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Ecstasy Use among U.S. Adolescents from 1999 to 2008

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Abstract

Aims—To investigate trends in rates of ecstasy use among US adolescents from 1999 to 2008, and to examine the associations between the major sociodemographic factors, especially gender, and ecstasy use, during this period.

Methods—The adolescent subsamples (ages 12–17) from the 1999–2008 NHSDA/NSDUH surveys were used for the current study. Data from adolescents' self–reports on use of ecstasy and of other drugs, as well as sociodemographic characteristics, were used in the analyses.

Results—There was an increasing trend in adolescent ecstasy use from 1999 to 2002, which was followed by a decreasing trend from 2002 to 2005, and a slight rise from 2005 to 2008. In contrast to some other drugs, ecstasy was more likely to be used by girls than by boys. This gender difference persisted over the 10-year period and could not be explained by other demographic factors.

Conclusion—Given the known health consequences of ecstasy use, especially for females, the observed gender difference in adolescent ecstasy use should be taken into account by drug prevention and intervention programs.

Keywords

ecstasy use; drug use; gender differences; adolescents; trends

1. Introduction

Adolescent drug use has long been a major public health concern, and trends in adolescent drug use have been monitored closely by government agencies. For some drugs, such as marijuana, cocaine, and crack, rates of adolescent use have been relatively stable over the past two decades. Rates of adolescent use of some other drugs have, however, varied more

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drastically over time. Ecstasy is one of these drugs (Johnston et al., 2009; Martins et al., 2005). In the early 1990's ecstasy was relatively unknown among adolescents (Johnston et al., 2007). The Monitoring the Future survey of 1996 found that the prevalence of lifetime ecstasy use among 12th graders was 4.6%, lower than the corresponding prevalences for drugs such as marijuana, amphetamine, inhalants, LSD, and cocaine. By the early 2000's, however, this prevalence had doubled. Ecstasy became the third most commonly used drug among adolescents (Johnston et al., 2007). Between 2001 and 2005, however, there was a decline in rates of adolescent ecstasy use, which was followed by a slight rise between 2005 and 2008 (Substance Abuse and Mental Health Services Administration, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009).

Rates of ecstasy use have generally been higher among adolescents and young adults than in the general population (Substance Abuse and Mental Health Services Administration, 2009). It has been estimated that by 2002, when ecstasy use rates were at their peak (Substance Abuse and Mental Health Services Administration, 2003), about 10 million people in the United States had used ecstasy at least once. About 17% of these ecstasy users were adolescents. The magnitude of adolescents' rates of ecstasy use can also be seen in reference to rates of use of other drugs. For example, in 2002, cocaine use was about three times as common, in the general population, as ecstasy use, while among adolescents ecstasy was more commonly used than cocaine (Substance Abuse and Mental Health Services Administration, 2003). Adolescent ecstasy users report that they use the drug to "experiment", and to feel good and enhance social activities (Parks and Kennedy, 2004).

While many studies have examined the relationships between adolescent use of drugs such as marijuana, cocaine and crack, and the major sociodemographic factors, less is known regarding the relationships between these sociodemographic factors and adolescent ecstasy use (Martins et al., 2007; Martins et al., 2008; Wu et al., 2010). Recent research indicates that adolescent girls are more likely, compared to boys, to be ecstasy users, and that girls who use ecstasy and/or other hallucinogens may be more vulnerable than boys to developing symptoms of hallucinogen dependence (Wu et al., 2009). Ecstasy use has also been found to be more common among non-Hispanic whites than in other racial/ethnic groups (Wu et al., 2009). An early study on ecstasy use found it to be more common among higher-income than among lower-income individuals (Brecht and von Mayrhauser, 2002), but more recent reports indicate that this income effect no longer holds (Gfroerer et al., 2007; Wu et al., 2006). Residents of urban areas have been found to be more likely to use ecstasy than those living in rural areas (Gfroerer et al., 2007). Given the unusually dramatic turns that have been observed in adolescent ecstasy use rates over the years, and the known health consequences of ecstasy use (Hanson and Luciana, 2004; Zakzanis and Young, 2001), further examination of changes in rates of ecstasy use over time, in relation to the major demographic factors, and to trends in the use of other drugs, is warranted. This paper will examine (1) trends in rates of lifetime ecstasy use among U.S. adolescents from 1999 to 2008, overall and by specific demographic factors, (2) gender differences in ecstasy use in comparison to gender differences in use of other drugs and (3) differences and similarities across age groups with regard to the observed gender difference in rates of adolescent ecstasy use. A thorough examination of these relationships will help not only to fill existing gaps in our knowledge regarding patterns of ecstasy use, but also to guide programs aimed at preventing ecstasy use.

2. Methods

2.1. Samples and Measures

The National Survey on Drug Use and Health (NSDUH) is a series of surveys covering use of illicit drugs, alcohol, and tobacco, and associated factors, among members of the noninstitutionalized U.S. civilian population aged 12 or older (Substance Abuse and Mental

Health Services Administration, 2009). Before 2002, the surveys' official name was the National Household Survey on Drug Abuse (NHSDA). The surveys include detailed questions on substance use, and on a wide range of individual and family characteristics. Further information on the methodology of the surveys, such as their sampling design and weighting procedures, is available elsewhere (Substance Abuse and Mental Health Services Administration, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009).

Trained interviewers interviewed respondents in their homes in person. Since 1999 the surveys have been conducted using a computer-assisted interview (CAI). Part of each interview is conducted by the interviewer using a computer-assisted personal interview (CAPI). For substance use and other sensitive questions, however, an audio computer-assisted self-interview (ACASI) is used to provide the respondent with a highly private and confidential means of responding to questions and to increase the level of honest reporting (Substance Abuse and Mental Health Services Administration, 2003). The surveys' response rates have been very good. For example, the response rate for the 2002 survey was 79%; for the 2003 survey it was 77% (Substance Abuse and Mental Health Services Administration, 2003). The adolescent subsamples (ages 12–17) from the 1999–2008 NHSDA/NSDUH surveys were used for the current study. The sizes of these subsamples vary by year, and range in size from 17,429, for the year 2001, to 19,430, for 2000.

The surveys collected information on lifetime use of ecstasy, marijuana and other drugs. In some of the analyses for the current study, patterns of adolescent ecstasy use are compared with patterns of adolescent marijuana use. Sociodemographic information collected in the surveys, on variables such as adolescent age, gender, race/ethnicity, family income and the urbanicity of a respondent's area of residence, was also used in our analyses.

2.2. Statistical Analyses

2.2.1. Analysis of Data from Each Survey Year—First, prevalences of ecstasy and marijuana use, and of the major sociodemographic characteristics, were estimated for the adolescent population as a whole for each survey year; rates of lifetime use of ecstasy were also estimated by the major sociodemographic variables. Tests of the bivariate associations between ecstasy use and each of the sociodemographic factors were then performed for each year. Finally, logistic regression analyses examining gender differences in ecstasy use were performed, controlling for other important demographic factors, for each survey year. The regression parameter for the gender variable, interpreted as a log odds ratio, was used to estimate the size of the gender effect. SUDAAN software was used in these analyses, to take the surveys' complex sampling designs into account, incorporating the appropriate sampling weights into the analyses.

2.2.2. Meta-analysis—Using estimates obtained from each of the 10 annual surveys, random effects meta-regression analyses were conducted to examine gender differences in ecstasy use, while adjusting for covariates. The analyses used hierarchical Bayesian linear models (DuMouchel et al., 1996) which combine and summarize the results obtained from multiple datasets. Weighted regression methods, in which the unit of observation was the dataset from a particular year, were employed. Bayesian hierarchical models assume a normal distribution for the observations (i.e., in our analyses, the estimated logistic regression coefficients for the effect of gender on ecstasy use, estimated separately for each dataset) conditional on the true value of the model parameters. The advantages of this technique are that it allows for the use of linear regression models to explain variations in the estimated effects and for the use of random effects to account for unexplained random variation among datasets. Sampling error within each dataset is represented by the standard error of the estimated effect. The priors used for the regression coefficients and random effects are similar to those in DuMouchel and

Waternaux (DuMouchel et al., 1996). Results are based on the estimated posterior mean and standard deviation of each regression coefficient, along with the posterior probability that the coefficient is positive (or negative), conditional on the data. A posterior probability above 0.95 is considered to be meaningful.

3. Results

3.1. Characteristics of the Samples

The 10 datasets from the year 1999 to 2008 have similar distributions of sex and age. The male percentages of the adolescent samples range from 51.1% to 51.2%, and the percentages of 16–17 year olds vary only between 32.1% and 34.6%. The ethnic group distributions of the samples have, however, changed over time. Over the 10 years the proportion of whites gradually decreased, from 66.0% to 59.0%, while the proportions of African-Americans and Hispanics steadily increased, from 13.9% to 15.2% and from 13.9% to 19.0%, respectively. The distributions of household income level were relatively stable, except that the percentage in the $75,000 or more category increased from 20.9% to 35.4% over the period.

3.2. Rates of Lifetime Ecstasy Use during 1999–2008

The prevalences, by year, of ecstasy use among adolescents aged 12–17, as displayed in Table 1, show a temporal pattern. The prevalence of lifetime ecstasy use increased from 1.86% in 1999 to a peak of 3.37% in 2002, then declined to 1.54% in 2005, after which it began again to increase, reaching 2.17% in 2008.

3.3. Rates of Ecstasy use by Sociodemographic Characteristics

Table 1 also lists adolescents' rates of lifetime ecstasy use by the demographic factors of gender, age, ethnicity, family income and the urbanicity of a respondent's area of residence. In terms of gender, girls' rates of ecstasy use were higher than boys' for all 10 years. For six of these years this gender difference was statistically significant ($p<0.05$); for two of the years it was marginally significant ($p=0.06$); while for the remaining two years (2002 and 2007), the difference was not statistically significant. In each year, as expected, the overall rate of ecstasy use for adolescents aged 16–17 was much higher than that of the younger adolescent group ($p<0.001$). Significant racial/ethnic differences were also found consistently across the 10 year period ($p<0.001$). African American adolescents were least likely to use ecstasy, while white adolescents in general had the highest rates of ecstasy use, although the latter did not hold true for the years 2000 and 2001; for these two years, the highest rate of ecstasy use was among adolescents in the "Other" ethnic category – i.e., among those who were neither white, nor African American, nor Hispanic. Also, in 2007, Hispanics adolescents' overall ecstasy use rates were essentially the same as those of non-Hispanic whites. Rates of ecstasy use did not differ significantly by household income except in the year 2001. However, the relationship between income level and ecstasy use did appear to change over time. Before 2002, higher percentages of adolescents from high income families were ecstasy users, compared to those from families with lower incomes, but by 2008 adolescents from the lowest income group had the highest rate of ecstasy use. Adolescents living in rural areas tended to have lower rates of ecstasy use, but only in the years 1999, 2001 and 2008 were the associations between urbanicity and rates of ecstasy use statistically significant.

3.4. Gender Differences in Ecstasy Use and in Marijuana Use

In order to explore the implications of our finding of higher ecstasy use rates among girls than among boys across the study period (Figure 1), we conducted a parallel analysis of gender differences in rates of use of marijuana, the most commonly used illicit drug for the youth population (Figure 2). A comparison of the two figures shows that the gender differences in ecstasy use rates were in the opposite direction from those found in rates of marijuana use.

3.5. Gender Differences in Ecstasy Use by Age Group

Further analyses were conducted to explore whether or not the gender differences observed in overall adolescent rates of ecstasy use would hold true for adolescents at different developmental stages. Table 2 shows gender-specific rates of ecstasy use for adolescents ages 12–15 and ages 16–17 separately, by survey year. For both age groups, the ecstasy use rates are higher for girls than for boys for each year, except that in the year 2000, boys in the younger age group had a slightly higher rate of ecstasy use than girls in the younger age group.

Because the results of the bivariate analyses had indicated that adolescent rates of ecstasy use differ not only by gender, but also by other demographic characteristics, we conducted additional logistic regression analyses to examine whether the observed gender differences would still hold, for each age group, after controlling for race/ethnicity, urbanicity, and family income.

Table 2 displays the covariate adjusted odds ratios comparing girls' odds of ecstasy use with boys', within each age group, and in each survey year, as well as the associated 95% confidence intervals. Derived from the estimated parameters of the corresponding logistic regression model, the adjusted odds ratio (AOR) estimates the magnitude of the difference between girls' and boys' odds of ecstasy use for each year. The covariates include age, racial/ethnic grouping (non-Hispanic white vs. other racial/ethnic group), income level, and urbanicity (large Metropolitan Statistical Area (MSA), smaller MSA, vs. not an MSA). For every year and for both age groups, excepting the younger group in year 2000, girls' odds of ecstasy use were higher than boys' (with AORs ranging between 1.10 and 1.51 for the older group, and between 1.19 and 2.51 for the younger group, excluding the year 2000, for which the AOR is less than one (AOR=.99)). The gender differences within the younger group tended to increase in size over time, but this was not true for the older age group. By 2008, the gender difference for the younger age group was significantly larger than for the older age group. In the subsequent meta-analysis we assessed the time trend of the gender effect for each age group by applying Bayesian hierarchical linear modeling to the estimated logistic regression coefficients for gender difference (log odds ratios) for each year, and explored possible age group differences in the gender effect on ecstasy use. The model with a single parameter, representing the common gender effect, fit the regression coefficients well for the older age group. It gave a posterior probability greater than 0.9999 that the OR would be greater than one. The posterior mean estimate of the model parameter was 0.2413 (SD=0.0510), predicting an overall odds ratio of 1.2729 for the gender difference. For the younger age group, the result was similar, indicating that the posterior probability for an OR above one was 0.9997 and that the posterior mean estimate of the model parameter was 0.3816 (SD=.0993), predicting an overall odds ratio of 1.4646 for the gender difference. However, there were a few large residuals, suggesting that the time trend in the regression coefficients for the gender effect for the younger group should not be ignored. When a linear model including a time trend variable was applied, the residuals became small, indicating a good fit. This model gave a posterior probability of 0.9934 for an increasing time trend for the gender effect for the younger group. The posterior mean slope estimate was 0.0805 (SD=0.0315). Finally, the hierarchical Bayesian linear model, well fitted to all of the log odds ratio estimates for both age groups, suggests that the gender difference in the odds of ecstasy use increased over time for the younger age group (the posterior probability for a positive slope was 0.9968 with a posterior mean slope estimate of 0.0813 and SD=0.0296), but not for the older age group (the posterior mean slope estimate was 0.0179 and SD=0.0182). The posterior probability of an age group difference in the gender effect time trends was 0.9977.

In summary, the results, with and without control for other demographic factors, indicate that during this period girls were more likely than boys to be ecstasy users. For the younger age group, the gender difference tended to become larger over time.

4. Discussion

Using data from 10 nationally representative annual surveys, this study examined trends in adolescent ecstasy use over a 10-year period, overall and by gender, race/ethnicity and other demographic factors. It was found that there was an increasing trend in adolescent ecstasy use from 1999 to 2002, which was followed by a significant decreasing trend from 2002 to 2005. After 2005, however, increases in use were again seen. Unlike some other drugs, ecstasy was more likely to be used by girls than by boys; this gender difference persisted over the 10-year period. The gender difference was more stable among older than among younger adolescents. Among the younger adolescents, the size of this gender difference appeared to increase between 1999 and 2008. This gender difference could not be explained by other demographic factors.

Previous research has noted that rates of ecstasy use increased during the late 1990s (Martins et al., 2008). The observed trends in ecstasy use from 1999 to 2008 indicate that the early increase in use rates reached its peak in 2002, and was followed by a decline. This decline may have resulted from changes in federal drug policies such as the implementation of the Ecstasy Anti-Proliferation Act in 2001. This act increased penalties for ecstasy trafficking so that, for example, the guideline sentence for trafficking 200 grams of ecstasy rose from 15 months to 5 years (ONDCP, 2004). Further legislative action against the use of Ecstasy and other club drugs was taken in April 2003, with the passage of the Illicit Drug Anti-Proliferation Act, which allows for additional grounds under which individuals – such as owners of clubs where drugs are used – may be prosecuted for being, direct or indirectly, associated with the sale of illicit drugs (USDEA, 2003a). These policy changes – as well as more stringent policies against ecstasy manufacture in the Netherlands, which had been a major source of ecstasy eventually sold in the United States (UNODC, 2008) – may have impacted ecstasy's availability. Such a conclusion is supported by findings from the MTF surveys. For example, results from the 2001 MTF survey indicated that 62% of 12^{th} graders thought that they could get ecstasy fairly easily; by 2005, however, when rates of ecstasy use were at their lowest point, this percentage had fallen to 40% (Johnston et al., 2007). Adolescent perceptions regarding the risks of ecstasy use may also affect their rates of use. Findings from the MTF surveys indicate that among high school seniors, about 39% considered use of ecstasy to entail "great risk" in 2000; this percentage increased to 60% by 2005, when rates of use were at their lowest (Johnston et al., 2007). The recent rise in adolescent ecstasy use rates that began in 2005 was, in turn, accompanied by a drop in the levels of ecstasy-related risk perceived by adolescents (Johnston et al., 2009).

This paper's major finding is that there was a consistent pattern of higher rates of ecstasy use among adolescent girls than among boys over the period 1999–2008. This finding is consistent with those of other studies of adolescents (Johnston et al., 2007; Wu et al., 2009; Yacoubian et al., 2002). For example, the Monitoring the Future (MTF) study has reported that rates of ecstasy use were higher among female eighth graders than male eighth graders between 2003 and 2006 (Johnston et al., 2007). Where gender differences in ecstasy use rates have been found in older age groups, however, they have generally appeared to be in the opposite direction. In the MTF surveys, twelfth grade males were found to be more likely to use ecstasy than their female counterparts (Johnston et al., 2007), and studies of adults have found that rates of ecstasy use are higher among men than among women (NIDA 2003), and that the majority of ecstasy-associated fatalities (70%) are male (Landry, 2002). The comparison between the younger and older adolescent groups, with regard to gender differences in ecstasy use, revealed some interesting findings. For the younger adolescent group, the gender difference has tended, over the past decade, to become bigger. Specifically, controlling for the other sociodemographic factors, younger adolescent girls were 1.3 times more likely to be ecstasy users in 1999, compared to their male counterparts. By 2008, younger adolescent girls were 2.5 times more likely than boys to be ecstasy users. Among the older adolescents, however, the gender difference in rates of ecstasy use did not become larger over this period. In 1999, older adolescent girls were about 1.49 times more likely to use ecstasy than their male counterparts, but by 2008 this ratio had fallen to about 1.10. Taken together with the findings of adult studies, our findings indicate that the nature of gender's influence on ecstasy use changes during the transition from adolescence to adulthood, in contrast to use of some other drugs, such as marijuana, which males are consistently more likely to use over the life span. It has also been reported that a given dose of MDMA tends to produce more intense negative psychoactive effects in women than in men (Liechti et al., 2001), and that girls may generally be more vulnerable than boys to developing symptoms of hallucinogen dependence (Wu et al., 2009). This indicates that adolescent girls who continue to use ecstasy are at increased risk of suffering from related negative health effects. It is important for drug prevention and intervention programs to take these gender differences into account.

Similarly, our findings regarding recent proportionate increases in ecstasy use among Hispanic adolescents, and regarding ecstasy's shift from being a drug that adolescents from high income families were more likely to use, in the early 2000s, to one that in recent years has been more commonly used by adolescents from low-income families, should also be taken into account in designing drug intervention programs for adolescents.

4.1. Limitations

The study is limited in the following ways. First, respondents to the NSDUH/NHSDA surveys began to be asked about their lifetime use of ecstasy only in 1999, and it was not until 2002 that they began to be asked about their past year ecstasy use. As a result only trends in lifetime ecstasy use over the 10-year period could be examined in this study. Secondly, all information on the adolescents in the surveys was obtained from the adolescents' own self reports; the accuracy of such information, especially with regard to family income, may be questionable. Also, the fact that tablets sold as ecstasy may actually consist, partly or wholly, of other substances (Baggot et al., 2000) may introduce a further element of unreliability into self-report data regarding ecstasy. Finally, the study could not test the specific effects of particular policy changes on time trends in ecstasy use. However, the findings from this paper provide information which may be of use to policy makers concerned not only with adolescent use of ecstasy, but also with substance use in general.

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References

Baggot M, Heifets B, Jones RT, Mendelson J, Sferios E, Zehnder J. Chemical analysis of ecstasy pills. JAMA 2000:2190. [PubMed: 11056589]

Brecht ML, von Mayrhauser C. Differences between Ecstasy-using and nonusing methamphetamine users. Journal of Psychoactive Drugs 2002;34:215–223. [PubMed: 12691212]

DuMouchel, W.; Waternaux, C.; Kinney, D. Hierarchical Bayesian Linear Models for Assessing the Effect of Extreme Cold Weather on Schizophrenic Births. In: Berry, D.; Stangl, D., editors. Bayesian Biostatistics. Oxford University Press; New York: 1996.

Gfroerer JC, Larson SL, Colliver JD. Drug use patterns and trends in rural communities. The Journal of Rural Health 2007;23:10–15. [PubMed: 18237319]

Hanson KL, Luciana M. Neurocognitive function in users of MDMA: the importance of clinically significant patterns of use. Psychological Medicine 2004;34:229–246. [PubMed: 14982129]

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Secondary school students 2006. Vol. 1. National Institute on Drug Abuse; Bethesda, MD: 2007. Monitoring the Future national survey results on drug use, 1975–2006.

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Secondary school students. Vol. 1. National Institute on Drug Abuse; Bethesda, MD: 2009. Monitoring the Future national survey results on drug use, 1975–2008.

Landry MJ. MDMA: a review of epidemiologic data. Journal of Psychoactive Drugs 2002;34:163–169. [PubMed: 12691206]

Liechti ME, Gamma A, Vollenweider FX. Gender differences in the subjective effects of MDMA. Psychopharmacology 2001;154:161–168. [PubMed: 11314678]

Martins SS, Ghandour LA, Chilcoat HD. Pathways between ecstasy initiation and other drug use. Addictive Behaviors 2007;32:1511–1518. [PubMed: 17174036]

Martins SS, Mazzotti G, Chilcoat HD. Trends in ecstasy use in the United States from 1995 to 2001: Comparison with marijuana users and association with other drug use. Experimental & Clinical Psychopharmacology 2005;13:244–252. [PubMed: 16173888]

Martins SS, Storr CL, Alexandre PK, Chilcoat HD. Adolescent ecstasy and other drug use in the National Survey of Parents and Youth: The role of sensation-seeking, parental monitoring and peer's drug use. Addictive Behaviors 2008;33:919–933. [PubMed: 18355973]

ONDCP. MDMA (Ecstasy). 2004. http://www.whitehousedrugpolicy.gov/publications/factsht/mdma/ accessed on

Parks KA, Kennedy CL. Club Drugs: Reasons for and Consequences of Use. Journal of Psychoactive Drugs 2004;36:295–302. [PubMed: 15559677]

Substance Abuse and Mental Health Services Administration. Summary of Findings from the 1999 National Household Survey on Drug Abuse (NHSDA). U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration (SAMHSA), Office of Applied Studies; Rockville, MD: 2000.

Substance Abuse and Mental Health Services Administration. Summary of findings from the 2000 National Household Survey on Drug Abuse. Office of Applied Studies, Substance Abuse and Mental Health Services Administration; Rockville, MD: 2001.

Substance Abuse and Mental Health Services Administration. Technical appendices and selected data tables. Office of Applied Studies, Substance Abuse and Mental Health Services Administration; Rockville, MD: 2002. Results from the 2001 National Household Survey on Drug Abuse: Volume II.

Substance Abuse and Mental Health Services Administration. Results from the 2002 National Survey on Drug Use and Health: National Findings. Office of Applied Studies; Rockville, MD: 2003.

Substance Abuse and Mental Health Services Administration. Results from the 2003 National Survey on Drug Use and Health: National Findings. Office of Applied Studies; Rockville, MD: 2004.

Substance Abuse and Mental Health Services Administration. Results from the 2004 National Survey on Drug Use and Health: National findings Office of Applied Studies. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2005.

Substance Abuse and Mental Health Services Administration. Results from the 2005 National Survey on Drug Use and Health: National findings Office of Applied Studies. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2006.

Substance Abuse and Mental Health Services Administration. Results from the 2006 National Survey on Drug Use and Health: National findings Office of Applied Studies. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2007.

Substance Abuse and Mental Health Services Administration. NSDUH Series H-34, DHHS Publication No SMA 08-4343. Office of Applied Studies, Substance Abuse and Mental Health Services Administration; Rockville, MD: 2008. Results from the 2007 National Survey on Drug Use and Health: National findings.

Substance Abuse and Mental Health Services Administration. NSDUH Series H-36, HHS Publication No SMA 09-4434. Office of Applied Studies, Substance Abuse and Mental Health Services Administration; Rockville, MD: 2009. Results from the 2008 National Survey on Drug Use and Health: National findings.

UNODC. 2008 Global ATS Assessment. United Nations Office on Drugs and Crime; Vienna, Austria: 2008. Amphetamines and Ecstasy.

USDEA. New drug law protects children. Unscrupulous event promoters targeted. 2003a [accessed on January 10 2004]. http://www.dea.gov/ongoing/anti-proliferation_act.html

USDEA. State Factsheets. 2003b [accessed on January 18 2004]. http://www.usdoj.gov/dea/pubs/state_factsheets.html

Wu LT, Ringwalt CL, Weiss RD, Blazer DG. Hallucinogen-related disorders in a national sample of adolescents: The influence of ecstasy/MDMA use. Drug and Alcohol Dependence 2009;104:156–166. [PubMed: 19500920]

Wu LT, Schlenger WE, Galvin DM. Concurrent use of methamphetamine, MDMA, LSD, ketamine, GHB, and flunitrazepam among American youths. Drug Alcohol Depend 2006;84:102–113. [PubMed: 16483730]

Wu P, Liu X, Fan B. Factors associated with initiation of ecstasy use among US adolescents: Findings from a national survey. Drug and Alcohol Dependence 2010;106:193–198. [PubMed: 19781862]

Yacoubian GS Jr, Arria AM, Fost E, Wish ED. Estimating the prevalence of ecstasy use among juvenile offenders. Journal of Psychoactive Drugs 2002;34:209–213. [PubMed: 12691211]

Zakzanis KK, Young DA. Memory impairment in abstinent MDMA ("Ecstasy") users: a longitudinal investigation. Neurology 51(6):1532–7 2001;56:966–969.

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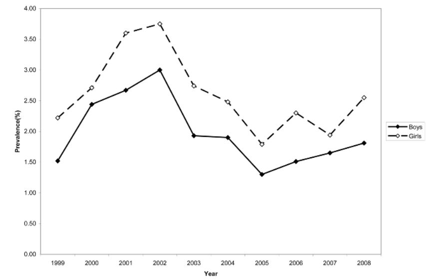

Figure 1. Gender Differences in Adolescent Ecstasy Use, 1999–2008
Percentages of adolescents of each gender, in each year, who were lifetime ecstasy users.

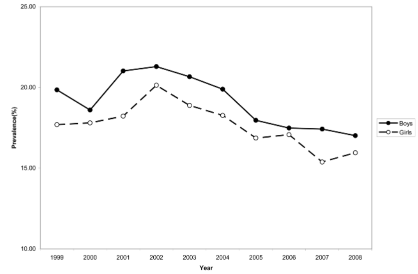

Figure 2. Gender Differences in Adolescent Marijuana Use, 1999–2008

Percentages of adolescents of each gender, in each year, who were lifetime marijuana users.

Table 1

Lifetime Ecstasy Use Rates Over 10 Years, Overall and by Sociodemographic Factors

	1999		2000		2001		2002		2003		2004		2005		2006		2007		2008	
	%	N[a]	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
Total	1.86	347	2.57	500	3.13	545	3.37	597	2.33	425	2.19	400	1.54	287	1.90	348	1.79	318	2.17	387
Gender																				
Male	1.52	145	2.44	243	2.67	238	3.00	272	1.93	180	1.90	178	1.30	124	1.51	142	1.65	149	1.81	165
Female	2.22	202	2.71	257	3.60	307	3.75	325	2.74	245	2.48	222	1.79	163	2.30	206	1.94	169	2.55	222
P Value		0.0042		0.2833		0.0026		0.0251		0.0036		0.0622		0.0586		0.0092		0.2782		0.0199
Age																				
12–15	0.68	84	1.12	147	1.66	193	1.44	173	1.11	137	0.97	120	0.55	68	0.75	91	1.02	120	0.99	116
16–17	4.21	263	5.61	353	6.09	352	7.45	424	4.82	288	4.72	280	3.52	219	4.18	257	3.30	198	4.39	271
P Value		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001
Ethnicity																				
White	2.32	286	3.12	397	3.74	424	3.94	438	2.63	299	2.52	283	1.90	215	2.32	255	1.99	210	2.47	260
African-American	0.20	5	0.55	15	0.97	24	0.82	21	0.97	27	1.08	30	0.76	22	0.64	18	0.72	19	0.84	22
Hispanic	1.76	45	1.70	47	2.16	54	3.41	96	2.34	70	2.03	62	0.86	28	1.60	53	2.00	66	2.45	83
Other	0.91	11	3.50	41	3.96	43	3.47	42	2.46	29	2.03	25	1.75	22	1.81	22	1.92	23	1.79	22
P Value		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		0.0003		<0.0001
Household Income																				
Under $20,000	1.58	55	2.34	80	2.29	68	3.43	109	2.77	93	2.32	78	1.20	40	1.72	53	1.87	56	2.79	75
$20K–$39,999	1.93	95	2.31	115	3.65	155	3.35	139	2.50	106	2.02	84	1.54	64	2.30	92	2.31	84	2.37	86
$40K–$74,999	1.69	108	2.74	179	2.87	166	3.29	190	2.43	137	2.40	133	1.90	104	1.93	104	1.57	79	1.83	95
$75,000+	2.28	89	2.91	126	3.52	156	3.35	159	1.77	89	2.01	105	1.39	79	1.69	99	1.63	99	2.07	131
P Value		0.2670		0.4122		0.0134		0.9845		0.0566		0.6728		0.0702		0.3786		0.2632		0.1883
Population Density[b]																				
Not MSA	1.25	52	2.04	91	2.16	88	2.90	114	2.26	91	1.16	65	1.55	21	1.94	23	1.31	16	1.17	13
MSA < 1M	1.68	104	2.69	175	3.54	208	3.48	204	2.45	147	2.24	134	1.74	131	1.97	148	1.58	114	2.36	176
MSA > 1M	2.29	191	2.77	234	3.33	249	3.51	279	2.26	187	2.43	201	1.38	135	1.84	177	2.02	188	2.14	198
P Value		0.0002		0.0761		<0.0001		0.2937		0.8006		0.0611		0.3611		0.9145		0.1030		0.0153

[a]Weighted Ns.

[b] MSA= Metropolitan Statistical Areas. M=Million

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Table 2

Gender Differences in Rates of Ecstasy Use Over 10 Years, by Age Group

	Age 12–15			Age 16–17		
Year	**Girls % (SE)**	**Boys % (SE)**	**AOR (95% CI)[a]**	**Girls % (SE)**	**Boys % (SE)**	**AOR (95%CI)[a]**
1999	0.76 (0.13)	0.59 (0.12)	1.32 (0.78, 2.22)	5.06 (0.46)	3.38 (0.38)	1.49 (1.11, 2.00)
2000	1.11 (0.14)	1.13 (0.15)	0.99 (0.69, 1.43)	5.92 (0.47)	5.30 (0.50)	1.15 (0.90, 1.47)
2001	1.79 (0.20)	1.52 (0.24)	1.19 (0.82, 1.72)	7.27 (0.59)	4.97 (0.44)	1.51 (1.17, 1.95)
2002	1.67 (0.19)	1.21 (0.20)	1.37(0.91, 2.05)	8.11 (0.69)	6.82 (0.57)	1.22 (0.96, 1.55)
2003	1.42 (0.19)	0.81 (0.15)	1.76 (1.10, 2.81)	5.42 (0.50)	4.24 (0.46)	1.30 (0.97, 1.74)
2004	1.18 (0.17)	0.77 (0.16)	1.59 (0.94, 2.67)	5.22 (0.50)	4.25 (0.56)	1.22 (0.87, 1.73)
2005	0.74 (0.11)	0.37 (0.09)	2.00 (1.08, 3.71)	3.92 (0.47)	3.14 (0.39)	1.24 (0.88, 1.75)
2006	1.05 (0.17)	0.46 (0.11)	2.26 (1.14, 4.45)	4.75 (0.58)	3.62 (0.33)	1.33 (0.99, 1.80)
2007	1.15 (0.21)	0.90 (0.20)	1.29 (0.69, 2.38)	3.53 (0.43)	3.09 (0.42)	1.15 (0.82, 1.61)
2008	1.40 (0.23)	0.61 (0.15)	2.51 (1.43, 4.39)[b]	4.65 (0.50)	4.13 (0.47)	1.10 (0.79, 1.53)[b]

[a]AOR=Adjusted Odds Ratio; CI = Confidence Interval; Adolescent age, race/ethnicity, household income and population density were controlled for in the analyses.

[b]The difference between the two age groups is statistically significant, p=0.013.