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# Patterns of Use and Their Relationship to DSM-IV Abuse and Dependence of Alcohol among Adolescents and Young Adults

## Key Words

Alcohol abuse  
Alcohol dependence  
Adolescents  
Symptom progression

## Abstract

First use and initiation of regular alcohol use has been frequently found to start in adolescence. However, only few studies have also investigated how many adolescents proceed during ages 14–24 to harmful drinking or even develop alcohol use disorders. This paper – using the EDSP baseline sample of 3,021 community respondents from the Munich area – examines the prevalence of use, abuse and dependence and investigates the dose/disorder relationship. Alcohol abuse was reported by 9.7% of respondents and alcohol dependence by 6.2%. Men were more likely to report an alcohol disorder than women, prevalence also increased in the older age cohorts. However, even among 14- to 17-year-olds a substantial proportion of respondents report high and regular consumption rates, the occurrence of abuse and dependence criteria and even a full dependence syndrome. There is however only a moderate association between average number of standard drinks consumed with the risk of developing abuse and dependence. In light of the substantial rates among adolescents and young adults the validity of DSM-IV alcohol disorder criteria is discussed.

## Introduction

In two earlier publications from the EDSP we recently presented findings about the prevalence and associated risk factors of alcohol abuse and dependence among adolescents and young adults in Munich, Germany [1, 2]. In this follow-up paper we examine in more detail how frequently and what amounts of alcohol adolescents and young adults typically consume and describe the relation-

ship of drinking patterns with a diagnosis of either abuse or dependence.

### *Alcohol Use Patterns and Relationship to Disorders*

Several studies, most of which were conducted with questionnaires in general population samples, have shown that in most western industrialized countries [3] and in Germany [4] a considerable proportion of adolescents drink alcohol fairly regularly. High or regular alcohol use has been reported to start in adolescence [5, 6] usually before age 18. Furthermore these studies also suggest that a considerable proportion of adolescents show a

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considerable and heavy use of alcohol. Although diagnoses of alcohol abuse and dependence according to DSM-IV and ICD-10 do not explicitly define any critical amount of alcohol use [7] as a necessary requirement for diagnosis, some authors – in the absence of a diagnostic instrument – have nevertheless reported rates of ‘harmful use’, as defined as the weekly averaged consumption of at least 40 g of alcohol per day in males and more than 20 g for females. The BMG study [8] for example estimated, referring to this definition, that between 10.4 and 12.8% of men and 5.6–9.0% of all females show ‘harmful’ alcohol consumption patterns.

The linkage between alcohol disorders and heavy drinking that is frequently assumed to be essential in clinical practice, however, seems to be quite complex and remains overall unclear. From the perspective of diagnostic criteria for abuse and dependence according to DSM-IV, there is no abuse criterion revealing an evident relationship to averaged indices of regular heavy drinking. Strictly applying the DSM-IV abuse criteria, it is possible that subjects receive a diagnosis of abuse, even though they used alcohol only on three single occasions in a 1-year period, for example when repeatedly driving a car while intoxicated. Such persons for example would report having drunk 4 glasses of wine (equals approximately 8 standard drinks), resulting in an averaged weekly consumption that looks fairly low. For DSM-IV dependence symptoms only two out of the total of seven criteria can be assumed to be clearly related to at least significant regular use, namely ‘tolerance’ and ‘withdrawal syndrome’.

In general, only few data are available clarifying dose criteria relationship and associations with diagnostic status in more detail. Ghodsian and Power [9] found a highly skewed distribution of alcohol consumption in a national follow-up investigation at 16 and 23 years. At age 23 years, only 3% men were abstainers (women 6%), 35% were classified as light drinkers (women 56%) and 12% as heavy drinkers (women 2%), referring to the weekly amount of alcohol consumed. Only *early onset* heavy drinking was positively correlated with later heavy drinking. Unfortunately, no information on alcohol-related problems is given. In a birth cohort of 15-year-olds, Fergusson et al. [10] reported a proportion of 28.4% abstainers with 27.2% reporting drinking alcohol at least once a month. Typically 53.1% of all respondents drank up to 30 ml (or 24 g) pure alcohol. High odds ratios were found for high level of use and the presence of other substance use or abuse symptoms. In a representative sample, Dawson and Archer [11] examined average daily intake and rela-

tive frequency of heavy drinking (defined as 5 or more standard drinks, each containing about 8–9 g absolute ethanol) and found only a modest correlation, both, between heavy drinking and abuse as well as with dependence. Similarly modest associations were found by Bailey and Rachal [12] between adolescent alcohol intake, abuse-related symptoms and dependence symptoms. White [13] reported a two-factor solution with use being rather independent of abuse symptoms. Similarly only modest associations of alcohol-related problems and ethanol intake were found by Harford et al. [14], Lewinsohn et al. [15], Grant and Harford [16] as well as Barnes and Welte [17] in a wide variety of samples.

To summarize, there seems to be only a modest relationship between quantity and frequency characteristics and alcohol use disorders. Because none of the above-mentioned papers was conducted in Germany, taking into account the culture-specific characteristics, and further because none of the studies used stringent diagnostic criteria according to DSM-IV this paper will investigate these issues further.

## Aims

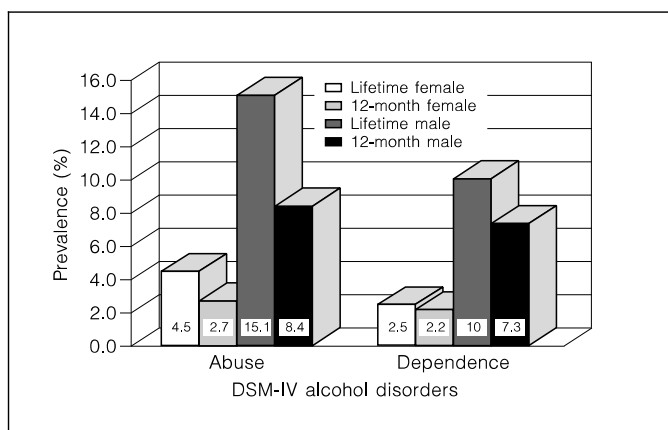
In this paper, data on alcohol use patterns of 3,021 adolescents and young adults from Munich, Germany are reported focussing on the following questions: (1) How many adolescents and young adults are regular alcohol users? (2) What is the typical quantity and frequency of alcohol use in male and female respondents aged 14–24? (3) Are alcohol use disorders associated with specific patterns of alcohol use?

## Methods

Because the methodology of the EDSP [18] as well as of the diagnostic instrument used, the M-CIDI [19], is comprehensively discussed elsewhere, only a few methodological issues should be addressed.

### *Measurement of Alcohol Consumption*

The term abstainers throughout the paper refers to subjects reporting in the M-CIDI that they have never drunk a glass of alcohol (even when counting a glass of champagne at a festivity or a beer at a meal). ‘Infrequent users’ refers to subjects reporting having never consumed more than 12 glasses of alcohol of any alcoholic beverage. Subjects reporting having consumed 12 or more glasses of alcoholic beverages within any period of 12 months of their life were classified as ‘lifetime regular users’. The latter group is, for some portions of the analysis, further grouped into ‘current lifetime users’ (12 or more



**Fig. 1.** Lifetime and current (12-month) prevalence of DSM-IV alcohol abuse and dependence in adolescents and young adults.

**Table 1.** Abstainers, infrequent and regular users of alcohol in a sample of 3,021 community respondents, aged 14–24 years

	Abstainers %	Infrequent users, %	Regular users, %	
			current	non-current <sup>1</sup>
In total sample	5.5	29.7	60.4	4.4
Among females	4.8	35.1	66.4	3.3
Among males	6.1	24.2	54.6	5.4
Among age groups				
14–15	23.9	61.9	13.2	1.0
16–17	4.3	44.0	49.4	2.3
18–19	2.0	27.6	65.3	5.0
20–24	1.5	17.1	75.6	5.8

<sup>1</sup> Non-current defined as 12-month.

times in the last 12 months preceding the interview) and noncurrent regular lifetime users.

For all lifetime regular users the M-CIDI evaluates the quantity, frequency and weekly consumption for the past 12 months and for the 12-month period of their lives in which they had the heaviest use. Frequency is measured by asking 'How often did you drink alcohol, was it nearly every day, 3 or 4 times a week, 1 or 2 times a week, 1–3 times a month or less than once a month?'. In the next question, the interviewer asked for 'the quantity of alcohol that was usually drunk in one day'. To answer this, subjects referred to a list where standard sizes of alcoholic beverages were presented. Quantity was coded in number of standard drinks (SD) with one drink representing an equivalent of 9 g absolute ethanol. The SD equivalent ethanol values were carefully assessed by a systematic inquiry of those breweries and other distributors of alcoholic beverages known to be relevant to the region the study was performed in.

### Analysis

Findings reported are based on weighted data to reflect the sampling scheme used as well as to adjust for nonresponse. Findings concerning quantity and frequency are raw percentages among subgroups of the sample. Tests for significance were done by using the Mann-Whitney test for all pairwise comparisons and the Kruskal-Wallis test for comparing the age groups.

## Results

### Abstainers and Users

Overall only 5.5% (6.1% males and 4.8% females) of the respondents reported to have never had any alcoholic drink in their life (table 1). Even among the youngest age groups of 14–15 years old more than two-thirds have already been exposed to alcohol at least once. In the age group 20–24 only 1.5% were complete abstainers. 29.7% of the sample were infrequent drinkers (less than 12 times) most of which obviously were young, as the age group breakdown suggests. In early adulthood, after age 20 only 17.1% described themselves as infrequent users. Overall, taking the abstainers and the infrequent drinkers together, only 18.6% of the adults after age 20 could be described as almost complete abstainers. The proportions of lifetime and current regular users steadily increases in each successive age group from a low of 13.2% among the youngest to a high of 75.6% in the oldest group, with no indication that a significant proportion switches from regular to infrequent or no alcohol use. Regarding sex differences, females are more likely to be infrequent users than males (OR:1.7; 95% CI: 1.42–1.98).

### Quantity and Frequency Characteristics of Regular Users

Table 2 reveals similar age-group and sex-specific differences with regard to the frequency and quantity of alcohol consumed. Females report use of alcoholic drinks less frequently ( $p < 0.001$ ) and on average in considerably smaller amounts than males (in terms of standard drinks: median standard drinks in males: 5.0 vs. 3.0 in females,  $p < 0.001$ ). There seems to be considerable stability across all age groups considered with regard to the proportion of subjects in each age group reporting the consumption of an average of 3–4 and 5–6 standard drinks per day. However, the number of light drinkers (1–2 standard drinks per day) decreases from a high of 34.3% in 14- to 15-year-olds to 11% in the oldest group ( $p > 0.001$ ).

It is remarkable that even among the two youngest age groups, quite similar to the oldest group, more than 10% of regular users do report the consumption of more than

**Table 2.** Frequency and quantity of alcohol consumption in SD (equals 9 g absolute alcohol) among lifetime ever users aged 14–24 (12-month period with highest quantity, whether current or not)

	Total (n = 1,958)	Male (n = 1,040)	Female (n = 918)	Age groups			
				14–15 (n = 68)	16–17 (n = 230)	18–19 (n = 313)	20–24 (n = 1,347)
<i>Frequency of alcohol consumption</i>							
<3 times/month	33.7	22.6	46.1	67.9	4.0	3.5	2.6
1–2 times/week	38.8	39.4	38.1	25.7	40.0	39.9	39.0
3–4 times/week	18.1	24.0	11.4	3.3	7.1	12.8	22.0
Almost daily	9.5	14.0	4.4*	3.1	5.3	6.4	11.2 <sup>+</sup>
<i>Quantity of consumption (SD)</i>							
1–2	21.7	10.4	34.3	34.3	19.2	23.6	11.0
3–4	32.2	27.1	37.9	26.3	36.1	32.7	31.7
5–6	25.3	30.6	19.3	21.5	23.8	25.5	25.7
7–9	10.1	14.3	5.2	7.8	8.0	9.4	10.8
10 and more	10.7	17.5	3.2	10.1	13.0	8.8	10.9
Median (SD)	4.0	5.0	3.0*	3.0	3.0	4.0	4.0 <sup>NS</sup>
Maximum (SD)	50	50	20	16	21	25	50

\*  $p < 0.001$  by Mann-Whitney test; <sup>+</sup>  $p < 0.001$  by Kruskal-Wallis test (gender difference).

10 SD (equals 90 g absolute ethanol). However, there is a marked difference regarding the frequency with which young and old respondents consume alcohol, indicating that daily or almost daily heavy use might be more typical of young adults, whereas adolescents drink heavily only occasionally.

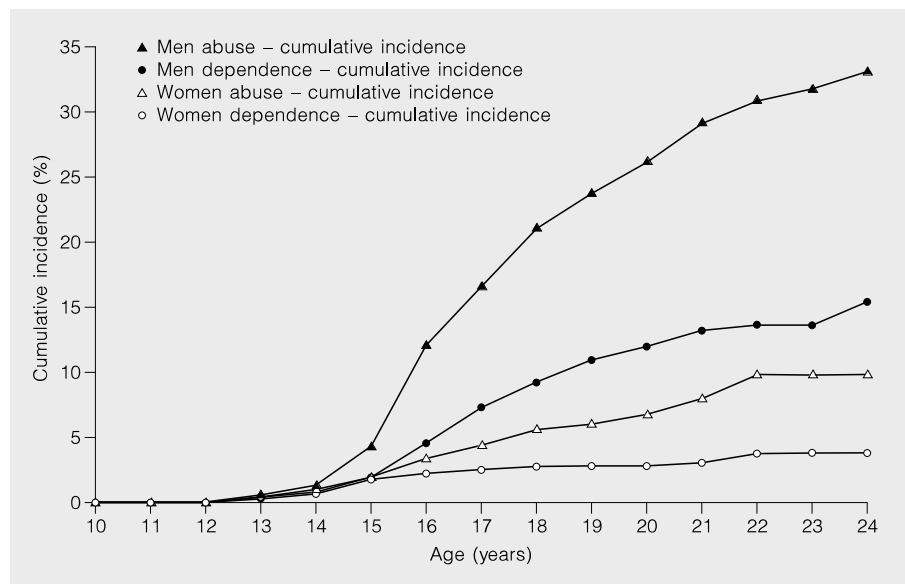
#### *Prevalence and Cumulative Incidence of Alcohol Use Disorders*

Lifetime cumulative incidence curves (hazards) (fig. 2) and lifetime as well as 12-month prevalence of DSM-IV alcohol abuse without dependence and alcohol dependence are presented in figure 1 for the total population. Overall, 25.1% men and 7.0% women in this sample met criteria for a DSM-IV alcohol diagnosis at some time in their lives, alcohol abuse without dependence being more prevalent than alcohol dependence. As can be seen in the total population the lifetime prevalence of abuse without dependence and dependence are 15.1 and 10.0% among men and 4.5 and 2.5% among women, respectively.

Figure 2 reveals that the cumulative incidence of alcohol outcome among men is higher than among women. For example, in the total population the lifetime cumulative incidence of alcohol abuse without dependence is 15.1% for men and 4.5% for women (OR: 3.7; 95% CI: 2.84–4.98) and for dependence it is 10.0% for men and 2.5% for women (OR: 4.3; 95% CI: 3.03–6.27). Age pat-

terns of cumulative incidence are different for men and women. For men the cumulative incidence for both alcohol outcomes increases consistently with age. Among women the cumulative incidence of alcohol abuse as in men increases up to age 22, with no further incident cases. As regards alcohol dependence, however, females show a strong initial increase before age 17, with only few new incident cases after this age. This pattern of diagnosis onset among women is, in contrast to that seen among men, in two ways. First, the higher cumulative incidence of dependence among 14- to 15-year-old women as compared to men in the alcohol user population points to an exceptional liability for dependence among these young women. And second, in the absence of selection or recall bias, these age patterns might be indicative of birth cohort effects such that 14- to 17-year-old women are reporting a higher incidence of both diagnoses than their 18- to 24-year-old counterparts.

Age at onset for a diagnosis is subject to the age structure of the incidence, which varies by gender and diagnosis. As can be seen in figure 2, diagnosis incidence begins at 13–14 years of age increasing rapidly to a peak in the mid-teens at 15–17 years of age and decreasing more gradually thereafter. (Among both men and women a second increase in incidence appears in the early 20s but is unstable as a result of the small number of outcomes and the small population in these ages).



**Fig. 2.** Cumulative lifetime incidence of DSM-IV alcohol disorders by gender.

**Table 3.** Frequency and quantity of alcohol consumption in standard drinks (equals 9 g absolute alcohol) among regular users, cases with DSM-IV abuse or dependence

	Among regular users, % (n = 1,477)	Among those with abuse, % (n = 294)	Among those with dependence, % (n = 187)
<i>Freq. of alcohol consumption</i>			
<3 times/month	40.1	19.3	4.7
1–2 times/week	40.3	40.5	23.9
3–4 times/week	14.9	24.9	33.3
Almost daily	4.7	15.4*	38.1#
<i>Quantity in standard drinks</i>			
1–2	26.4	11.0	0
3–4	36.5	23.3	8.0
5–6	24.3	30.8	24.6
7–9	6.8	17.1	25.0
10 and more	6.0	32.8	40.1
Median (SD)	3.0	5.0*	8.0#
Maximum (SD)	29	35	50

\* p < 0.001 (Mann-Whitney) regular vs. abuse; #p < 0.001 (Mann-Whitney) abuse vs. dependence.

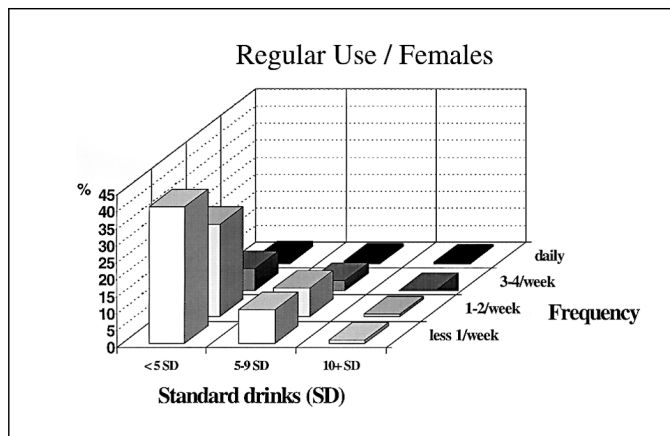
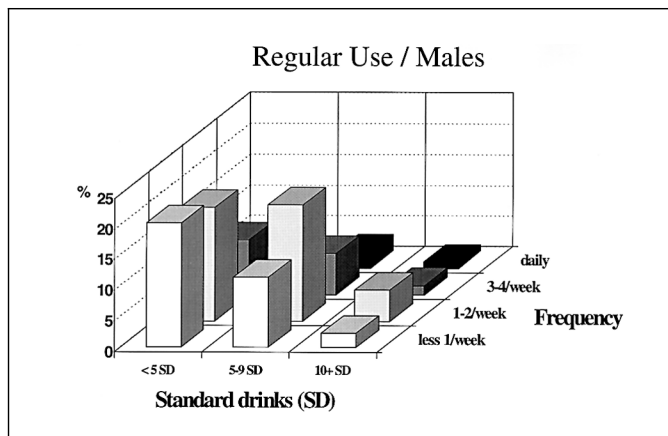
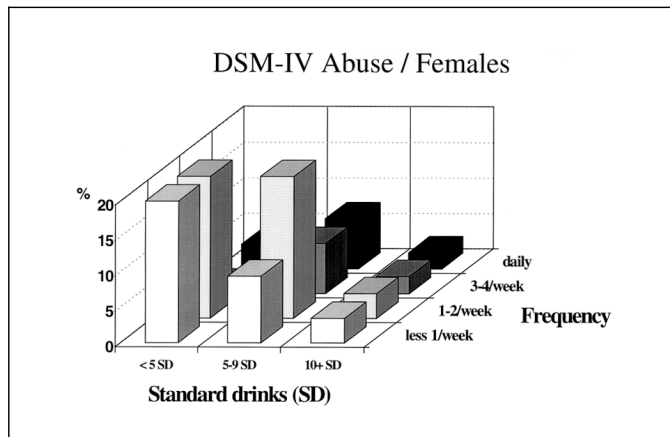
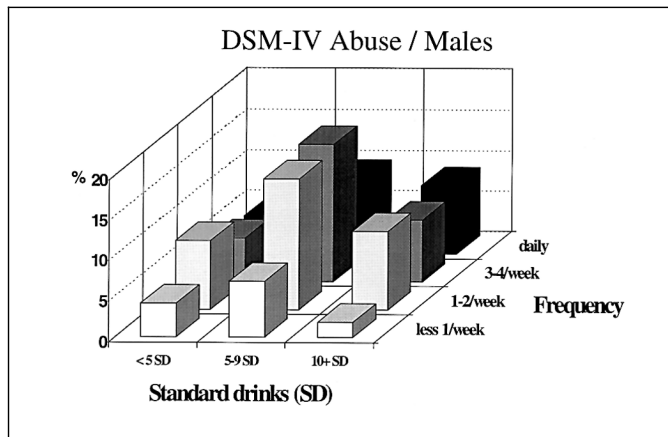
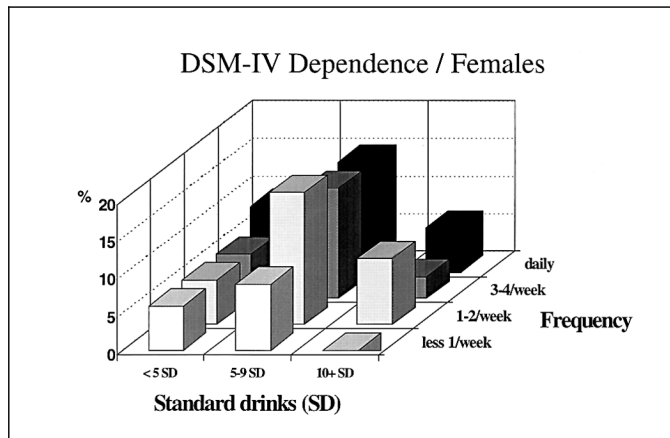
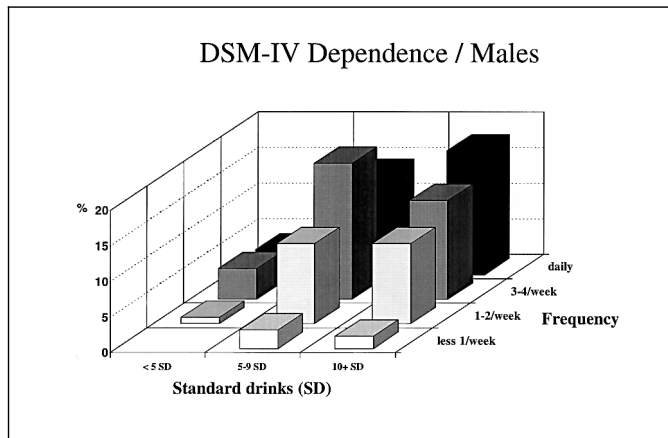
*Quantity and Frequency among Regular Users and Those with Abuse or Dependence: How Close Is the Association?*

Table 3 reveals, with regard to quantity and frequency of alcohol consumption, that there are highly significant differences between regular users and those with abuse, as

well as differences between abuse and dependence. Concerning frequency, only few regular users (19.6%) report alcohol use ‘3–4 times or almost daily’, as compared to a significantly higher proportion of abusers (40.3%) and those with dependence (71.4%, all group differences being highly significant). Similarly there are highly significant group differences with regard to the number of SD with a median of 3 for regular users, of 5 for abusers and 8 for those with dependence.

Still table 3 also reveals a critical issue, namely the existence of a few abuse and dependence cases with either an unusually low frequency or an exceptionally low number of SD. Therefore figure 3 cross-tabulates for males (left) and females (right) the quantity and frequency reports of all three groups: regular users (3e, 3f) without a diagnosis, those with abuse only (3c, 3d) and those with dependence (3a, 3b).

Considerably different patterns of use are apparent in this complex visual summary presentation. (a) Females with alcohol dependence have remarkably lower alcohol consumption indices than their male counterparts. With few exceptions females are also responsible for the ‘low-dose dependencies’ mentioned in the previous paragraph. (b) This picture is replicated even more impressively for DSM-IV abuse diagnoses, with females unlike males falling considerably more often into the low frequency/low-amount groups. (c) The abuse groups differ from the dependence groups mainly in terms of lower proportions of daily users with very high amounts of alcohol (SD) as well as its obvious heterogeneity of patterns.



**Fig. 3.** Patterns of alcohol consumption in regular users with and without alcohol disorders by gender.

In order to quantify the relative contribution of quantity and frequency patterns on diagnoses of abuse and dependence, a logistic regression was performed, taking standard drinks by frequency consumed, current age, sex and their interactions into account. Age (dependence OR:

1.2; CI: 1.1–1.3; for abuse: OR: 1.1), drinks per week (dependence OR: 1.4; CI: 1.3–1.5; abuse: 1.2) and gender (dependence OR: 3.3; CI: 2.0–5.5; for abuse 3.1) all significantly predicted the risk for abuse and dependence. Only one interaction term reached just the significance level

(standard drinks by age: OR: 0.9 for abuse and dependence), suggesting that the earlier 'considerable use' occurs in the respondents' life, the higher is the probability of both abuse and dependence.

## Discussion

Before summarizing these findings, some strengths and weaknesses of the study and the methods used in this paper should be addressed.

(1) Diagnoses reported here are based on DSM-IV criteria and are distinguished from the DSM-III-R and DSM-III criteria in several ways. The most important of these distinctions are the segregation of the social consequences of alcohol use from compulsive behavior and physiological adaptation associated with use, and the syndromal conceptualization of dependence where no single criterion is necessary or sufficient for a diagnosis. (2) In light of the surprisingly high rates of consumption even in 14- to 15-year-olds, it should be remembered that legal access to alcoholic beverages in Germany begins at 16 years of age and is accompanied by a relatively widespread acceptance of alcohol use at this age. This is in contrast to the United States, where the legal age for purchasing alcoholic beverages has risen from 18 to 21 years of age since the early 1980s and has been accompanied by significant sanctions for sales to under-age consumers. (3) Our sample was 14–24 years of age when interviewed in 1995 as compared to 18–65+ age range in the ECA [20], 15–54 years of age in the NCS [21] and 18+ years of age for the National Longitudinal Alcohol Epidemiologic Survey [22] which was in the field during 1992, all of which were conducted in North America. Apart from the differing historical periods in which the interviews were conducted, these studies have shown significant differences in lifetime and 12-month prevalence between the oldest and youngest age groups and for this reason comparisons should be made with the youngest age groups, when possible. (4) Finally and maybe most importantly it needs to be acknowledged that we did not take into account the duration in which the alcohol use pattern occurred, a variable that might add considerably to the strength of association between quantity/frequency and alcohol disorders. We refrained from including this additional level of sophistication, because our forthcoming prospective data will offer a more satisfying data base for such an exploration.

Aside from our interest in exploring more closely the relationship between quantity and frequency of alcohol use and diagnoses, prompted by several critical comments

on our previously published substantial prevalence rates in adolescents and young adults [1, 2], we were especially interested in identifying cases with fairly low amounts of alcohol consumption. From this perspective our findings first replicated previous studies using various designs and methods of diagnostic assessment showing that there is only a modest association between the frequency and quantity of alcohol consumed by adolescents and young adults and the risk for abuse and dependence according to DSM-IV criteria.

Secondly, our findings support our previously reported prevalence estimates at least for alcohol abuse and dependence [1, 2], by revealing that indeed more than two-thirds of all with a DSM-IV diagnosis consume alcohol several times a week or daily in considerable amounts. Taking the threshold for harmful use of alcohol, suggested by the above-mentioned BMG study [8], 92% of all male and female cases with DSM-IV alcohol dependence reveal 'harmful use', defined as using more than 40 g (male) respectively 20 g (female) absolute alcohol on a typical day. Concerning DSM-IV abuse, 67% fall above the threshold of harmful use. The fact that 33% do report lower daily alcohol consumption rates does not invalidate in itself the M-CIDI/DSM-IV diagnostic algorithms used. As mentioned in the introduction, criteria for abuse can easily be met even with fairly low average daily alcohol consumption rates, if a significant amount of alcohol of for example three standard drinks is consumed only occasionally. Further the sex-specific analysis revealed almost exclusively females among those with low dose alcohol disorders. For females, however, a considerably lower threshold of 'harmful use' of 20 g absolute ethanol has been suggested [8].

To conclude, in agreement with previous studies using a comparable methodology [8], we confirm that alcohol use is extremely widespread among male and female adolescents and young adults. Beyond this finding we also demonstrated that among the substantial number of cases meeting DSM-IV criteria for alcohol abuse and dependence the amount and the frequency in which alcohol is being consumed is high and could be regarded as harmful in the vast majority. However quantity and frequency information alone does not allow a determination of prevalence of alcohol use disorders, due to only modest associations between quantity/frequency information and diagnostic status. This points to the substantial role other factors play in the development of early stages of alcohol use disorders.

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