

# Concurrent use of addictive substances among alcohol drinkers: Prevalence and problems in a Swedish general population sample

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## Abstract

**Aims:** To examine concurrent use of addictive substances among alcohol drinkers in the Swedish general population and to assess to what extent this increases the risk of alcohol problems.

**Methods:** Data were retrieved from a nationally representative survey from 2013 on use of and problems related to alcohol, tobacco, illicit drugs and non-prescribed use of analgesics and sedatives with 15,576 respondents. Alcohol users were divided into different groups on the basis of frequency of drinking overall and binge drinking. Tobacco use was measured in terms of daily use and use of illicit drugs and non-prescribed use of analgesics and sedatives were measured in terms of last 12 months prevalence. A dichotomous indicator of a DSM-IV dependence or abuse diagnosis was used. Logistic regression models were estimated to examine the relationship between various patterns of drinking in combination with other substance use and risk of alcohol abuse and/or dependence.

**Results:** People who drink alcohol in Sweden were more likely to use other addictive substances than non-drinkers and such concurrent use becomes more common the more alcohol is consumed. Alcohol drinkers using other substances have a higher prevalence of alcohol abuse and dependence at all frequencies of drinking. Multivariate models controlling for sex, age and drinking frequency found that an elevated risk of harm remained for drinkers using addictive substances other than snuff. **Conclusion:** A large group of drinkers in the Swedish general population have an accumulation of risks as a result of using both alcohol and other addictive substances. Concurrent

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use of cigarettes, illicit drugs and non-prescribed use of analgesics and sedatives adds an independent risk of alcohol abuse/dependence in this group in addition to their drinking. The findings point at the importance of taking multiple substance-use patterns into account when combating drinking problems. Screening for concurrent use of other addictive substances could help healthcare providers to identify patients in need of treatment for alcohol problems.

### Keywords

alcohol drinkers, alcohol problems, concurrent substance use, general population, Sweden

It is well established that heavy drinkers in treatment often use other addictive substances, e.g., tobacco and illicit drugs, and that such multiple substance use elevates the harmful effects of their drinking (Moss, Goldstein, Chen, & Yi, 2015; Walitzer, Dearing, Barrick, & Shyhalla, 2015). Other studies of clinical populations found a poorer treatment outcome for persons using other addictive substances (Malcolm, Hesselbrock, & Segal, 2006). Furthermore, mortality studies show that other addictive substances often are detected in autopsies of people having died from alcohol-related causes (Darke, Dufrou, Torok, & Prolov, 2013). All in all, the literature based on populations with severe drinking problems suggests a clustering of addictive substances and subsequent elevated risk of harm in this group.

Less is known of multiple substance use among alcohol drinkers in the general population, including heavy drinkers without clinically diagnosed alcohol problems. To establish such knowledge is critical since this group of drinkers accounts for a substantial share of alcohol problems in society due to their sheer size (Andréasson, Danielsson, & Hallgren, 2013). Whether concurrent use of addictive substances is common among drinkers in the general population and whether it is associated with an elevated risk of harm is important knowledge for alcohol prevention work, e.g., to support an integrated view targeting diverse substance-use patterns.

There is some evidence in the international literature suggesting that concurrent use of

addictive substances is fairly common among drinkers in the general population and typically associated with a higher risk of alcohol problems (Subbaraman & Kerr, 2015). For instance, alcohol-dependent drinkers who also used tobacco, cannabis, cocaine, and other illicit drugs had more severe patterns of alcohol consumption compared to alcohol-dependent drinkers who only use alcohol (Moss et al., 2015). Moreover, several studies have found that smoking is prevalent among heavy drinkers, including people diagnosed with alcohol abuse or dependence (Gupta, Maulik, Pednekar, & Saxena, 2005). There is also considerable evidence that cannabis use is relatively common among heavy drinkers in general population samples (Hakkarainen & Metso, 2009; Höhne, Pabst, Hannemann, & Kraus, 2014; Midanik, Tam, & Weisner, 2007; Smith, Farrell, Bunting, Houston, & Shevlin, 2011) as well as use of prescription drugs (Breslow, Dong, & White, 2015). Moreover, in a recent study based on a nationally representative sample of US adults, simultaneous co-use of alcohol and drugs was associated with an elevated risk of an alcohol-use disorder (Karriker-Jaffe, Subbaraman, Greenfield, & Kerr, 2018).

Current knowledge of multiple substance use among alcohol drinkers in the adult Swedish general population is surprisingly limited, with some scattered findings for subpopulations. For instance, combined use of alcohol and tobacco among women was found to be associated with a higher risk of not being able to abstain from alcohol during pregnancy

(Skagerström, Alehagen, Häggström-Nordin, Årestedt, & Nilsen, 2013). A higher prevalence of snuff use has been found among heavy drinkers in Stockholm county (Engström, Magnusson, & Galanti, 2010) and some findings suggest that use of snuff increases the risk of developing alcohol dependence in a middle-aged population (Norberg, Malmberg, Ng, & Broström, 2015). There is, however, no research on the prevalence of concurrent use of alcohol and drugs in the general population in Sweden and to what extent this is associated with an elevated risk of alcohol-related harm.

The aim of this article is to examine patterns of concurrent use of addictive substances among drinkers in the Swedish general population and to assess to what extent this increases the risk of alcohol abuse and/or dependence. We will examine the most common types of addictive substances in a Swedish context, namely tobacco use (cigarettes and snuff), illicit drugs (e.g., cannabis, opioids and amphetamines) as well as non-prescribed use of analgesics and sedatives. The following two major research questions will be addressed:

1. What is the prevalence of other substance use among alcohol drinkers at different patterns of drinking, and does concurrent use of other addictive substances increase with frequency of drinking?
2. To what extent does concurrent use of addictive substances increase the risk of alcohol abuse/dependence at different frequencies of drinking?

## Data and methods

The study uses data from a nationally representative survey on use of and problems related to alcohol, tobacco, illicit drugs and prescription drugs conducted in 2013 with a total of 15,576 respondents and a response rate of 59.3% (Ramstedt, Sundin, Landberg, & Raninen, 2014). The sample was randomly drawn from the Swedish

population register (SPAR) and includes individuals aged 17–84 years. Respondents were asked to participate either by answering a postal questionnaire (85% of the sample) or by answering the same questions on an internet web page (15%). For the present analysis, we used the following questions in the survey:

### Alcohol consumption:

*Frequency of drinking in general:* How often during the last 12 months have you drunk at least one glass containing alcohol? (1) More or less every day, (2) four to five times a week, (3) two to three times a week, (4) once a week, (5) two to three times a month, (6) once a month, (7) a few times during the last 12 months, (8) once during the last 12 months, (9) never.

*Frequency of binge drinking:* How often during the last 12 months have you drunk at least one bottle of wine (75 cl) or corresponding volumes in spirits (five glasses), beer, cider, alcopops (four cans) or the weaker beer “Folköl”? (1) More or less every day, (2) four to five times a week, (3) two to three times a week, (4) once a week, (5) two to three times a month, (6) once a month, (7) a few times during the last 12 months, (8) once during the last 12 months, (9) never.

### Tobacco use:

*Smoking:* Do you smoke? (1) Every day, (2) occasionally, (3) no, but I have smoked previously within the last six months, (4) no, I have smoked previously but not during the last six months, (5) no, I have never smoked.

*Snuff:* Do you use snuff? (1) Every day, (2) occasionally, (3) no, but I have used snuff previously within the last six months, (4) no, I have used snuff previously but not during the last six months, (5) no, I have never used snuff.

### Drug use:

*Non-prescribed use of analgesics or sedatives:* Have you ever used analgesics or sedatives? (1) Yes, more than 12 months

**Table 1.** Questions measuring dependence and abuse in DSM-IV.

<b>Question During the last 12 months...</b>	
1	did you need to use more alcohol to get the same effect that you did when you first started drinking?
2	did you get withdrawal symptoms after having decreased or quit drinking?
3	did you drink more than you had originally planned?
4	did you try to reduce or stop drinking but fail?
5	did you spend considerable time (more than two hours) acquiring, using or recovering from the effects of drinking or think about alcohol?
6	did you use less time to work, engage in hobbies, or be with others because of your drinking?
7	did you continue to use alcohol though you knew it gave you health or mental problems?
8	did you not fulfil your obligations at work, in your studies, or at home?
9	did your drinking lead to a high risk of physical injury (e.g., in traffic)?
10	did your drinking lead to problems with the law (e.g., seized by police)?
11	did you continue to use alcohol even though this caused constant or recurring problems in relation to other people?

ago, (2) yes, within the last 12 months, (3) yes, within the last 30 days.

*Illicit drugs:* Have you ever used illicit drugs (e.g., cannabis, amphetamines, opioids, cocaine, ecstasy, hallucinogens)? (1) Yes, more than 12 months ago, (2) yes, within the last 12 months, (3) yes, within the last 30 days.

### *Alcohol abuse and dependence (DSM-IV)*

Among respondents who reported alcohol use in the past year, the DSM-IV criteria for alcohol dependence (criteria 1–7) and alcohol abuse (criteria 8–11) were assessed and combined into one dichotomous indicator of a DSM-IV dependence or abuse diagnosis (Table 1). Cut-off values of 3 and 1 for measuring the levels of dependence and abuse, respectively, were used.

### **Analysis**

The analysis consists of three parts: first, a descriptive analysis is conducted examining the prevalence of other substance use in the different categories of drinkers based on frequency in general and frequency of binge drinking. The following categories of substance use are included in the analyses: (1) Daily use of

cigarettes, (2) daily use of snuff, (3) 12-month prevalence of illicit drug use, (4) 12-month prevalence of use of analgesics or sedatives (without prescription from doctor or more than prescribed), (5) at least one of these categories. The next analysis consists of estimating the prevalence of alcohol problems in the different groups of drinkers combined with other substance use by describing the proportion in each drinking category that fulfil the criteria for alcohol dependence and/or abuse (according to DSM-IV). Finally, logistic regression models were estimated to examine the risk of alcohol abuse and/or dependence among drinkers with different patterns of concurrent substances use when controlling for sociodemographic characteristics and drinking patterns (Table 2).

### **Results**

#### *Concurrent use of addictive substances at different frequencies of drinking*

Figure 1 presents the proportion of respondents that use other addictive substances by frequency of drinking. The proportion is consistently highest among those with the highest drinking frequency, i.e., those consuming alcohol at least four times a week. Furthermore, other substance use is lowest among non-users

**Table 2.** Estimated association (OR = odds ratios) between use of other addictive substances among drinkers and alcohol abuse and/or dependence (Logistic regression). All drinkers = 13,513.

Drinking alcohol in combination with:	Model 1				Model 2				Model 3			
	OR	P-value	95% Confidence Interval		OR	P-value	95% Confidence Interval		OR	P-value	95% Confidence Interval	
			Lower	Upper			Lower	Upper			Lower	Upper
Daily use of snuff (ref. not using snuff)	2.13	<0.0001	1.77	2.56	1.64	<0.0001	1.35	1.99	1.05	0.6600	0.85	1.29
Daily smoking (ref. not daily smoking)	3.11	<0.0001	2.60	3.72	3.48	<0.0001	2.90	4.19	2.40	<0.0001	1.75	2.92
Use of non-prescribed analgesics and sedatives during the last 12 months (ref. no use)	2.72	<0.0001	2.26	3.28	2.98	<0.0001	2.46	3.61	2.50	<0.0001	2.02	3.09
Illegal drug use during the last 12 months (ref. no use)	7.48	<0.0001	5.88	9.52	4.68	<0.0001	3.63	6.04	2.45	<0.0001	1.87	3.26

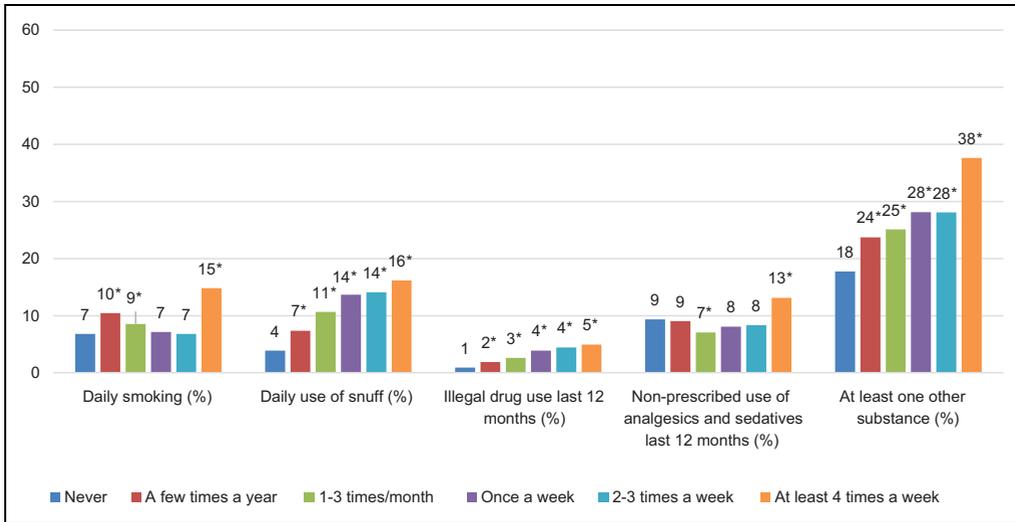
Notes. Model 1: crude. Model 2: control for age and sex. Model 3: control for age, sex, frequency of drinking and binge drinking.

of alcohol except for smoking and non-prescribed use of analgesics and sedatives. Whereas the proportion of daily smokers was 6.8% among non-drinkers, the proportion among those drinking alcohol at least four times a week was 14.8%. Corresponding figures for snuff were 3.9% and 16.2% respectively and for illicit drug use 0.9% and 4.9% respectively. As to non-prescribed use of analgesics and sedatives, the corresponding difference was smaller – 9.3% and 13.0% respectively. Finally, regarding use of at least one of these other substances, the proportion was 17.7% among non-drinkers and 37.6% in the group drinking most frequently. The association between frequency of drinking and daily use of snuff, use of illicit drugs and use of at least one other substance is positive, with the proportion of users increasing consistently by each increase in frequency of drinking.

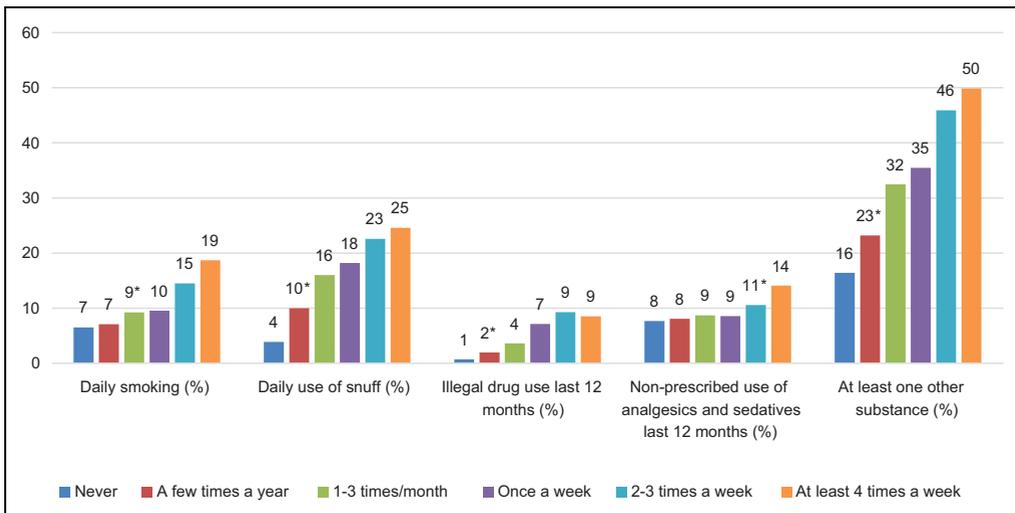
Figure 2 presents a similar graph relating frequency of binge drinking to concurrent use of addictive substances. The highest proportion of other substance use is found in the group with the highest binge drinking frequency (at least four times a week) or with respect to illicit drug use among the three highest binge drinking categories. The association between frequency of binge drinking and daily use of cigarettes and snuff as well as “at least one other substance”, is positive and the proportion of users increases with each increase in frequency of drinking. This is also the case for use of illicit drugs and non-prescribed use of analgesics and sedatives, although the association is weaker. These analyses thus show a positive association between use of other addictive substances and frequency of binge drinking.

### *Alcohol problems in relation to drinking frequency and other substance use*

The prevalence of alcohol dependence and/or abuse at different frequencies of drinking and combinations of other substance use is presented in Figure 3. Among drinkers using other addictive substances, alcohol abuse and



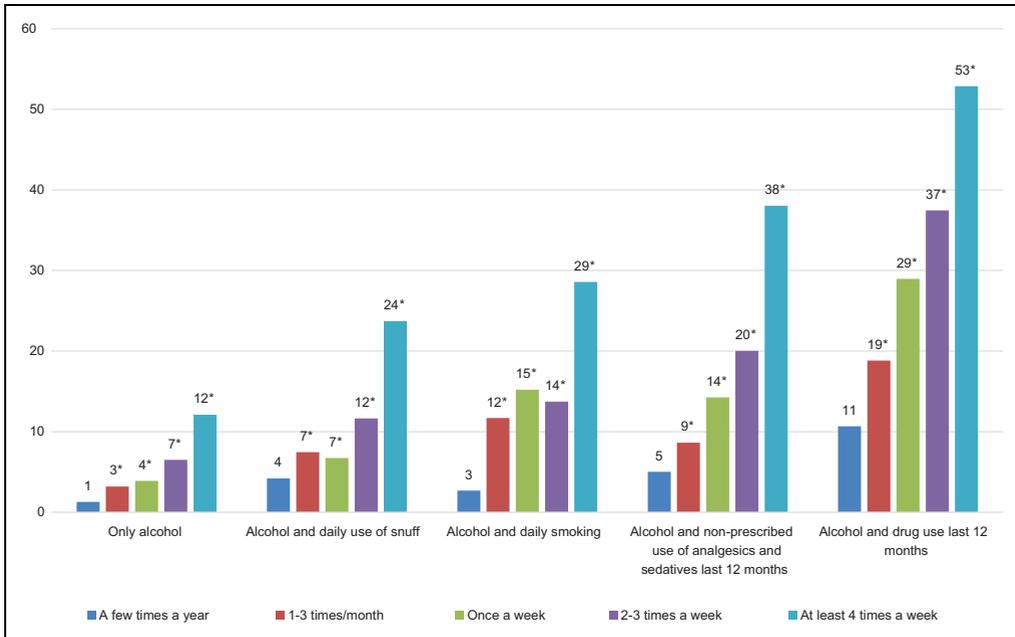
**Figure 1.** The proportion (%) of respondents that uses other addictive substances by frequency of drinking. \*Difference from “Never” is statistically significant,  $p < 0.05$ .



**Figure 2.** The proportion (%) of respondents that uses other addictive substances by frequency of binge drinking. \*Difference from “Never” is statistically significant,  $p < 0.05$ .

dependence is more common at all drinking frequencies compared with drinkers using alcohol only. The highest prevalence of harm is found in the group drinking alcohol at least four times a week in combination with illicit drug

use during the last 12 months, where the prevalence of alcohol dependence and abuse was 53%. Corresponding prevalence rates in this group of frequent drinkers were 38% among those using non-prescribed drugs during the last



**Figure 3.** The prevalence of alcohol dependence and/or abuse at different frequencies of drinking and combinations of other substance use.

\*Difference from “A few times a year” is statistically significant,  $p < 0.05$ .

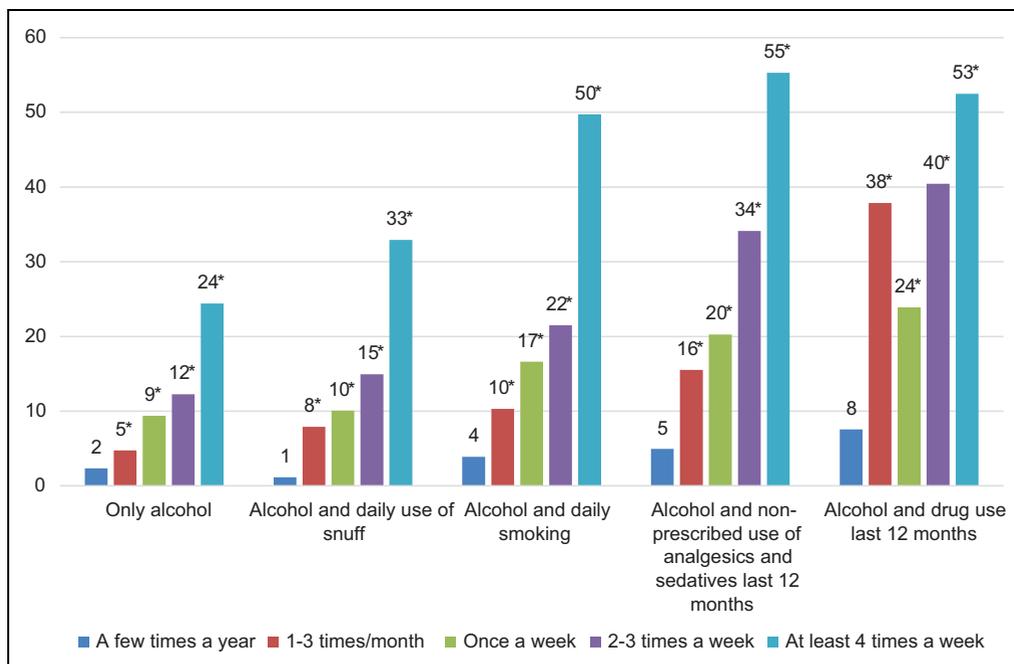
12 months, 29% among daily smokers and 24% among daily users of snuff. When no other substance is used, the proportion was 12%.

A positive association is also found between binge drinking frequency and prevalence of alcohol abuse and dependence with an even higher prevalence of harm at each frequency compared with general drinking frequencies (Figure 4). In the group of binge drinkers without other substance use, the prevalence of alcohol abuse and dependence is 2.4% among those who only binge drink a few times a year, whereas the prevalence is 24.4% among those who binge drink at least four times a week. When adding use of other substances, prevalence rates of abuse and/or dependence become higher and increase by binge drinking frequency. The highest risk of abuse and/or dependence is found among those binge drinking at least four times a week when this is combined with non-prescribed use of analgesics and sedatives (55.3%), illicit drugs (52.5%) or daily

smoking (49.9%). The corresponding prevalence rate in this group of frequent binge drinkers among daily users of snuff was 32.9%.

### *Estimation of multivariate logistic regression models*

To further complement the graphical analyses of the importance of other substance use among drinkers in relation to the risk of alcohol abuse/dependence, we estimated multivariate logistic regression models. More specifically we tested whether drinkers with various forms of concurrent substance use were more likely to suffer from alcohol abuse and/or dependence than drinkers not using each substance with control for sociodemographic factors and drinking habits. Three models were estimated: one crude model with each substance use as a predictor of harm (Model 1), one model controlling for sex and age (Model 2), and one final model also including



**Figure 4.** The prevalence of alcohol dependence and/or abuse at different frequencies of binge drinking and combinations of other substance use.

\*Difference from “A few times a year” is statistically significant,  $p < 0.05$ .

frequency of drinking in general and frequency of binge drinking (Model 3).

Findings in Model 1 suggest that the risk of abuse and/or dependence is significantly higher among drinkers who also use snuff daily ( $OR = 2.13$ ,  $CI = 1.77-2.56$ ), smoke daily ( $OR = 3.11$ ,  $CI = 2.60-3.72$ ), have used non-prescribed analgesics and sedatives during the last 12 months ( $OR = 2.72$ ,  $CI = 2.26-3.28$ ) and in particular have used illicit drugs during the last 12 months ( $OR = 7.48$ ,  $CI = 5.88-9.52$ ). When controlling for age and sex in Model 2, estimates became somewhat weaker for daily use of snuff and illicit drugs, whereas small increases were observed for daily smoking and non-prescribed use of analgesics and sedatives. Model 3 tested whether concurrent use of other substances includes a risk of abuse and/or dependence in addition to the risk pertaining to drinking habits. The findings show that daily use of snuff does not add any

additional risk to the drinking in this group whereas the risk is significantly elevated to a similar extent among users of cigarettes, illicit drugs and ( $ORs = 2.40-2.50$ ).

### Discussion

The aim of this article was to assess the prevalence of concurrent use of other addictive substances among alcohol drinkers in the Swedish general population and to examine whether such multiple substance use was associated with a higher risk of alcohol problems measured by alcohol abuse and/or dependence. To our knowledge, this is the first study addressing these questions.

People who drink alcohol in Sweden were more likely to use tobacco, illicit drugs and non-prescribed analgesics and sedatives than non-drinkers. While 18% of non-drinkers were daily users of tobacco (cigarettes or snuff) or

had used illicit drugs or non-prescribed analgesics and sedatives during the last 12 months, this proportion increased continuously by drinking frequency and was 38% among those consuming alcohol at least four times a week. The association was stronger and more consistent for binge drinking, with 15% using other addictive substances among those who never engage in binge drinking, increasing to 50% among those binge drinking at least four times a week. A similar pattern was found when concurrent use of each of the substances was analysed separately. Thus, use of cigarettes, snuff, illicit drugs and non-prescribed analgesics and sedatives, is common among alcohol drinkers and becomes more common the more alcohol is consumed. These findings accord with results from clinical studies showing a clustering of addictive substances among those clients drinking most alcohol (Moss et al., 2015; Walitzer et al., 2015) and demonstrate that a similar concentration of substance use is also found among heavy drinkers in the general population in Sweden. This suggests that a large group of drinkers in the Swedish general population suffer from an accumulation of risks as a result of using both alcohol and other substances, which is in accordance with findings from other countries (Breslow et al., 2015; Gupta et al., 2005; Hakkarainen & Metso, 2009; Höhne et al., 2014; Karriker-Jaffe et al., 2018; Midanik et al., 2007; Smith et al., 2011; Subbaraman & Kerr, 2015).

In line with the conclusion that drinkers using other substances are a risk group, was the finding of a higher prevalence of alcohol abuse and/or dependence at different levels of drinking in the group using other addictive substances as well. The prevalence was especially high among drinkers using illicit drugs, where more than 50% of those with the highest drinking frequency had abuse and/or dependence compared to 12% among those using only alcohol with a similar frequency. In addition, among the most frequent binge drinkers (at least four times a week) around half of the daily smokers and users of illicit drugs had

abuse and/or dependence. The high prevalence of alcohol problems among drinkers using other substances was to some extent explained by the fact that drinking was higher in this group than among drinkers using alcohol only. However, multivariate models controlling for sex, age and drinking frequency (both overall and binge drinking) showed that an elevated risk remained for drinkers using other substances, except for drinkers using snuff. This suggests that the risk of alcohol abuse and dependence is higher if cigarettes, illicit drugs or non-prescribed analgesics and sedatives were also used given similar drinking habits, thus indicating that concurrent use of other substances adds an independent risk of alcohol problems in this group. Similar results have been found in a general population study in the USA, where concurrent use of alcohol and cannabis added a risk beyond drinking per se (Karriker-Jaffe et al., 2018). One explanation for this finding is that there is a selection of people with a higher risk of developing alcohol abuse and dependence among drinkers using other addictive substances and that concurrent substance use is a marker of this individual vulnerability. Another explanation is that concurrent use of other addictive substances represents a marker for a clustering of several risk factors in this population. For instance, alcohol consumers who smoke or use illicit drugs or non-prescribed analgesics and sedatives may have a poorer health status or social situation and subsequently a lack of protective factors in respect of developing problems with drinking. This explanation also matches the deviant finding for snuff which is significantly less risky to health than use of the other substances (Daniel Roth, Roth, & Liu, 2005). All in all, a conclusion to be drawn is that healthcare providers should screen for concurrent use of other addictive substances to help identify patients who may be in need of alcohol-abuse treatment; in particular use of cigarettes, illicit drugs and non-prescribed use of analgesics and sedatives.

### **Study limitations and strengths**

There are some limitations that need to be mentioned. First, the analysis was based on self-reported data with the well-known limitations related to this approach, e.g., regarding bias due to social desirability and non-response (Greenfield & Kerr, 2008). Thus, if there is social desirability bias, then there may be some clustering of respondents who either overreport or underreport both substance-use patterns and alcohol problems. If this is the case, then the positive association between multiple substance use and harm may be somewhat overstated. Furthermore, if the group of non-respondents (41% of the original sample) were significantly different from the respondents taking part in the survey, then there is a risk that the present findings are not representative of the Swedish adult general population.

Another more specific limitation is that the measures of drinking do not take into account how much alcohol is consumed but only how often respondents drink in general and in terms of binge drinking. Thus, the possibility cannot be excluded that drinkers using other substances in fact drink a higher volume of alcohol although the same frequencies are reported, and that the higher risk of abuse and dependence is explained by a higher drinking level in this group. If this is the case, then the importance of concurrent use of other addictive substances may be exaggerated as a factor elevating the risk of alcohol abuse and dependence.

It should also be mentioned that combining all illicit drugs into one variable is potentially problematic, e.g., combining cannabis and alcohol is not the same as combining cocaine and alcohol. However, the prevalence of use of drugs other than cannabis was very low in the present study and did not allow for making specific analyses of specific drugs.

A strength of the study is that the findings are based on data from a large general population survey with a relatively high response rate and including well established measures of drinking, substance use and related problems.

The findings are also consistent in the sense that both frequency of drinking in general and frequency of binge drinking were associated with use of other addictive substances and with the risk of alcohol-related harm.

### **Conclusions**

It is important to take into account use of other addictive substances in order to understand the association between drinking and alcohol problems in the general population. The findings will help to guide prevention priorities by pointing at the importance of taking different multiple substance-use patterns into account when combating drinking problems. Furthermore, healthcare providers should screen for concurrent use of other addictive substances to help identify patients who may be in need of alcohol-abuse treatment

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