2004). Ecstasy use in South Africa: Findings from the South African Community Epidemiology Network on Drug Use (SACENDU) project (January 1997–December 2001). *Subst. Use Misuse* 39(1):87–105.
- Public Health—Seattle & King County, HIV/AIDS Epidemiology Program (2003). Facts about HIV/AIDS in men who have sex with men.
- Riley, S. C., James, C., Gregory, D., Dingle, H., Cadger, M. (2001). Patterns of recreational drug use at dance events in Edinburgh, Scotland. *Addiction* 96(7):1035–1047.
- Seattle Public Schools (2002). Communities that care 2002 survey, Seattle schools. Seattle Public Schools: Seattle, Washington.

- Shaw, K., Turner, J., Del Mar, C. (2002). Are tryptophan and 5-hydroxytryptophan effective treatments for depression? A meta-analysis. *Australian and New Zealand Journal of Psychiatry* 36(4):488–491.
- Shulgin, A. T., Shulgin, A. (1995). *PIKHAL: A Chemical Love Story*. Berkeley, CA: Transform Press.
- Shulgin, A. T., Shulgin, A. (1997). *TIKHAL: The Continuation*. Berkeley, CA: Transform Press.
- von Sydow, K., Lieb, R., Pfister, H., Hofler, M., Wittchen, H. U. (2002). Use, abuse and dependence of ecstasy and related drugs in adolescents and young adults—a transient phenomenon? Results from a longitudinal community study. *Drug Alcohol Depend.* 66(2):147–159.
- Winstock, A. R., Wolff, K., Ramsey, J. (2001). Ecstasy pill testing: Harm minimization gone too far? *Addiction* 96:1139–1148.