

POST-PRINT

This is a pre-print (post-referred) version of the manuscript that has been published in Drug and Alcohol Review. The citation details and the link to the final publisher version are below.

Fraser, D., Gartner, C. and Hall, W. (2014), Patterns of tobacco smoking among illicit drug users in Australia 2001–2010. Drug and Alcohol Review, 33: 534–539.

doi: 10.1111/dar.12187. Epub 2014 Jul 29

<http://onlinelibrary.wiley.com/doi/10.1111/dar.12187/abstract;jsessionid=5059554>

Patterns of tobacco smoking among illicit drug users in Australia 2001-2010

Running title: Tobacco smoking among illicit drug users

Doug Fraser, BSc (Hons) (Psych), Research Assistant, University of Queensland Centre for Clinical Research

Coral Gartner, PhD, Senior Research Fellow, University of Queensland Centre for Clinical Research

Wayne Hall, PhD, Director, Centre for Youth Substance Abuse Research, University of Queensland and University of Queensland Centre for Clinical Research

Corresponding author:

Wayne Hall

The University of Queensland Centre for Youth Substance Abuse Research

K Floor Mental Health Centre

Royal Brisbane and Women's Hospital

HERSTON QLD 4029

w.hall@uq.edu.au; +61-(0)7-3365-5246

Abstract

Introduction and Aims

This study aimed to investigate whether there were changes from 2001 to 2010 in the characteristics of young adults who used party drugs or other illicit drugs and to determine if the prevalence of tobacco smoking differed depending on the type of drugs used.

Design and Methods

We analysed confidentialised data from the 2001 and 2010 National Drug Strategy Household Surveys. We compared young adults (aged 18-29) who used party drugs to other drug users and non-users on key demographic variables. We assessed relationships between (a) illicit drug use and smoking; (b) illicit drug use and smoking while controlling for social and demographic differences; and (c) illicit drug use and smoking after controlling for social and demographic variables as well as cannabis and alcohol use.

Results

There was little difference between 2001 and 2010 in drug user characteristics and smoking. Party drug users were more educated and of higher socioeconomic status than illicit drug users and non-users. Party drug users and users of other illicit drugs were far more likely to smoke tobacco,

however a large part of this relationship was explained by the higher rate of cannabis and alcohol use in these groups.

Discussion and Conclusions

Over the last decade party drug users have been a relatively socially advantaged sub-population yet smoking prevalence among these and other drug users has remained higher than among non-users.

This might be explained by the common sequence of drug involvement in which people initiate smoking then cannabis use followed by other drugs.

Keywords: smoking; illicit drugs; ecstasy; cannabis; tobacco

The prevalence of tobacco smoking in Australia has steeply declined over the past two decades. In 1964, 58% of males and 28% of females were smokers [1]. By 2010 this had declined to 22% of males and 18% of female [2]. The converging prevalence of smoking in Australian men and women reflects a rising prevalence of initiation among women in recent birth cohorts and similar rates of continuation to regular smoking [3].

Smoking prevalence is lowest among the most socioeconomically advantaged (highest income and education) [2]. This reflects higher cessation rates and lower rates of smoking initiation in persons of higher socioeconomic status (SES) compared to persons of lower SES. Apart from this social trend, there is very little evidence of hardening among smokers: the average number of cigarettes smoked per day, one measure of nicotine dependence, has decreased over time [4] while the higher rates of comorbid mental disorders among smokers have remained unchanged over the past decade or so [5, 6].

Illicit drug users are another sub-population in which the prevalence of smoking has traditionally been higher than among non-users of the same age. Illicit drug users interviewed in the Illicit Drug Reporting System (IDRS) [7] and the Ecstasy Drug Reporting System (EDRS) [8] have been consistently more likely to be current smokers or report a past history of cigarette smoking than their non-using peers. A similar pattern was reported in analyses of the 1998 and 2001 National Drug Strategy Household Survey (NDSHS) of drug use [9].

The demographic characteristics of people who use 'party' drugs (e.g., ecstasy) - typically young adults from a relatively advantaged background [2] - do not describe a population which would normally have a higher smoking prevalence. However, party drug users have been found to have high rates of poly drug use, alcohol use, and cigarette smoking [8, 10-12].

In this paper we describe trends in the prevalence of smoking among illicit drug users in Australia over the past decade during which the population prevalence of smoking has declined. We used data

from the 2001 and 2010 NDSHSs on self-reported smoking and drug use among 18-29 year olds. We explored the social and demographic characteristics of young adults and the associations between cigarette smoking and the use of 'party' drugs, here defined as ecstasy, cocaine or gamma hydroxyl butyrate (GHB), and the use of other illicit drugs (heroin, methamphetamine, etc.). We compared the 2001 and 2010 NDSHS datasets to examine whether:

- there had been any change in the social and demographic characteristics of young adults according to their drug use;
- the prevalence of cigarette smoking among party and other illicit drug users differed from that among peers who had not used any of these illicit drugs; and
- any differences in rates of cigarette smoking between non-users and users of illicit drugs persisted after adjusting for demographic differences as well as cannabis and alcohol use.

Method

We used data on tobacco and illicit drug use among young adults (18 to 29 years old) from the 2001 and 2010 National Drug Strategy Household Surveys. These surveys were conducted by Roy Morgan Research and managed by the Australian Institute of Health and Welfare (AIHW) on behalf of the Australian Department of Health and Ageing. They measured awareness, attitudes, and behaviours relating to drug use, including alcohol, tobacco, and illicit drugs [2, 13]. The confidentialised data files were provided by the AIHW through the Australian Data Archive. Ethics approval was obtained from the University of Queensland Human Research Ethics Committee.

The surveys used multistage random sampling of households in which the sample was stratified by region, with oversampling in some areas. Responses were collected using a drop and collect procedure in 2010, while in 2001 this was partly supplemented by personal and telephone interviews. In 2001 there was a response rate of 50% resulting in a sample size of 4958 young adults and in 2010 the response rate was 51% resulting in a sample size of 3836 young adults (aged 18-29). Weights

were applied to the data to align the sample to the Australian population. To account for the reduction in statistical power caused by the complex sampling design, the sample size was proportionally reduced to the 'effective sample size' based on the mean design effect calculated across key measures in the survey. More information on sampling and weighting is available in the survey reports [14, 15].

We classified participants into two categories of tobacco smoking: smokers (daily) and non-smokers (ex- and never-smokers). Cannabis use was coded as 'current' if they currently used cannabis at least once a month and 'not current' if they used cannabis less than monthly or not at all.

We used the NHMRC 2009 guidelines for alcohol consumption and health risk [16] as a measure of alcohol use. Specifically, participants were coded as regularly drinking at risky levels if they drank more than four standard drinks on a single occasion at least monthly.

We included the demographic variables of sex, socioeconomic status and education. For socioeconomic status (SES) we used the Index of Relative Socio-economic Disadvantage in quintiles developed by the Australian Bureau of Statistics. It is an area-based index of socioeconomic disadvantage calculated from components such as income, education, and occupation from national census data [17].

Illicit drug use was categorised into: 1) party drug users; 2) other illicit drug users; and 3) non-users. Party drug users (10.5% of young adults) were defined as those who reported using ecstasy, cocaine or GHB in the last 12 months and had no history of injecting drugs. 'Other' illicit drug users (6.5% of young adults) were those who reported any non-medical use of meth/amphetamines, inhalants, heroin, painkillers, tranquilisers, methadone, hallucinogens, or opiates in the last 12 months, and who had not used party drugs in that time. Non-users of illicit drugs (83% of young adults) were those who had not reported using any illicit drugs in the last 12 months and who reported that they had never injected drugs.

Statistical Analyses:

All analyses were performed in IBM SPSS Statistics 22.0. We compared the three groups of young adults as defined by their illicit drug use on key demographic variables (SES, sex, education) cigarette smoking, and current cannabis use using chi-square tests for each year separately.

We used logistic regression with the independent variables entered in three separate blocks to assess relationships between (a) illicit drug use and cigarette smoking; (b) illicit drug use and cigarette smoking while controlling for social and demographic differences between the three groups; and (c) illicit drug users and cigarette smoking after controlling for social and demographic covariates as well as current cannabis and alcohol use. To ensure the assumptions of the model were met we used linear regression to assess collinearity between predictors. We used measures of tolerance and VIF along with bivariate correlations between predictors to test for the absence of multicollinearity.

Results

Characteristics of illicit drug users

Table 1 indicates that more party drug users and other drug users were male in both 2001 and 2010 ($\chi^2(2) = 8.20, p = .017$; $\chi^2(2) = 10.15, p = .006$) and that party drug users were of higher SES than other illicit drug users and non-drug users in both 2001 ($\chi^2(8) = 35.29, p < .001$) and 2010 ($\chi^2(8) = 39.80, p < .001$).

Party drug users were also better educated than other illicit drug users in both years. A higher proportion of users of other illicit drugs did not complete year twelve compared to non-drug users and party drug users in both years and fewer non-drug users had a bachelor degree compared party drug users in 2001 ($\chi^2(6) = 26.80, p < .001$), but in 2010 this had reversed ($\chi^2(6) = 13.97, p = .03$).

Table 1. Characteristics of Australians aged 18-29 by drug use category in 2001 and 2010.

Variable	2001 % (95% CI)			2010 % (95% CI)		
	Non-users	Party drug users	Other illicit users	Non users	Party drug users	Other illicit users
Sex						
Female	51 (49–53)	42 (40–43)	47 (45–49)	51 (49–52)	42 (40–44)	45 (44–47)
Male	49 (47–51)	59 (57–60)	53 (51–55)	49 (48–51)	58 (56–60)	55 (53–56)
SES						
Lowest	17 (15–18)	9 (8–11)	20 (19–21)	18 (17–19)	11 (10–12)	25 (24–27)
Second	27 (25–29)	19 (17–20)	29 (27–31)	19 (17–20)	16 (15–18)	17 (16–18)
Third	20 (18–21)	22 (21–24)	18 (16–19)	20 (19–21)	17 (15–18)	18 (16–19)
Fourth	14 (13–15)	16 (15–18)	17 (16–18)	23 (21–24)	23 (21–24)	20 (19–21)
Highest	23 (21–25)	34 (32–35)	16 (14–18)	21 (19–22)	34 (32–35)	21 (19–22)
Education						
Bachelor+	21 (19–22)	24 (23–26)	13 (11–14)	26 (25–28)	24 (22–25)	18 (17–20)
Year 12	32 (30–33)	33 (31–35)	24 (22–26)	31 (29–33)	33 (31–35)	27 (26–29)
Cert/dip	33 (31–34)	31 (29–33)	38 (36–40)	31 (30–33)	33 (32–35)	36 (34–38)
< year 12	15 (14–17)	11 (10–12)	25 (23–26)	11 (10–13)	10 (9–11)	18 (17–19)

Smoking prevalence among young Australian adults declined from 27.3% in 2001 to 18.2% in 2010 ($\chi^2(1) = 66.08, p < .001$). This decline was seen in all three drug use categories (Figure 1). Current cigarette smoking was more common among both types of illicit drug users than among non-drug users and these differences persisted across the period of study despite a decline in overall smoking prevalence.

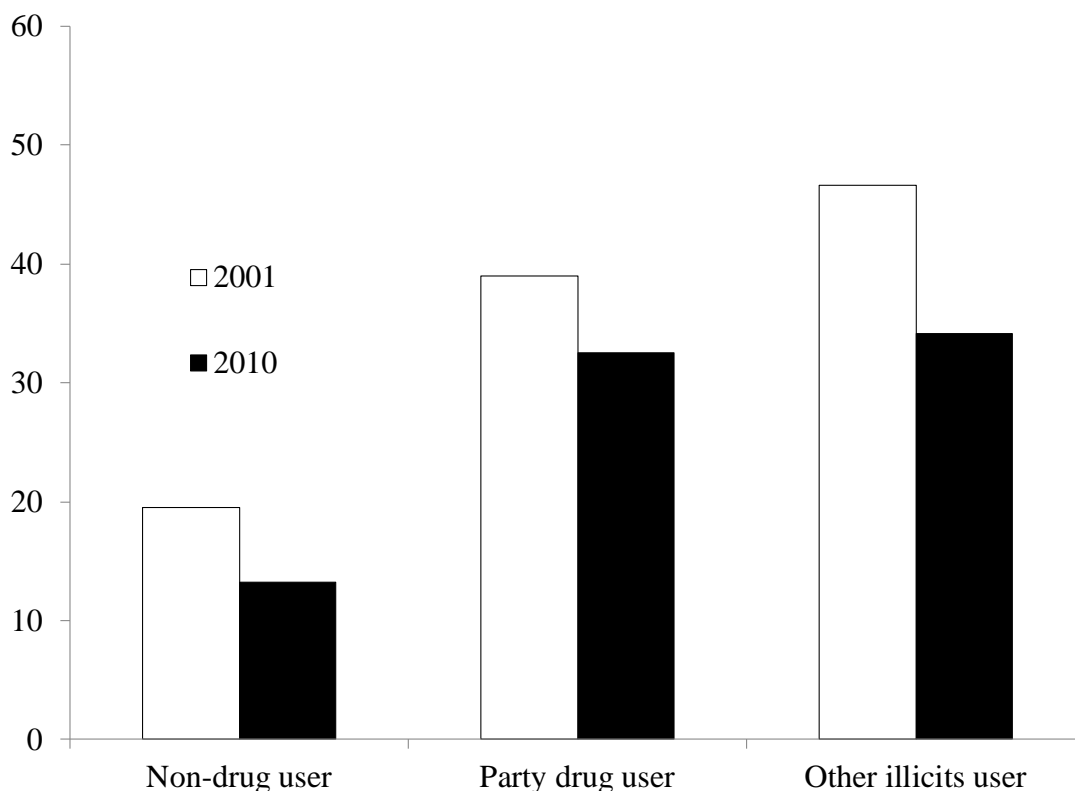


Figure 1. Smoking prevalence in young adults by drug use category and year of survey

There was also a decline in the number of young adults who smoked cannabis at least monthly, from 13.3% in 2001 to 8.9% in 2010, ($\chi^2(1) = 44.57, p < .001$). This decline occurred in all three categories of drug user but appeared to be steepest in party drug users, for whom the prevalence of frequent cannabis use decreased from 53.6% to 36.9% (Figure 2).

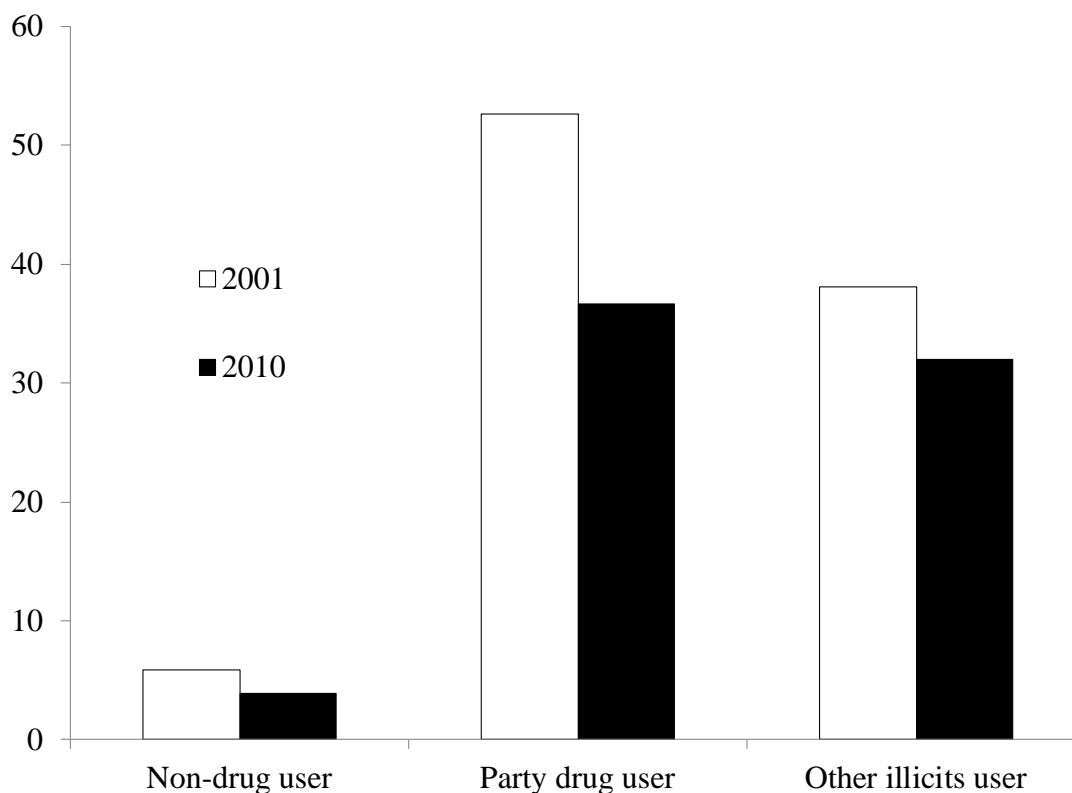


Figure 2. Prevalence of current (at least monthly) cannabis use in young adults by drug use category and year of survey.

There was a marginal decline in monthly single occasion risky drinking between 2001 and 2010 in young adults from 51.2% to 48.0% ($\chi^2(1) = 5.84$, $p = .016$). This was despite an increase in monthly binge drinking within party drug users from 2001 (75.8%) to 2010 (86.0%).

Correlates of Cigarette Smoking

Table 2 displays the results of logistic regression models predicting smoking status from drug use category, social and demographic variables, and cannabis use. Party drug users and users of other illicit drugs were 3-4 times more likely to smoke tobacco compared to their non-drug using peers, without controlling for any other variables. Adjustment for social and demographic differences between the three groups had only a marginal effect on the difference in smoking rates between non users and those who had used party and other illicit drugs.

Before accounting for cannabis and alcohol use, males had very marginally higher rates of smoking than females, while the odds of cigarette smoking declined by 35% between 2001 and 2010.

Adding cannabis and alcohol use to the model had little effect on demographic predictors, but reduced the odds of smoking associated with other drug use (party drugs and other illicit drugs).

Regular cannabis use became the second strongest predictor of cigarette smoking after education: young adults who used cannabis at least monthly were about four times more likely to smoke tobacco than young adults who were not regular cannabis users. Those who drank at risky levels at least monthly were about twice as likely to be smokers.

There were strong social differentials in smoking prevalence: prevalence was highest in respondents who had not finished year 12 and lowest in those who had a bachelor's degree. Young adults in the two most disadvantaged quintiles of SES were significantly more likely to smoke than those in the least disadvantaged quintile.

Table 2. *Illicit drug use and demographic factors predicting smoking status. In model 1 smoking status was predicted by drug use category, while model 2 additionally included survey year and the demographic variables sex, SES, and education.*

Variable	Adjusted odds ratio (95% CI)		
	Model 1	Model 2	Model 3
Drug use category			
None	1	1	1
Party drugs	3.70 (3.03–4.51)	4.30 (3.48–5.32)	2.05 (1.61–2.62)
Other Illicit	4.12 (3.26–5.21)	3.53 (2.76–4.51)	2.20 (1.68–2.87)
Sex			
Female		1	1
Male		1.14 (0.98–1.32)	0.916 (0.79–1.07)
SES			
Highest		1	1
Fourth		1.12 (0.88–1.42)	1.20 (0.94–1.54)
Third		1.17 (0.92–1.48)	1.18 (0.93–1.51)
Second		1.31 (1.05–1.65)	1.38 (1.09–1.75)
Lowest		1.43 (1.12–1.81)	1.45 (1.13–1.86)
Highest education			
Bachelor or higher		1	1
Cert/Dip		3.42 (2.70–4.35)	3.10 (2.42–3.96)
Year 12		1.97 (1.54–2.53)	1.79 (1.39–2.31)
Less than year 12		5.69 (4.35–7.43)	5.10 (3.87–6.72)
Year of survey			
2001		1	1
2010		0.65 (0.56–0.75)	0.67 (0.58–0.78)
Cannabis use			
Never/infrequent			1
At least monthly			3.80 (3.02–4.76)
Alcohol use			
Abstainer/infrequent			1
At least monthly			1.96 (1.67–2.30)

Discussion

The key findings of our analyses were: that, as expected, party drug users being better educated and of higher SES than both other illicit drug users and non-drug using peers; and that cigarette smoking prevalence remained higher among both types of illicit drug user than non-using peers despite overall smoking rates declining in all three drug use groups between 2001 and 2010. More novel was the finding that these differences persisted after accounting for social and demographic differences between the three drug using groups. The results of the logistic regression model indicated that while party drug use and other illicit drug use was associated with a two-fold greater odds of smoking compared to no drug use, current cannabis use accounted for a four-fold increased odds of smoking. The shared route of administration [18] between cigarette smoking and cannabis smoking and mixing of tobacco with cannabis ('mulling') are the most plausible explanations of the strong association observed between cigarette smoking and cannabis use and other illicit drug use. Drinking alcohol at risky levels monthly or more often also accounted for a two-fold increased odds of smoking.

A higher smoking prevalence among party drug users was expected given the common sequences of drug involvement found in longitudinal studies in Australia [19, 20] and other developed countries [21, 22]. In these studies, young people who initiate drinking alcohol or cigarette smoking at an earlier age are more likely to smoke cannabis [22], and early and heavier cannabis users are subsequently more likely to use party drugs and other illicit drugs [23]. These patterns appear to be explained in turn by: shared genetic vulnerabilities to develop drug dependence; shared environments that provide early access to different types of illicit drugs and favourable social attitudes towards drug use; and the potential gateway effects of the shared route of smoking between tobacco and cannabis that in turn increases the likelihood of using party drugs [18].

There is no suggestion in our data that party drug use in Australia has moved down the social class gradient, as cigarette smoking and arguably cannabis smoking have recently done in Australia, and as cocaine use did in the USA in the mid-1980s [24]. The social correlates of party drug use remained unchanged between 2001 and 2010: in both years the better educated and more socially advantaged young adults were more likely to use these types of illicit drugs.

One might expect that the declining prevalence of tobacco smoking and the social marginalisation of cigarette smokers may make tobacco smoking again the badge of nonconformity, societal rejection, sensation seeking and a preparedness to take risks. Historically this was the social framing of cigarette smoking before World War I encouraged widespread smoking among Australian men after World War II and normalised cigarette smoking [25]. If so, cigarette smoking may in future become an even stronger predictor of illicit drug use among young Australians than it is now.

These data and other prospective data from cohort studies suggests that we should take cigarette smoking more seriously as a risk factor for cannabis and other illicit drug use. A continued emphasis on deterring smoking tobacco may also reduce the size of the cohort susceptible to starting cannabis smoking. Other public health responses could include more inclusion of tobacco smoking cessation assistance in drug treatment and harm reduction programs; education about the risks of developing tobacco dependence as a result of smoking mulled cannabis; and perhaps targeted education campaigns about cigarette smoking among young people who use illicit drugs, especially the larger, better educated group who use party drugs.

Acknowledgements

Wayne Hall was supported by a NHMRC Australia Fellowship. Coral Gartner was supported by a NHMRC Career Development Fellowship (GNT1061978). The confidentialised unit record file for the 2001 and 2010 National Drug Strategy Household Surveys were provided by the Australian Institute of Health and Welfare, the Department of Health and Ageing, and the Australian Data Archive; however, they bear no responsibility for the analyses presented within this publication or the interpretation of them.

References

- [1] Gray NJ, Hill DJ. Patterns of tobacco smoking in Australia. 2. *Med J Aust* 1977;2:327-8.
- [2] Australian Institute of Health and Welfare. 2010 National drug strategy household survey report. Canberra: AIHW, 2011.
- [3] Morley KI, Hall WD. Explaining the convergence of male and female smoking prevalence in Australia. *Addiction* 2008;103:487-95.
- [4] Scollo M. Chapter 2. Trends in tobacco consumption. In: Scollo M, Winstanley M, eds. *Tobacco in Australia: Facts and Issues*. 4 edn. Melbourne: Cancer Council Victoria; 2012.
- [5] Gartner C, Scollo M, Marquart L, Mathews R, Hall W. Analysis of national data shows mixed evidence of hardening among Australian smokers. *Aust N Z J Public Health* 2012;36:408-14.
- [6] Mathews R, Hall WD, Gartner CE. Is there evidence of 'hardening' among Australian smokers between 1997 and 2007? Analyses of the Australian National Surveys of Mental Health and Well-Being. *Aust N Z J Psychiatry* 2010;44:1132-6.
- [7] Stafford J, Burns L. *Australian Drug Trends 2012. Findings from the Illicit Drug Reporting System (IDRS)*. Australian Drug Trend Series No. 91. Sydney: National Drug and Alcohol Research Centre, University of New South Wales; 2012.
- [8] Sindicich N, Burns L. *Australian trends in ecstasy and related drug markets 2011: Findings from the Ecstasy and related Drugs Reporting System (EDRS)* Sydney. National Drug and Alcohol Research Centre, UNSW 2012.
- [9] Degenhardt L, Barker B, Topp L. Patterns of ecstasy use in Australia: findings from a national household survey. *Addiction* 2004;99:187-95.
- [10] Martins SS, Ghandour LA, Chilcoat HD. Pathways between ecstasy initiation and other drug use. *Addict Behav* 2007;32:1511-8.
- [11] Pedersen W, Skrandal A. Ecstasy and new patterns of drug use: a normal population study. *Addiction* 1999;94:1695-706.
- [12] Wu P, Liu X, Fan B. Factors associated with initiation of ecstasy use among US adolescents: Findings from a national survey. *Drug Alcohol Depend* 2010;106:193-8.
- [13] Grau J, Tatham N. 2001 National drug strategy household survey: detailed findings. Canberra: AIHW, 2002.
- [14] Roy Morgan Research. *National Drug Strategy Household Survey 2001 Technical Report*. Canberra: AIHW, 2002.
- [15] Roy Morgan Research. *National Drug Strategy Household Survey 2010 Final Technical Report*. Canberra: AIHW, 2011.
- [16] National Health and Medical Research Council. *Australian guidelines to reduce health risks from drinking alcohol*. Canberra: NHMRC, 2009.
- [17] Australian Bureau of Statistics. *Information Paper: An introduction to Socio-Economic Indexes for Areas (SEIFA)* Canberra: ABS; 2006.
- [18] Patton GC, Coffey C, Carlin JB, Sawyer SM, Lynskey M. Reverse gateways? Frequent cannabis use as a predictor of tobacco initiation and nicotine dependence. *Addiction* 2005;100:1518-25.
- [19] Alati R, Kinner SA, Hayatbakhsh MR, Mamun AA, Najman JM, Williams GM. Pathways to ecstasy use in young adults: Anxiety, depression or behavioural deviance? *Drug Alcohol Depend* 2008;92:108-15.
- [20] Degenhardt L, Coffey C, Moran P, Carlin JB, Patton GC. The predictors and consequences of adolescent amphetamine use: findings from the Victoria Adolescent Health Cohort Study. *Addiction* 2007;102:1076-84.
- [21] Fergusson DM, Boden JM, Horwood LJ. Cannabis use and other illicit drug use: testing the cannabis gateway hypothesis. *Addiction* 2006;101:556-69.
- [22] Kandel DB, Yamaguchi K, Chen K. Stages of progression in drug involvement from adolescence to adulthood: further evidence for the gateway theory. *J Stud Alcohol Drugs* 1992;53:447.
- [23] Hall WD, Lynskey M. Is cannabis a gateway drug? Testing hypotheses about the relationship between cannabis use and the use of other illicit drugs. *Drug Alcohol Rev* 2005;24:39-48.

- [24] Johnston LD, O'malley PM, Bachman JG, Schulenberg JE. Monitoring the Future: National Survey Results on Drug Use, 1975-2009. Volume I: Secondary School Students. Bethesda: National Institute on Drug Abuse (NIDA), 2010.
- [25] Tyrrell IR. Deadly enemies: University of New South Wales Press, 1999.