

**The association between alcohol abstinence, drinking or binge drinking and drug use:
is alcohol abstinence that safe?**

Abstract

Purpose – *This study investigates the association between alcohol abstinence and illicit drug use during early adulthood, and compares abstinence to moderate drinking and binge drinking, regrouped in different frequencies.*

Design/methodology/approach – *A total of 5,968 young male adults who completed the questionnaires were selected for the analyses. Alcohol abstinent participants were compared to moderate drinkers (who did not experience binge drinking during the previous 12 months), and casual, monthly, weekly and daily binge drinkers in terms of prevalence of drug use during early adulthood.*

Findings – *Alcohol abstinence was associated with higher risks of drug use than moderate drinking ($OR > 3$) for most of drugs, especially last-stage drugs: crystal meth, solvents, spice and heroin ($6.50 < OR < 13.50$). Such findings encourage rethinking prevention among alcohol abstainers who were so far considered at low risk of drug use.*

Research limitations/implications – *The main limitations of the study are the fact that it is cross-sectional, gender-blind and focusing on Swiss native who are less vulnerable than migrants.*

Practical implications – *High-risk subjects should be identified among young people who do not drink in order to develop specific preventive interventions.*

Originality/value – *This study is one of the first that compare alcohol abstinence, moderate drinking and binge drinking. Separate results covering 15 different drugs are presented.*

Key words: alcohol abstinence, binge drinking frequency, illicit drug use, substance use, Switzerland, young adult men

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Introduction

Due to its impact on health economy, binge drinking during adolescence and early adulthood has become a major topic for public health research. Indeed, numerous studies have highlighted associations between alcohol abuse and physical and mental preventable health consequences. Namely, the main consequences of drunkenness consist of accidents (Marmet *et al.*, 2014), including car accidents (Connor *et al.*, 2004); detrimental consequences of drunkenness also consist of aggressive behaviors (Pridemore, 2004), and risky sexual behaviors (Cooper, 2002; Dermen and Cooper, 1994). Regarding mid-term consequences, it has been shown that binge drinking causes more relational problems and unemployment (Rehm and Gmel, 1999). Binge drinking is also related to smoking (Wechsler *et al.*, 1995) and illicit drug use (Adam *et al.*, 2011; Chassin *et al.*, 2002; Wechsler *et al.*, 1997). Furthermore, alcohol drinking in adolescence and early adulthood is well described as a determinant step of any possible substance use trajectories (Baggio *et al.*, 2014; Kandel, 1975; Kuntsche *et al.*, 2004; Lanza *et al.*, 2010).

So far, it is established that the more often young people binge, the more often they experience alcohol-related problems (Adam *et al.*, 2011; Daeppen *et al.*, 2005; Kuntsche and Gmel, 2013); this includes directly attributable consequences of drinking or drunkenness (*i.e.* that occur only when one is drinking), and related problems such as drug use (*i.e.* that can occur when one is not drinking, but that are more likely to occur when one is drinking), as well. Nonetheless, most studies kept focusing on frequent *versus* infrequent binge drinkers, but did neither compare them to abstainers (*i.e.* people who do not drink alcohol) nor to moderate drinkers (*i.e.* people who do not binge). In a recent attempt to fill this gap (Dupuis *et al.*, 2014), it was found that alcohol abstinence during the previous 12 months was associated with higher proportions of detrimental consequences of drunkenness than moderate drinking among early adult males 15 months later. Such findings are quite counterintuitive and require some explanation: since most of alcohol abstainers who responded to the survey were still abstaining from drinking at follow-

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up, they could not experience alcohol-attributable consequences, even less consequences of drunkenness; this implies that the few participants who started (or restarted) drinking after the baseline study experienced all of the alcohol-related problems reported within the group of abstainers at baseline. Indeed, despite that the prevalence of alcohol dependence 15 months later was pretty low among people who were alcohol abstinent at the beginning of the survey (2.8%), 7.5% of those abstainers who started drinking became dependent only a couple of months later.

Despite that studies focusing alcohol abstinence exist, a distinction should be made between drinking cessation and any other forms of alcohol abstinence. Excluding research focusing on formerly alcoholic patients, research focusing on youths who do not drink is scarce. Moreover, it appears that such young people are considered as following the safest developmental pathway relying on the assumption that people who do not drink when they are the likeliest to drink will never drink ever. In contrast with this naïve assumption, Dupuis and colleagues (2014) stated that the rare abstainers who experienced drinking for the following year were at high risk of alcohol dependence and risky sexual behaviors, and suggested that moderate drinkers consisted of a more homogenous category of youths with a low risk of detrimental issues directly attributable to alcohol. Nevertheless these results have neither been replicated so far nor applied to other issues associated to alcohol use and binge drinking in particular. This is why this study purpose was to compare alcohol abstinence, moderate drinking and different binge drinking frequencies in terms of prevalence of alcohol-related issues that are not strictly caused by drinking, namely illicit drug use in early adulthood. However, unlike consequences of drunkenness, drug use and alcohol abstinence can co-occur during the same period. This is why this paper purports to investigate the association between abstinence, moderate drinking and difference binge drinking frequencies and the lifetime prevalence of drug use reported at the same time.

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Methods

Study design

This study is based on cross-sectional data from a Swiss epidemiological study on substance use (Cohort Study on Substance Use Risk Factors, ‘C-SURF’). As described in former articles (Baggio *et al.*, 2014; Dupuis *et al.*, 2014; Gmel *et al.*, 2015; Studer *et al.*, 2013), men aged around 20 years old were enrolled in 3 of the 6 Swiss military recruitment centers during their 3-day conscription, which is mandatory in Switzerland for each adult Swiss male. Despite that participants were enrolled in the study during conscription in order to recruit every young adult male, participants were clearly informed that the survey was independent of the Swiss Army: questionnaires were sent to the participants’ private addresses, only a short screening questionnaire was administered during the 3-day conscription to compare participants and non-participants. This makes the sample highly representative of young Swiss men and prevent from malingering in order to avoid military or civil obligations. The study protocol was approved by Lausanne University Hospital’s Clinical Research Ethics Committee (Protocol No. 15/07). Gmel and colleagues (2015) provided an overview of the study’s findings published for the 4 past years.

Participants

From August 2010 to November 2011, 13,245 conscripts were eligible to take part in a study on substance use. A total of 7,563 men consented to participate in the baseline survey, and 5,990 (79.2%) completed the questionnaire. The participants who completed the survey were rewarded with a voucher to the value of CHF 30; the equivalent amounts in US dollars or Euros when participants were recruited were about USD 30 and € 25, respectively.

Sampling characteristics and non-response between screening and baseline study have been described by Studer *et al.* (2013); some factors related to attrition were also investigated by Dupuis *et al.* (2014). Briefly, alcohol abstainers and daily binge drinkers were more likely to

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quit the study. In addition, the prevalence of weekly binge drinking was found to be clearly higher than Adam *et al.* (2011), whose sample was recruited 4 years earlier using the same procedure from one military assessment center where C-SURF took place (*i.e.* Lausanne).

Measurements

Participants were asked about how often they experienced binge drinking during the previous 12 months. Binge drinking was defined as drinking more than 5 standard drinks at one occasion. Six answers were proposed by the questionnaire: alcohol abstinence (coded 0); never, *i.e.* drinking without meeting the criteria for binge drinking (1); casual binge drinking, *i.e.* less than once a month (2); monthly binge drinking (3); weekly binge drinking (4); daily or nearly daily binge drinking (5). Participants were also asked if they had been smoking during the previous 12 months. In addition, they had to report how many standard drinks they had on average within a week.

Regarding drug use, a total of 15 drug categories were studied, namely: cannabis; hallucinogens (*i.e.* magic mushrooms, peyote, mescaline); LSD and PCP; salvia divinorum; speed; amphetamine and methamphetamine; ecstasy; crystal meth (Ice); nitrite inhalants (*i.e.* poppers); solvents (*i.e.* glue, solvent and gas such as benzene, ether, nitrous oxide, etc.); GHB and GBL; spice; cocaine, crack and freebase; heroin; and ketamine. Participants were asked whether they had ever experience using each of those.

In addition, since most of participants were still in professional training, they were asked about their parents' financial situation as a proxy for socioeconomic status. Given that they were unlikely to know their parents' exact income, parents' financial situation was investigated in terms of "being well-off compared to others", based on a 7-point scale. Finally, urban places are consistently associated with higher prevalence of drug use (Farrell *et al.*, 2005; Peen *et al.*, 2010). Thus, participants' mailing addresses were used to measure hometown urbanicity;

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hometowns with more than 10,000 inhabitants were considered as urban (coded 1), while hometowns with less than 10,000 inhabitants were considered as rural (0).

Statistical analysis

The different binge drinking frequencies were compared in terms of lifetime prevalence of illicit drug use using binary logistic regressions. Given the well-known association between drinking and smoking, the smoking status was the second main variable of the models. In addition, since both drug traffic and drug use are more likely to take place in urban areas (Cronk and Sarvela, 1997; Dalmadge and Cain, 2014; Edwards *et al.*, 2011; Radatz *et al.*, 2014), hometown urbanicity was also taken into account in the models. In addition, parents' financial situation was taken as control variables. Finally, the logistic regression analyses were also controlling for the total volume of alcohol drunk in a typical week in order to distinguish the effect of the alcohol intake and the effect of abstinence, drinking or binge drinking as behavioral patterns. Using the same rationales as the former study focusing on drinking consequences among the same cohort (Dupuis *et al.*, 2014), moderate drinking was taken as the reference modality for the analyses. Indeed, asking young adults not to drink seems unrealistic, and it was found that it was not the most protective drinking pattern at all. Associations were reported in terms of odds ratios. One-tailed tests were used assuming that only positive effects were expected. Statistical analyses were performed using SPSS 21.

Results

Sample's description

Of the 5,990 participants, 22 did not answer the questions related to binge drinking frequency and were thereby excluded. The final analytic sample consists of 5,968 participants. Mean age was 20.0 ± 1.23 years. The average number of drinks per week was 4.22 ± 2.99 . As summarized in Table 1, most common drinking patterns consist of casual or monthly binge drinking. Yet, 21.2% of the participants reported no binge drinking experience during the 12 months preceding

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the investigation; 483 (8.1%) participants were abstinent and 781 (13.1%) reported drinking but never as much as 5 drinks at one single occasion, and were thus considered as “moderate drinkers”. In addition, 2,840 (47.6%) participants were currently smoking. Regarding drug use, 2,850 (47.7%) participants reported having experienced cannabis use and 1,001 (16.8%) reported having experienced using other illicit drugs during the past 12 months. Illicit drugs that were used by most of participants were ecstasy (5.9%), hallucinogens (5.8%), and cocaine, crack and freebase (5.7%).

[Insert Table 1 around here]

Associations between binge drinking frequencies, smoking and illicit drug use

Cigarette smoking was consistently associated to drug use, except crystal meth and ketamine. Concerning participants' hometown, urban places were associated with higher prevalence rates of drug use, except LSD and PCP, speed, GHB and GBL, and spice. Crystal meth and heroin were the drugs, which use was the most specific to urban areas (OR = 1.80). Significant differences were found between binge drinking groups, highlighting substantial association between drinking and experiencing drug use, even controlling for the volume of alcohol drunken in a typical week. Predictably, the groups of frequent binge drinkers, that is to say, people who were usually binge drinking weekly or more often, were associated with the highest prevalence rates of each illicit drug use (Table 2).

More interesting findings regard the difference between moderate drinkers and abstainers. Indeed, significant positive associations were found between abstinence and drug use for every drug, except cannabis and nitrite inhalants. Odds ratios higher than 4 were found regarding hallucinogens, LSD and PCP, speed, and GHB and GBL. Furthermore, odds ratios even higher than 5 were measured for crystal meth (OR=7.70, $p<0.01$) and solvents (OR=7.41, $p<0.01$), heroin (OR=6.74, $p<0.05$) and spice (OR=13.44, $p<0.01$), which can be considered as large effects.

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[Insert Table 2 about here]

Discussion

Some current results were quite predictable, confirming what is already well known; for example, the association between smoking and drug use was perfectly consistent with literature (Kuntsche *et al.*, 2004; Lewinsohn *et al.*, 1999; Wechsler *et al.*, 1997). Nonetheless, the current findings regarding alcohol drinking are surprising and need to be discussed. The main finding is that alcohol abstinence is associated with higher prevalence of various illicit drug uses during early adulthood than moderate drinking. On one's hand, the general results are fully supported by various studies that demonstrated that "light" binge drinking patterns are safer than "heavy" binge drinking patterns in terms of prevalence of illicit drug use (Lanza *et al.*, 2010; O'Grady *et al.*, 2008; Tucker *et al.*, 2005). On the other hand, the idea that abstinence may be a more risky pattern than moderate drinking is counterintuitive. More surprising is the fact that abstinent young men are more likely to use specific illicit drugs than casual binge drinkers too. Such findings concern crystal meth, GHB and GBL, heroin, and ketamine. Those results can be explained by the fact that these drugs can be considered as final-stage drugs as stated by Degenhardt and Dunn (2008) and by Baggio *et al.* (2014). Moreover, final-stage drug users are less likely to be alcohol drinkers (Baggio *et al.*, 2014; Degenhardt and Topp, 2003). The fact that some participants were already final-stage drug users might explain why they were having no interest in alcohol drinking and even why they were not drinking for the past 12 months when they were assessed.

Another point that requires to be mentioned concerns the subgroup of daily binge drinkers. Due to its size and its lack of temporal stability, it might be not considered as a specific binge drinking frequency. Yet, given the differences with weekly binge drinker in terms of drinking consequences reported in a former work on the same data (Dupuis *et al.*, 2014), it was also assumed as a specific but temporary binge drinking pattern, and was associated with high

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prevalence of alcohol-related problems. Regarding the current study, differences between weekly and daily binge drinkers were utterly more difficult to detect because the prevalence of illicit drug use is much lower than the prevalence of drinking consequences. Still, similar differences between daily and weekly binge drinkers have emerged from the current analyses. A last point to be discussed is the question of scope about the categorization of drinking and binge drinking patterns. Indeed, most of differences with other studies may result from the comparison of abstinence and moderate drinking with binge drinking patterns. So far, most studies have been using shorter numbers of categories to measure binge drinking frequencies. Various rationales might have lead to this methodological choice (*e.g.* to produce results comparable to former studies, to present legible results, or to warrant their significance); yet, these rationales do not alleviate the question of the most relevant categorization. Thus, the current results should encourage further research to distinguish abstainers from moderate drinkers in order to observe drinking and binge drinking issues with a less short-sighted view.

Strengths and limitations

This study has both strengths and limitations requiring to be stated. First, it is based on cross-sectional data, which implies that causal associations cannot be assumed; in addition, it is based on drinking pattern during the past 12 months, which implies that some abstainers may be former drinkers. Second, due to how participants were recruited, this study is highly representative of a population of Swiss young male adults. Nevertheless, this also implies that this study does not take potential gender differences into account, and that it is blind to differences between Swiss nationals and foreigners. Still, such findings are likely to be generalizable to other countries from Western Europe with similar drinking habits (*i.e.* Austria, France, Germany and Spain) (Rehm *et al.*, 2001). Another limitation is the fact that this survey did not explore drug use motives in order to distinguish lifetime drug use from “phases”. Finally, participants were rewarded for completing the study; this represents a source of bias

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regarding participation that required to be mentioned, yet the effect of this bias was negligible, as stated in a former paper (Dupuis *et al.*, 2014).

Conclusion

Consistent with literature, the current results show that the more frequent young adults experience binge drinking, the more likely they are to use drugs. Furthermore, the main and newest results of this study are that alcohol abstinence is associated to higher risks of substance use than moderate drinking. Such results sustain that drug users are not only frequent binge drinkers, and encourage rethinking prevention by developing interventions that focus on youths who do not drink alcohol.

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Additional information, including English, French and German complete versions of the questionnaires used, is freely available on C-SURF website (www.csurf.ch).

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Table 1: Sample's characteristics (N=5,968)

| Variable | Participants | |
|---|--------------|------------|
| | N | Proportion |
| Urban | 2,378 | 39.7% |
| Smoking | 2,840 | 47.6% |
| Binge drinking frequency | | |
| Alcohol abstinence | 483 | 8.1% |
| Moderate drinking (no binge) | 781 | 13.1% |
| Casual binge drinking | 1,958 | 32.8% |
| Monthly binge drinking | 1,397 | 23.4% |
| Weekly binge drinking | 1,277 | 21.4% |
| Daily binge drinking (or nearly) | 72 | 1.2% |
| Financial situation of the parents | | |
| Very much better-off | 142 | 2.4% |
| Much better-off | 562 | 9.4% |
| Better-off | 1,918 | 32.1% |
| About the same | 2,456 | 41.2% |
| Less well-off | 6,61 | 11.1% |
| Much less well-off | 154 | 2.6% |
| Very much less well-off | 47 | 0.8% |
| Missing | 28 | 0.5% |
| Illicit drug use | | |
| Cannabis | 2,850 | 47.7% |
| Hallucinogens (magic mushrooms, peyote, mescaline) | 344 | 5.8% |
| LSD and PCP | 256 | 4.3% |
| Salvia divinorum | 312 | 5.3% |
| Speed | 286 | 4.8% |
| Amphetamine and methamphetamine | 207 | 3.5% |
| Ecstasy | 348 | 5.9% |
| Crystal meth | 69 | 1.2% |
| Nitrite inhalants (poppers) | 313 | 5.3% |
| Solvents (glue, solvent and gas, <i>e.g.</i> benzene, ether, nitrous oxide, etc.) | 288 | 4.9% |
| GHB and GBL | 71 | 1.2% |
| Spice | 87 | 1.5% |
| Cocaine, crack and freebase | 337 | 5.7% |
| Heroin | 66 | 1.1% |
| Ketamine | 78 | 1.3% |

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Table 2: Associations of risk factors with illicit drug use

| <i>Outcome</i> | <i>Risk factors</i> | <i>Prevalence</i> | <i>OR^a</i> | <i>90% CI^b</i> | |
|--|----------------------------------|-------------------|-----------------------|---------------------------|-------|
| Cannabis | Urban | 50.4% | 1.51 ^{***} | 1.32 | 1.72 |
| | Smoking | 75.5% | 2.42 ^{***} | 2.09 | 2.79 |
| | Alcohol abstinence | 14.2% | 0.78 | 0.53 | 1.14 |
| | Moderate drinking (no binge) | 21.4% | 1 | | |
| | Casual binge drinking | 43.5% | 1.93 ^{***} | 1.52 | 2.45 |
| | Monthly binge drinking | 58.0% | 2.78 ^{***} | 2.15 | 3.59 |
| | Weekly binge drinking | 70.5% | 4.33 ^{***} | 3.25 | 5.77 |
| | Daily binge drinking (or nearly) | 65.3% | 2.80 ^{**} | 1.52 | 5.17 |
| Hallucinogens (magic mushroom, peyote, mescaline) | Urban | 7.2% | 1.60 ^{***} | 1.31 | 1.95 |
| | Smoking | 10.5% | 3.01 ^{***} | 2.12 | 4.26 |
| | Alcohol abstinence | 3.5% | 4.58 ^{***} | 2.05 | 10.23 |
| | Moderate drinking (no binge) | 1.9% | 1 | | |
| | Casual binge drinking | 4.1% | 2.41 ^{**} | 1.23 | 4.69 |
| | Monthly binge drinking | 6.2% | 2.98 ^{**} | 1.53 | 5.84 |
| | Weekly binge drinking | 10.3% | 4.59 ^{***} | 2.32 | 9.07 |
| | Daily binge drinking (or nearly) | 18.1% | 8.50 ^{***} | 3.54 | 20.37 |
| LSD and PCP | Urban | 4.9% | 1.20 | 0.95 | 1.51 |
| | Smoking | 7.8% | 3.22 ^{***} | 2.13 | 4.87 |
| | Alcohol abstinence | 3.8% | 4.62 ^{***} | 2.24 | 9.52 |
| | Moderate drinking (no binge) | 1.6% | 1 | | |
| | Casual binge drinking | 3.1% | 2.02 | 0.98 | 4.16 |
| | Monthly binge drinking | 4.2% | 2.15 [*] | 1.04 | 4.47 |
| | Weekly binge drinking | 7.6% | 3.04 ^{**} | 1.45 | 6.38 |
| | Daily binge drinking (or nearly) | 16.7% | 8.03 ^{***} | 2.88 | 18.46 |
| Salvia divinorum | Urban | 6.3% | 1.49 ^{***} | 1.21 | 1.84 |
| | Smoking | 9.7% | 3.40 ^{***} | 2.32 | 4.98 |
| | Alcohol abstinence | 2.7% | 3.24 [*] | 1.39 | 7.52 |
| | Moderate drinking (no binge) | 1.7% | 1 | | |
| | Casual binge drinking | 3.8% | 2.27 [*] | 1.16 | 4.43 |
| | Monthly binge drinking | 5.1% | 2.54 [*] | 1.29 | 5.00 |
| | Weekly binge drinking | 10.2% | 4.75 ^{***} | 2.40 | 9.43 |
| | Daily binge drinking (or nearly) | 18.1% | 9.60 ^{***} | 4.00 | 23.10 |
| Speed | Urban | 5.2% | 1.17 | 0.94 | 1.46 |
| | Smoking | 8.9% | 3.23 ^{***} | 2.18 | 4.78 |
| | Alcohol abstinence | 2.9% | 4.89 ^{**} | 2.06 | 11.62 |
| | Moderate drinking (no binge) | 1.6% | 1 | | |
| | Casual binge drinking | 3.2% | 2.08 [*] | 1.01 | 4.27 |
| | Monthly binge drinking | 5.0% | 2.36 [*] | 1.15 | 4.88 |
| | Weekly binge drinking | 9.0% | 3.21 ^{**} | 1.54 | 6.69 |
| | Daily binge drinking (or nearly) | 19.4% | 7.93 ^{***} | 3.21 | 19.60 |

^a Odds ratios are adjusted for parents' income and total volume of alcohol drunk in a typical week

^b 95% CI for the one-tailed tests performed correspond to the lower bound of the 90% CI

* p < 0.05; ** p < 0.01; *** p < 0.001

ALCOHOL ABSTINENCE AND DRUG USE

Table 2 (continued): Associations of risk factors with illicit drug use

| <i>Outcome</i> | <i>Risk factors</i> | <i>Prevalence</i> | <i>OR^a</i> | <i>90% CI^b</i> | |
|---|----------------------------------|-------------------|-----------------------|---------------------------|--------|
| Amphetamine and methamphetamine | Urban | 4.3% | 1.57** | 1.22 | 2.02 |
| | Smoking | 6.3% | 3.09*** | 1.97 | 4.87 |
| | Alcohol abstinence | 3.3% | 3.14* | 1.33 | 7.45 |
| | Moderate drinking (no binge) | 1.6% | 1 | | |
| | Casual binge drinking | 2.3% | 1.33 | 0.67 | 2.64 |
| | Monthly binge drinking | 3.1% | 1.38 | 0.68 | 2.77 |
| | Weekly binge drinking | 6.3% | 2.29* | 1.13 | 4.66 |
| | Daily binge drinking (or nearly) | 16.7% | 6.58*** | 2.65 | 16.32 |
| Ecstasy | Urban | 7.0% | 1.42** | 1.16 | 1.72 |
| | Smoking | 10.8% | 3.05*** | 2.16 | 4.32 |
| | Alcohol abstinence | 3.1% | 3.65** | 1.64 | 8.10 |
| | Moderate drinking (no binge) | 2.1% | 1 | | |
| | Casual binge drinking | 3.8% | 1.82 | 0.97 | 3.41 |
| | Monthly binge drinking | 6.5% | 2.42* | 1.29 | 4.55 |
| | Weekly binge drinking | 11.2% | 3.23** | 1.70 | 6.14 |
| | Daily binge drinking (or nearly) | 19.4% | 5.89*** | 2.56 | 13.58 |
| Crystal meth | Urban | 1.6% | 1.86** | 1.19 | 2.89 |
| | Smoking | 1.8% | 1.62 | 0.85 | 3.08 |
| | Alcohol abstinence | 1.9% | 7.70** | 1.89 | 31.41 |
| | Moderate drinking (no binge) | 0.5% | 1 | | |
| | Casual binge drinking | 0.8% | 1.28 | 0.36 | 4.56 |
| | Monthly binge drinking | 0.8% | 1.04 | 0.28 | 3.85 |
| | Weekly binge drinking | 1.8% | 1.59 | 0.43 | 5.87 |
| | Daily binge drinking (or nearly) | 9.7% | 6.82** | 1.54 | 30.19 |
| Nitrite inhalants (poppers) | Urban | 6.1% | 1.45** | 1.18 | 1.80 |
| | Smoking | 8.7% | 1.95** | 1.41 | 2.70 |
| | Alcohol abstinence | 2.1% | 2.15 | 0.74 | 6.21 |
| | Moderate drinking (no binge) | 1.4% | 1 | | |
| | Casual binge drinking | 3.1% | 2.58* | 1.18 | 5.63 |
| | Monthly binge drinking | 7.3% | 5.26*** | 2.42 | 11.42 |
| | Weekly binge drinking | 9.2% | 5.86*** | 2.65 | 12.94 |
| | Daily binge drinking (or nearly) | 19.4% | 14.44*** | 5.52 | 37.79 |
| Solvents (glue, solvent and gas, e.g. benzene, ether, nitrous oxide) | Urban | 5.4% | 1.31* | 1.05 | 1.64 |
| | Smoking | 7.6% | 1.57** | 1.14 | 2.15 |
| | Alcohol abstinence | 2.5% | 7.41** | 1.95 | 28.19 |
| | Moderate drinking (no binge) | 1.3% | 1 | | |
| | Casual binge drinking | 3.9% | 7.64** | 2.32 | 25.11 |
| | Monthly binge drinking | 5.1% | 10.21*** | 3.09 | 33.68 |
| | Weekly binge drinking | 8.7% | 17.05*** | 5.13 | 56.70 |
| | Daily binge drinking (or nearly) | 13.9% | 26.74*** | 6.87 | 104.13 |

^a Odds ratios are adjusted for parents' income and total volume of alcohol drunk in a typical week

^b 95% CI for the one-tailed tests performed correspond to the lower bound of the 90% CI

* p < 0.05; ** p < 0.01; *** p < 0.001

ALCOHOL ABSTINENCE AND DRUG USE

Table 2 (continued): Associations of risk factors with illicit drug use

| <i>Outcome</i> | <i>Risk factors</i> | <i>Prevalence</i> | <i>OR^a</i> | <i>90% CI^b</i> | |
|------------------------------------|----------------------------------|-------------------|-----------------------|---------------------------|--------|
| GHB and GBL | Urban | 1.3% | 1.28 | 0.83 | 1.98 |
| | Smoking | 1.7% | 1.16 | 0.66 | 2.05 |
| | Alcohol abstinence | 1.5% | 4.34* | 1.02 | 18.51 |
| | Moderate drinking (no binge) | 0.5% | 1 | | |
| | Casual binge drinking | 1.0% | 1.95 | 0.56 | 6.76 |
| | Monthly binge drinking | 0.9% | 1.73 | 0.48 | 6.24 |
| | Weekly binge drinking | 1.8% | 2.44 | 0.66 | 9.10 |
| | Daily binge drinking (or nearly) | 8.3% | 13.46** | 2.93 | 61.80 |
| Spice | Urban | 1.7% | 1.40 | 0.94 | 2.08 |
| | Smoking | 2.2% | 1.34 | 0.77 | 2.34 |
| | Alcohol abstinence | 2.1% | 13.44** | 2.18 | 83.03 |
| | Moderate drinking (no binge) | 0.5% | 1 | | |
| | Casual binge drinking | 0.9% | 3.05 | 0.55 | 16.83 |
| | Monthly binge drinking | 1.2% | 3.10 | 0.56 | 17.36 |
| | Weekly binge drinking | 2.7% | 5.53 | 0.99 | 31.01 |
| | Daily binge drinking (or nearly) | 8.3% | 15.07** | 2.27 | 100.23 |
| Cocaine, crack and freebase | Urban | 6.9% | 1.50*** | 1.23 | 1.83 |
| | Smoking | 10.7% | 3.64*** | 2.51 | 5.29 |
| | Alcohol abstinence | 2.7% | 3.09** | 1.40 | 6.81 |
| | Moderate drinking (no binge) | 2.1% | 1 | | |
| | Casual binge drinking | 4.2% | 1.72 | 0.95 | 3.13 |
| | Monthly binge drinking | 5.8% | 1.72 | 0.94 | 3.15 |
| | Weekly binge drinking | 10.5% | 2.37* | 1.28 | 4.38 |
| | Daily binge drinking (or nearly) | 19.4% | 4.31*** | 1.91 | 9.75 |
| Heroin | Urban | 1.5% | 1.80* | 1.14 | 2.86 |
| | Smoking | 8.7% | 1.19 | 0.66 | 2.16 |
| | Alcohol abstinence | 1.9% | 6.74* | 1.65 | 27.49 |
| | Moderate drinking (no binge) | 0.8% | 1 | | |
| | Casual binge drinking | 0.9% | 1.77 | 0.51 | 6.16 |
| | Monthly binge drinking | 0.9% | 1.39 | 0.38 | 5.09 |
| | Weekly binge drinking | 1.3% | 1.39 | 0.36 | 5.31 |
| | Daily binge drinking (or nearly) | 8.3% | 8.35** | 1.80 | 38.75 |
| Ketamine | Urban | 1.7% | 1.62* | 1.08 | 2.45 |
| | Smoking | 2.1% | 1.77 | 0.97 | 3.24 |
| | Alcohol abstinence | 2.3% | 3.55* | 1.18 | 10.63 |
| | Moderate drinking (no binge) | 0.8% | 1 | | |
| | Casual binge drinking | 0.8% | 0.76 | 0.29 | 1.96 |
| | Monthly binge drinking | 1.2% | 1.01 | 0.39 | 2.63 |
| | Weekly binge drinking | 1.8% | 1.13 | 0.41 | 3.09 |
| | Daily binge drinking (or nearly) | 9.7% | 6.31*** | 1.84 | 21.68 |

^a Odds ratios are adjusted for parents' income and total volume of alcohol drunk in a typical week

^b 95% CI for the one-tailed tests performed correspond to the lower bound of the 90% CI

* p < 0.05; ** p < 0.01; *** p < 0.001