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# Correlates of recent and former ecstasy (MDMA) use in the Swedish general population

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## **Abstract**

The aim of the present study was to report independent correlates of ecstasy use in the Swedish general population. Data were drawn from a Swedish national household survey conducted in 2008-2009 on a random, stratified sample of 58,000 inhabitants of Sweden, aged 15 to 64. The response rate was 38.3 percent. Logistic regression analysis was used to identify correlates of recent (past-year) and former ecstasy use. Results are discussed and limitations of the study are noted.

## **Keywords**

Ecstasy, MDMA, Substance use disorders, Epidemiology, Correlates, Characteristics, General population, Sweden, Odds ratio, Logistic regression.

## **Introduction**

Ecstasy (3,4-methylenedioxymethamphetamine, MDMA) has been categorized as being a party drug, with a lower dependency potential than most other drugs of abuse (Degenhardt, Bruno, & Topp, 2010), but with known neurotoxic effects (Green, Mehan, Elliott, O'Shea, & Colado, 2003; Gouzoulis-Mayfrank & Daumann, 2006).

With few exceptions (Wu et al., 2009a; Wu, Parrott, Ringwalt, Yang, & Blazer, 2009b), most studies reporting correlates of ecstasy use have been conducted on perceived high-risk groups, such as youths (Degenhardt, Barker, & Topp, 2004; Keyes, Martins, & Hasin, 2008; Pedersen & Skrondal, 1999; Wu, Schlenger, & Galvin, 2006), students (Boyd, McCabe, & d'Arcy, 2003; Corapcioglu & Ogel, 2004) and illicit drug users (Ompad, Galea, Fuller, Edwards, & Vlahov, 2005). The aim of the present study was, therefore, to add to previous epidemiological studies on ecstasy use by reporting correlates of ecstasy use in the Swedish general population.

## **Method**

Data were drawn from a national household survey designed to assess the illicit drug use in the Swedish general population (The Swedish National Institute of Public Health, 2010). The survey was developed by the Swedish National Institute of Public Health in collaboration with Clinical Alcohol Research, Lund University. A stratified sample of 58,000 individuals was randomly selected from all registered inhabitants of Sweden aged 15 to 64, with an oversampling of groups with a suspected higher risk of drug use and low response rate (e. g., young males, lower educational level, larger city of residence). Surveys were sent out by mail, with an accompanying information letter, between November 2008 and February 2009. The survey was collected by Statistics Sweden, the national agency for population statistics,

and completed with register data on certain demographic variables. The data was then de-identified. A total of 22,095 people answered the survey, resulting in a response rate of 38.3% (weighted response rate 52.1%). All participants were informed that the survey was voluntary and anonymous. Informed consent was obtained for the collection of register data. The project as a whole was approved by the Ethics Committee of Lund University, Sweden.

The question used in the survey to assess participants' history of illicit drug use was: "Have you ever used any of the following substances without a doctor's prescription?" Ecstasy was one of eight classes of drugs examined and was further exemplified as MDMA, MDA or MDE. The possible answers were: "No", "Yes, during the past 30 days", "Yes, during the past 12 months" and "Yes, at least once in my life". For the main analysis, the material was divided into three mutually exclusive groups: recent (use within the past 12 months), former (lifetime use, but not within the past 12 months) and never-users of ecstasy.

The majority of independent variables were chosen based on previous epidemiologic studies on ecstasy using logistic regression analysis ( Boyd et al., 2003; Corapcioglu & Ogel, 2004; Degenhardt et al, 2004; Keyes et al., 2008; Ompad et al., 2005; Pedersen & Skrondal, 1999; Wu et al., 2006; Wu et al, 2009a) These were: age (categorized into three groups: 15-24, 25-34 and 35 years or older), gender, country of birth (born in Sweden or not), urbanicity (categorized into: living in a larger city (i. e., Stockholm, Gothenburg or Malmo), living in a suburb of a larger city, and other), income (above median or not), educational level (above high school level or not), housing status (living with one's partner or not), hazardous alcohol use, habitual smoking (smoking daily or having done so previously during at least six months), frequency of nights out (i. e., visiting a bar, night club or pub during the past 12 months, categorized into: twice a week or more, 2-4 times a month, and once a month or less)

and lifetime illicit use of other drugs: cannabis, stimulants (amphetamine and cocaine), heroin (this category also included methadone and buprenorphine) and prescription drugs.

Hazardous alcohol use was a dichotomous variable, based on the Alcohol Use Disorder Identification Test (AUDIT) (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), which was included in the survey, and was defined as an AUDIT score of eight or more for men and six or more for women (Reinert & Allen, 2007). The variable recent music festival attendance (visit during the past 12 months or not) was included because ecstasy use has been shown to be common among people who visit music festivals (Lim, Hellard, Hocking, Spelman, & Aitken, 2010). Based on the many long term adverse physical and psychological effects of ecstasy use that have been reported (Green et al., 2003), we also included the variables self-assessed physical and mental health, which were continuous variables based on questions asking participants for how many of the past 30 days their physical and mental health, respectively, had been poor.

We performed a hierarchical multinomial logistic regression analysis, with ecstasy use as the dependent variable. In the first model, sociodemographic factors (age, gender, country of birth, urbanicity, educational level, income and housing status) were entered as independent variables. In the second model, lifestyle and health variables (hazardous alcohol use, habitual smoking, frequency of nights out, music festival attendance and self-assessed physical and mental health) were added. In the third model, lifetime illicit use of other drugs was also controlled for. Clients with incomplete data on any of the included variables were excluded from the analyses. All analyses were performed in SPSS, version 17.0. Weights were created by Statistics Sweden to adjust for the sampling design of the survey. All percentages presented in this paper are weighted, while sample sizes presented in absolute numbers are unweighted. For the logistic regressions, unweighted data were used.

## **Results**

The weighted prevalence of recent (past-year) and former ecstasy use was 0.1% and 1.9%, respectively. Weighted frequency distributions for variables included in the regression analysis are presented in Table 1.

In the final model of the multinomial regression analysis, younger age, hazardous alcohol use and lifetime illicit use of cannabis, stimulants, heroin and prescription drugs were positively associated with both recent and former ecstasy use, as compared with no ecstasy use (Table 2). A higher frequency of nights out and recent music festival attendance were furthermore positively associated with, and living with one's partner negatively associated with, recent ecstasy use. Female gender, living in a larger city or a suburb and habitual smoking were positively associated with, and poor physical health negatively associated with, former ecstasy use.

## **Discussion**

The aim of this study was to describe correlates of ecstasy use in the Swedish general population. Illicit use of all other included types of drugs was highly associated with ecstasy use; however, odds ratios for stimulants were significantly higher than for other drugs.

Cocaine and amphetamine, as well as ecstasy, are often included in the group of so called "party drugs" and the associations between ecstasy and these kinds of drugs in particular, and other drugs in general, are well known from previous studies (Keyes et al., 2008; Wu et al, 2006). Even after controlling for use of other drugs, recent and former ecstasy users still differed from nonusers in a number of ways. The associations between ecstasy use and younger age, living in a larger city, smoking and hazardous alcohol use have been shown in

several previous studies (Degenhardt et al., 2004; Keyes et al., 2008; Wu et al., 2009a; Wu et al., 2006). The findings in this study indicate that the same patterns are present in the Swedish general population. In contrast with earlier studies (Degenhardt et al., 2004; Keyes et al., 2008), however, former ecstasy use was in this study associated with female gender. Another unexpected finding was that self-assessed poor physical health was associated with lower odds of former ecstasy use, both before and after controlling for use of other drugs. When analyzing the material further, however, we found that this association was not distinguishing for ecstasy use, but was in fact evident for several different kinds of illicit substance use (analyses not shown). We have not been able to find any other studies that compare self-assessed physical health between illicit substance users and nonusers and this issue may need to be addressed in future research.

Gender, urbanicity, self-assessed physical health and habitual smoking were significantly associated with former but not recent ecstasy use. These differences may partly be explained by the fact that the recent ecstasy users group was quite small ( $n = 211$ ), which might have decreased the statistical power. For gender, however, the association was not only insignificant, there was also a trend in the other direction, i. e., towards lower odds of ecstasy use for females.

Frequent nights out and recent music festival attendance were associated with higher odds of recent, but not former, ecstasy use. This difference is expected, as these variables refer to a relatively recent period of time.

Living with one's partner was associated with lower odds of recent ecstasy use. This finding is not unexpected, since several previous studies (Degenhardt et al., 2004; Keyes et al., 2008,



Wu et al., 2006) have shown a negative association between ecstasy use and marriage and, furthermore, entering a relationship has actually been indicated as a reason for ceasing ecstasy use (Peters, Kok, & Schaalma, 2008).

Being born in Sweden and poor mental health were positively associated, and higher education level and income above median were negatively associated with, both recent and former ecstasy use in the first two models, but not after controlling for use of other drugs. These findings imply that these variables are associated with illicit drug use in general, but that they do not distinguish ecstasy users from other illicit drug users.

### **Limitations**

This study is based on a self-report survey, and may thus be affected by both under- and over-reporting of certain variables. The unweighted response rate of 38% (52% weighted) is another limitation. The drop-out analysis showed no significant differences in drug use between responders and nonresponders, but at the same time, the drop-out analysis itself had a fairly low response rate of 53%. The cross-sectional design of the survey furthermore prevents any conclusions of causal relationships to be drawn from the findings.

This study is one of few to report correlates of ecstasy use in the general population. Despite its limitations, it adds to the literature on epidemiology of ecstasy use.

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**Table 1** Weighted demographic, lifestyle, health and drug use characteristics of recent, former and never-users of ecstasy.

<b>Selected characteristics</b>	<b>Recent ecstasy users (n = 211)</b>	<b>Former ecstasy users (n = 1,283)</b>	<b>Never-users (n = 20,043)</b>
Age group in years (%)			
15-24	61.6	22.2	20.5
25-34	22.4	48.7	17.7
35 or older	16.0	29.0	61.7
Female (%)	44.9	46.2	49.5
Born in Sweden (%)	84.1	97.6	83.7
Urbanicity			
Larger city	44.5	26.5	16.2
Suburb to larger city	18.5	10.2	16.8
Other	37.0	63.3	67.0
Educational level above high school (%)	31.4	30.9	33.2
Income above median (%)	11.3	46.3	50.7
Living with one's partner (%)	28.7	46.4	63.0
Hazardous alcohol use (%)	68.4	78.1	19.9
Habitual smoking (%)	40.7	69.7	35.5
Frequency of nights out (%)			
2 per week or more	19.3	12.0	1.6
2-4 per month	61.6	20.7	10.4
1 per month or less	19.1	67.3	88.0
Recent music festival attendance (%)	35.4	36.6	28.1
Days with poor physical health (mean)	3.2	2.5	3.9
Days with poor mental health (mean)	9.4	10.1	4.2
Lifetime illicit use of (%)			
Cannabis	99.3	95.5	14.7
Stimulants	94.5	92.1	3.8
Heroin	32.5	40.2	1.0
Prescription drugs	65.5	46.9	10.8

**Table 2** Factors associated with recent and former ecstasy use. Hierarchical logistic regression analysis.

Selected characteristics	Recent ecstasy use vs No ecstasy use			Former ecstasy use vs no ecstasy use		
	Model 1 AOR (95% CI)	Model 2 AOR (95% CI)	Model 3 AOR (95% CI)	Model 1 AOR (95% CI)	Model 2 AOR (95% CI)	Model 3 AOR (95% CI)
Age group in years						
15-24 vs 35 or older	1.48 (0.93 - 2.34)	<b>1.72 (1.04 - 2.84)<sup>a</sup></b>	<b>5.32 (3.10 - 9.12)<sup>c</sup></b>	<b>0.60 (0.49 - 0.73)<sup>c</sup></b>	<b>0.78 (0.64 - 0.96)<sup>a</sup></b>	<b>1.98 (1.51 - 2.59)<sup>c</sup></b>
25-34 vs 35 or older	<b>1.69 (1.09 - 2.60)<sup>a</sup></b>	1.54 (0.95 - 2.48)	<b>2.23 (1.35 - 3.67)<sup>b</sup></b>	<b>1.90 (1.63 - 2.22)<sup>c</sup></b>	<b>2.07 (1.75 - 2.44)<sup>c</sup></b>	<b>2.55 (2.07 - 3.15)<sup>c</sup></b>
Gender						
Female vs male	0.96 (0.77 - 1.41)	<b>0.62 (0.44 - 0.88)<sup>a</sup></b>	0.70 (0.47 - 1.03)	<b>1.49 (1.31 - 1.68)<sup>c</sup></b>	0.89 (0.77 - 1.02)	<b>1.34 (1.11 - 1.62)<sup>b</sup></b>
Country of birth						
Sweden vs other	<b>2.05 (1.25 - 3.36)<sup>a</sup></b>	1.63 (0.94 - 2.81)	0.98 (0.53 - 1.81)	<b>2.51 (2.02 - 3.12)<sup>c</sup></b>	<b>1.98 (1.57 - 2.48)<sup>c</sup></b>	1.10 (0.82 - 1.47)
Urbanicity						
Larger city vs other	<b>1.54 (1.04 - 2.28)<sup>a</sup></b>	1.16 (0.77 - 1.75)	1.41 (0.87 - 2.28)	<b>1.66 (1.40 - 1.96)<sup>c</sup></b>	<b>1.52 (1.27 - 1.83)<sup>c</sup></b>	<b>1.49 (1.17 - 1.89)<sup>b</sup></b>
Suburb vs other	0.92 (0.59 - 1.43)	0.90 (0.56 - 1.45)	1.32 (0.76 - 2.27)	1.08 (0.89 - 1.31)	1.20 (0.98 - 1.47)	<b>1.33 (1.02 - 1.74)<sup>a</sup></b>
Educational level						
Above high school vs not	0.88 (0.64 - 1.21)	0.83 (0.60 - 1.17)	1.08 (0.74 - 1.56)	<b>0.69 (0.61 - 0.78)<sup>c</sup></b>	<b>0.81 (0.71 - 0.93)<sup>b</sup></b>	1.04 (0.87 - 1.24)
Income						
Above median vs not	<b>0.53 (0.35 - 0.81)<sup>b</sup></b>	<b>0.60 (0.39 - 0.93)<sup>b</sup></b>	0.84 (0.53 - 1.33)	<b>0.56 (0.48 - 0.65)<sup>c</sup></b>	<b>0.64 (0.55 - 0.75)<sup>c</sup></b>	1.03 (0.84 - 1.26)
Housing situation						
Living with one's partner vs not	<b>0.49 (0.35 - 0.70)<sup>c</sup></b>	<b>0.55 (0.38 - 0.79)<sup>b</sup></b>	<b>0.52 (0.35 - 0.77)<sup>b</sup></b>	<b>1.15 (1.02 - 1.30)<sup>a</sup></b>	<b>1.17 (1.02 - 1.33)<sup>a</sup></b>	1.14 (0.96 - 1.35)
Hazardous alcohol use						
Yes vs no		<b>3.63 (2.46 - 5.36)<sup>c</sup></b>	<b>1.77 (1.16 - 2.70)<sup>a</sup></b>		<b>2.72 (2.37 - 3.12)<sup>c</sup></b>	<b>1.42 (1.18 - 1.69)<sup>c</sup></b>
Habitual smoking						
Yes vs no		<b>4.36 (3.17 - 6.01)<sup>c</sup></b>	1.28 (0.89 - 1.85)		<b>4.73 (4.13 - 5.41)<sup>c</sup></b>	<b>1.38 (1.16 - 1.65)<sup>c</sup></b>
Frequency of nights out						
> 2/week vs 1/month or less		<b>4.83 (3.05 - 7.65)<sup>c</sup></b>	<b>3.63 (2.14 - 6.16)<sup>c</sup></b>		<b>1.37 (1.06 - 1.76)<sup>a</sup></b>	0.99 (0.72 - 1.35)
2-4/month vs 1/month or less		<b>2.69 (1.85 - 3.92)<sup>c</sup></b>	<b>2.61 (1.71 - 3.98)<sup>c</sup></b>		1.10 (0.95 - 1.29)	1.05 (0.86 - 1.27)
Recent music festival attendance						
Yes vs no		<b>1.94 (1.44 - 2.62)<sup>c</sup></b>	<b>1.70 (1.21 - 2.38)<sup>b</sup></b>		1.08 (0.94 - 1.24)	0.98 (0.82 - 1.17)
Poor physical health						
Per extra day		1.00 (0.98 - 1.03)	0.99 (0.96 - 1.01)		<b>0.99 (0.98 - 1.00)<sup>a*</sup></b>	<b>0.98 (0.97 - 0.99)<sup>c</sup></b>
Poor mental health						
Per extra day		<b>1.03 (1.00 - 1.04)<sup>a*</sup></b>	1.01 (0.99 - 1.03)		<b>1.01 (1.00 - 1.02)<sup>c*</sup></b>	1.00 (0.99 - 1.01)
Lifetime illicit use of cannabis						
Yes vs no			<b>6.25 (2.58 - 15.17)<sup>c</sup></b>			<b>7.34 (5.44 - 10.07)<sup>c</sup></b>
Lifetime illicit use of stimulants						
Yes vs no			<b>32.04 (18.33 - 56.01)<sup>c</sup></b>			<b>17.84 (14.63 - 21.75)<sup>c</sup></b>
Lifetime illicit use of heroin						
Yes vs no			<b>4.50 (3.02 - 6.71)<sup>c</sup></b>			<b>3.76 (2.99 - 4.73)<sup>c</sup></b>
Lifetime illicit use of prescription drugs						
Yes vs no			<b>2.26 (1.53 - 3.34)<sup>c</sup></b>			<b>1.70 (1.42 - 2.03)<sup>c</sup></b>

AOR = adjusted odds ratio; CI = confidence interval.

<sup>a</sup>p < 0.05

<sup>b</sup>p < 0.005

$p < 0.001$

\*These data are significant, but have been rounded.