

Daily use of alcohol in the Norwegian general population:**Prevalence and associated factors**

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Abstract

Purpose: Harmful use of alcohol is a major public health problem. While harm is often researched in the context of heavy drinking episodes, high-frequency drinking, even when drinking moderate quantities, constitutes a health risk in a longer perspective. The aim of this study was to examine the prevalence of daily use of alcohol in the Norwegian general population, and to assess sociodemographic, mental health-related and personal resource variables associated with daily use of alcohol.

Methodology: A cross-sectional survey concerned with health, illness and serious life events was distributed to 5,500 persons in the general population in Norway (response rate 36 %). Sociodemographic variables, personal resource variables (general self-efficacy, optimism, and extraversion) and psychological distress (current anxiety and/or depression) were assessed with regards to their associations with daily drinking in unadjusted and adjusted regression models.

Findings: Daily use of alcohol was reported by 39 persons (2.2 %) in the sample (3.1 % of men and 1.4 % of women). While general self-efficacy, optimism and extraversion were unrelated to daily drinking, the adjusted model revealed that male sex (OR: 2.18, $p < 0.05$), being unemployed/not in education (OR: 3.10, $p < 0.05$) and reporting current anxiety and/or depression (OR: 3.12, $p < 0.01$) were associated with daily use of alcohol.

Value: The study has contributed to the knowledge about daily drinkers in a representative sample of the Norwegian population. A proportion of 2.2 % was found to drink alcohol on a daily basis. Compared to their counterparts, the odds of daily drinking were higher for men, unemployed persons and persons reporting current psychological distress. Public health initiatives aiming at reducing harmful use of alcohol may pay particular attention to these subsets of the population.

Keywords: alcohol, general population, nationwide survey, prevalence,

Introduction

Alcohol is commonly used among adults in the Western countries, and reasons for drinking alcohol are diverse. Amongst them, studies have reported mood enhancement, reduced tension, coping with anxiety and sleep problems, and conformity or desire to fit in a group (Cooper, 1994; Nishith *et al.*, 2001; Stappenbeck *et al.*, 2013). Kuntsche and co-workers' review identified three drinking motives (social motives, enhancement motives and coping motives), and concluded broadly that "social motives appear to be associated with moderate alcohol use, enhancement with heavy drinking and coping motives with alcohol-related problems" (Kuntsche *et al.*, 2005, p. 855). Further, a recent study of men with alcohol dependence differentiated between two types of drinking motives, reward-oriented versus relief-oriented drinking (Ertl *et al.*, 2018), and found that childhood emotional maltreatment and psychopathological symptoms were more frequently reported among relief-oriented drinkers. A longitudinal perspective on examining associations between heavy drinking and psychological symptoms was applied in a Finnish study (Berg *et al.*, 2018). More psychological symptoms were found to predict a pattern of heavy drinking from adolescence to midlife, whereas the oppositely directed association was absent. Thus, the results were interpreted to be in support of the self-medication hypothesis.

Irrespective of drinking motivation, the harmful consequences of alcohol use are widely recognized. Following comparative risk assessment methods, the Global Burden of Disease (GBD) Study estimated that 2,786,000 deaths globally were attributed to alcohol use in 2013, reflecting 40.9 % increase since 1990 (Forouzanfar *et al.*, 2015). The Disability Adjusted Life Years (DALY) estimate for 2013 was 99,278,000, also reflecting a substantial increase (30.5 %) in global disability related to alcohol use during the same period (Forouzanfar *et al.*, 2015). A recent study of persons admitted to hospital with acute medical

illness showed that 19.2 % of the patients in Moscow and 21.1 % of the patients in Oslo used alcohol in a harmful way (Kabashi *et al.*, 2019).

In the USA, the lifetime prevalence of alcohol abuse and alcohol dependence has been estimated to 13.2 % and 5.4 %, respectively (Kessler *et al.*, 2005). Lower prevalence estimates for lifetime alcohol abuse (4.1 %) and alcohol dependence (1.1 %) were found in a sample representative of six countries in Europe (Alonso *et al.*, 2004), and the estimates were markedly higher for men than for women. In Norway, the lifetime prevalence of alcohol abuse and alcohol dependence in the capital city of Oslo was estimated to 14.0 % and 8.8 %, respectively (Kringlen *et al.*, 2001). As the lifetime prevalence was more than twice as high as the 12-month prevalence, this may reflect heavy drinking in younger years, followed by decreased drinking as the participants aged. By contrast, the corresponding prevalence in the rural county of Sogn and Fjordane was 6.9 % and 2.4 %, indicating the presence of more alcohol problems in urban compared to rural areas of the country (Kringlen *et al.*, 2006). Alcohol use and alcohol problems appear also to be associated with the sociodemographic composition of city districts (Pedersen *et al.*, 2015). While young people from affluent districts in Oslo have been found to drink and be intoxicated more often than persons of similar age from poorer districts, alcohol-related problems were more frequent among persons living in the poorer districts. This ‘alcohol harm paradox’, where higher socioeconomic status (SES) is associated with more use of alcohol, while lower SES is associated with experiencing more harmful consequences (such as alcohol dependence, unemployment, homelessness and mortality), were supported in a recent review (Collins, 2016). While increased alcohol consumption is associated with more harm in all SES groups, the harms experienced by individuals with low SES have been found to be disproportionately many and severe (Katikireddi *et al.*, 2017).

The consequences of alcohol use extend beyond those found in many previous studies, such as mortality, injury and reduced physical and mental health for the individual (Bobak *et al.*, 2016; Forouzanfar *et al.*, 2015; Lim *et al.*, 2012; Rehm *et al.*, 2017; Stranges *et al.*, 2006; Sæther *et al.*, 2019) – consequences can also be burden or harm for others (Moan *et al.*, 2015), ranging from being kept awake at night to direct physical harm. Moreover, use of alcohol has been linked with reduced work productivity, including sick leave (Schou and Moan, 2016) and reduced work functioning (presenteeism) (Aas *et al.*, 2017; Thørrisen *et al.*, 2019), affecting the workplace productivity as well as the psychosocial environment of the workplace. In recognition of the high prevalence of alcohol use and its harmful effects on the individual and his or her environments, alcohol use is considered one of the major current challenges for the public health (Forouzanfar *et al.*, 2015).

While high-level use of alcohol is recognized as a risk factor for a variety of negative outcomes, the operationalization of ‘high-level’ drinking may concern frequency of drinking as well as the amount of alcohol consumed at each drinking event. While the consequences of consuming large quantities of alcohol at single events (i.e., binge drinking) occur within a short time frame and may include hangovers, blackouts, memory loss, nausea and vomiting (Kuntsche *et al.*, 2017), the health-related consequences of high-frequent drinking may arise over a longer period of time. Yet, there is evidence to claim that high-frequency drinking, even when drinking moderate quantities, constitutes a health risk. Rehm and co-workers (2010) found that daily intake of three drinks per day for men, and two drinks for women, significantly increased the mortality risk related to liver cirrhosis. Another study found that the risk of alcoholic cirrhosis was more than three times higher for daily drinkers compared to those drinking alcohol 2-4 days per week (Askgaard *et al.*, 2015). Nonetheless, as most

research has focused on the volume of alcohol consumed, more research is needed to identify the factors associated with drinking pattern (Rehm *et al.*, 2003).

Using the commonly employed AUDIT measure (Babor *et al.*, 2001) for screening potential alcohol problems among Norwegian employees, a recent study showed that 11 % of the sample (n = 3,571) were classified as ‘risky drinkers’ (Thørrisen *et al.*, 2018). Among Norwegian medical doctors, 15 % of the men and 3 % of the women reported hazardous use of alcohol 3.5 years after graduation (Grotmol *et al.*, 2010), and the proportions were almost unchanged six years later. However, the ten-item AUDIT serves as a composite measure of recent alcohol use, alcohol dependence symptoms, and alcohol-related problems in combination. One way of establishing a measure of drinking frequency alone is to use a single AUDIT item (Item #1), as was done in a recent study of alcohol use among women during pregnancy and breastfeeding (Dumas *et al.*, 2017). Of 1,852 drinkers in the sample, 0.6 % used alcohol on a daily basis before pregnancy. After giving birth, the proportion using alcohol on a daily or weekly basis was lower for those who had breastfed during the preceding month (1.6 %), compared to those who had not (5.2 %). It was concluded that labels such as ‘alcohol use in pregnancy’ is vague and should be avoided because it merges different types of drinking patterns (Dumas *et al.*, 2017).

In view of the existing literature, more research specifically focused on drinking frequency appears to be important. Different types of drinking patterns may be associated with different risk factors and outcomes, and those engaged in daily use of alcohol – in particular among persons with low SES – would have the highest risk of detrimental health outcomes. Thus, this study aimed to establish a prevalence estimate of daily alcohol use in the Norwegian general population, and to assess sociodemographic, mental health-related and personal resource variables associated with daily use of alcohol.

Methods

Study design and ethics

The Norwegian Population Study (NorPop) is a cross-sectional survey. The questionnaire used to collect the data consisted of 160 items reflecting a variety of health conditions in the general population. The study will provide national norm scores related to several questionnaires used for assessing symptoms, attitudes and behavior. Those who provided informed consent to participate completed the questionnaires and returned them to the researchers in a sealed envelope. The regional ethics committee was consulted and, as only anonymous data were collected, no formal ethical approval was required.

Sample selection

The National Population Register selected a random sample of adult persons (≥ 18 years of age), stratified by age, sex and geographic region, for possible inclusion in the study. The survey was sent by mail to the 5500 selected persons along with a letter explaining the study purpose. All data were collected in 2015 and 2016, and Figure 1 displays the recruitment and inclusion process.

FIGURE 1 ABOUT HERE

Measures

Sociodemographic background

Data regarding age, sex, education, employment status, civil status and place of residence were collected. In the multivariate analysis, age was recoded to represent ten-year increase in age. Formal education was dichotomized into 12 years' education or less (representing high school or less education) versus more than 12 years' education (representing some level of higher education). Employment status was similarly dichotomized into not working

versus working. The latter category included persons being employed with paid work or undergoing education, while the former category included persons who were retired, unemployed, doing full-time housework, or receiving disability benefits. Civil status was registered as living with spouse or cohabitant versus not. The participants reported the population size of their place of residence, categorized as rural district (less than 2,000 inhabitants), village (2,000-19,999 inhabitants), town (20,000-99,999 inhabitants) and city (100,000 or more inhabitants).

Use of alcohol

As an introduction to assessing alcohol use, the participants were asked: “Below is a list of some kinds of intoxicating substances and addictive pharmaceuticals. Have you used any of these?” One of the substances on the list was alcohol. The participants were asked to indicate how frequently (never, sometimes, weekly, daily) they used alcohol. Subsequently, the responses were recoded into a dichotomous variable indicating ‘daily alcohol use’ versus ‘less frequent or never’ alcohol use. The participants were also asked to state whether they had sought help for substance abuse problems, with response options listed as irrelevant, no, and yes.

Mental health problems

In the present study, we asked: “Below you will find listed some mental health problems. Do you have, or have you had, any of these problems?” This list contained anxiety, depression, and insomnia. For all of the listed mental health problems, the response alternatives were “no”, “yes previously, but not during the last month” and “yes, during the last month”. Participants with self-reported problems related to anxiety, depression or sleeping problems during the last month were classified as cases. One variable, psychological distress, was constructed as reporting anxiety or depression (or both) versus not reporting anxiety nor depression during the last month.

Personal resources and personality variables

The *General Self-Efficacy Scale* (GSE) (Schwarzer and Jerusalem, 1995) measures self-beliefs related to coping with the demands, tasks, and challenges of life in general.

Respondents rate the ten GSE statements from 1 (not at all true) to 4 (exactly true).

Examples of statements are “I can always manage to solve difficult problems if I try hard enough” and “I am certain that I can accomplish my goals”. The GSE score is calculated as the sum of all item scores, the sum score ranging between 10 and 40, with higher scores indicating higher general self-efficacy. Factor analysis of the GSE has consistently produced a one-factor solution, which was confirmed in a previous study with the Norwegian general population (Bonsaksen *et al.*, 2019). Cronbach’s α was 0.92.

The *Life Orientation Test - Revised* (LOT-R) was used to measure dispositional optimism (Scheier *et al.*, 1994). The LOT-R consists of 10 self-reported items, where four items are distractors used to disguise the purpose of the measure. Of the remaining six items, three are phrased in an optimistic and three in a pessimistic direction. An example of an optimistic statement is “In uncertain times I usually expect the best”, whereas a pessimistic statement example is “If something can go wrong for me, it will”. The respondents indicated the extent to which they agreed with each of the items on a 5-point scale from 0 (*strongly disagree*) to 4 (*strongly agree*). The total LOT-R score is calculated as the sum of the optimism and pessimism item scores, with the pessimism scores inverted. Thus, scores ranged from 0 to 24, with higher scores indicating more optimism. The LOT-R is commonly used with a one-factor structure, and persons who are more optimistic have been shown to be less inclined to report a wide range of physical and mental health conditions, compared to persons who are less optimistic (Schou-Bredal *et al.*, 2019). Cronbach’s α for the one-factor measure was 0.75 (Schou-Bredal *et al.*, 2017).

The *Eysenck Personality Questionnaire* (EPQ) is a self-report questionnaire designed to assess personality traits (Eysenck *et al.*, 1985). In this study, we used the questionnaire to assess extraversion. In line with previous studies, we omitted the psychoticism scale (Brunes *et al.*, 2013), and due to the conceptual overlap between anxiety, depression and neuroticism, we also excluded the neuroticism scale. Extraversion (degree of liveliness and social orientation) was assessed with six questions to which the respondent was asked to circle “yes” or “no”. One example statement is “Do you like to meet new people?” Higher sum score on the scale, ranging between 0 and 6, indicates higher level of extraversion. Cronbach’s α was 0.76 for the scale.

Statistical analyses

Data were analyzed using SPSS for Windows, version 24 (IBM Corporation, 2019). Missing values in the analyses were managed with the casewise deletion procedure, resulting in n varying between analyses. Descriptive analyses employed frequencies and percentages for categorical variables (age group, sex, education level, employment, civil status, population size of place of residence, mental health problems, alcohol use and help-seeking), and means and standard deviations for continuous variables (general self-efficacy, optimism, and extraversion). The chi-square test was used to assess whether the participants’ characteristics related to sociodemographic variables and mental health problems were significantly different between those using alcohol on a daily basis, compared to those using alcohol less frequently or never. Similarly, daily drinkers and less frequent drinkers/non-drinkers were compared regarding personal resources and personality variables using the independent t -test. Logistic regression analysis was used to investigate single and adjusted associations with daily use of alcohol. In the multivariate analysis, the independent variables included age, sex and education level. In addition, we included variables that were significantly associated with the outcome in the unadjusted analyses, or showed at least a small effect size

according to Cohen (1992). The level of statistical significance was set at $p < 0.05$. In the logistic regression analysis, effect sizes were reported as odds ratio (OR) with a corresponding 95 % confidence interval (CI).

Results

Sample

Altogether, 1792 responses (36.0 % response rate) were received. Twenty-eight responses had missing values on the alcohol use variable, and were therefore removed from the study sample. The mean age of the sample ($n = 1764$) was 53.1 years ($SD = 16.6$ years), and it was significantly higher for men ($M = 55.6$, $SD = 15.8$) compared to women ($M = 50.9$, $SD = 17.0$, $p < 0.001$). Women comprised the larger part of the sample ($n = 934$, 53.3 %), and over half of the sample had more than 12 years of education ($n = 939$, 53.6 %) and were employed ($n = 1065$, 60.4 %).

Alcohol use

In the sample, 291 (16.5 %) reported that they never drank alcohol. In comparison, 835 (47.3 %) reported drinking alcohol sometimes and 599 (34.0 %) every week, while 39 individuals (2.2%, 3.1 % of men and 1.4 % of women) reported drinking alcohol on a daily basis. Of these 39 individuals, 20 (51.3 %) stated that seeking help for substance abuse problems was irrelevant. Fourteen of these individuals (35.9 %) stated that they had not sought help for substance abuse problems, while five (12.8 %) stated that they had sought help.

Table 1 displays the characteristics of the whole sample and compare the proportions and mean scores of those reporting daily use alcohol against those who reported less frequent use or total abstinence. Among those who used alcohol on a daily basis, there were significantly higher proportions of men, individuals unemployed, and individuals reporting

anxiety and depression. There was a larger proportion of daily drinkers living in cities with more than 100,000 inhabitants (3.3 %) compared to the proportion living in smaller towns and places (1.8 %), but the difference was not statistically significant ($p = 0.06$). General self-efficacy, optimism and extraversion were not associated with daily drinking.

TABLE 1 ABOUT HERE

Associations with alcohol use

The results from the logistic regression analyses are shown in Table 2. In the unadjusted regression analyses, all of the included variables except education level were significantly associated with alcohol use. Daily use of alcohol was associated with higher age, male sex, not having employment, and reporting psychological distress. Including all variables in the adjusted model, male sex (OR: 2.18, $p < 0.05$), being unemployed and not in education (OR: 3.10, $p < 0.05$) and reporting psychological distress (OR: 3.12, $p < 0.01$) retained their initial associations with daily alcohol use.

TABLE 2 ABOUT HERE

Discussion

This study aimed to establish the prevalence of daily alcohol use in the Norwegian general population, and to assess sociodemographic, mental health-related and personal resource variables associated with daily use of alcohol. The analysis showed that 2.2 % of the participants consumed alcohol on a daily basis. After adjustment for age, sex, education, employment status and psychological distress, daily use of alcohol was significantly

associated with male sex, being unemployed and not in education, and reporting current psychological distress.

Despite population studies showing relatively high lifetime prevalence of alcohol abuse and alcohol dependence in the capital city of Oslo (Kringlen *et al.*, 2001), it appears from the current study that daily use of alcohol is less frequent in Norway, compared to other European countries and the USA. The results reported in the American population study by Stranges and coworkers (2006) showed that 12.6 % of the men and 5.9 % of the women were classified as daily drinkers. Across 28 countries in Europe in 2014, 9.2 % of the population above the age of 15 years were reported to drink alcohol on a daily basis, with proportions ranging between 0.5 % in Turkey and 24.2 % in Portugal (Eurostat, 2018). The estimated proportion of daily drinkers in Norway (2.1 %) (Eurostat, 2018) was similar to the prevalence estimate found in the current study, adding to its credibility.

A more restrictive legislation concerned with distribution, sale and consummation of alcoholic beverages, and a stronger focus on alcohol in the context of public health initiatives from the Ministry of Health in Norway (Ministry of Health, 2013) may contribute to explain the differences in relation to other European countries and the USA. For example, wine and liquor can in Norway only be purchased off-licence at liquor shops controlled by state authorities, and the number and distribution of liquor shops throughout the country is subject to strict regulation. Moreover, despite increased alcohol consumption in Norway over the last decades (Rossow, 2010), a lower degree of urbanization may contribute to a lower-frequency drinking pattern in Norway, compared to other European countries and the USA.

On the other hand, in the study of French women before and after childbirth (Dumas *et al.*, 2017), 0.6 % drank alcohol daily before pregnancy. After childbirth, the proportions were somewhat lower (0.3 % - 0.5 %). Due to small group sizes, one should be cautious

when interpreting differences between the studies. However, particularly low prevalence rates among breastfeeding women seem reasonable, given the current state of public knowledge about the adverse effects of alcohol use on infants. More generally, having responsibility for children has also been found to be associated with lower odds for engaging in risky drinking (Thørrisen *et al.*, 2018). It is also worth noting that among the daily drinkers in the current study, relatively few had sought help. This may indicate that some of those who drank alcohol on a daily basis did not consider themselves in need of help.

Adjusting for all employed variables, men had higher odds of reporting daily use of alcohol, compared to women. Men reporting more frequent alcohol use is consistent with previous research (for review, see Erol and Karpyak, 2015). In a previous epidemiological study from Norway's capital city of Oslo, the lifetime and 12-month prevalence rates of alcohol abuse and alcohol dependence were considerably higher among men, compared to women (Kringlen *et al.*, 2001), and the findings concerned with sex differences were replicated in a subsequent study from a rural area of Norway (Kringlen *et al.*, 2006). Further, in a more recent study of Norwegian university students, a considerably higher proportion of men were found to engage in risky alcohol consumption, compared to women (Sæther *et al.*, 2019). However, some recent studies indicate that the sex gap related to use of alcohol is closing, mostly because women have adopted a drinking pattern more similar to men (Bratberg *et al.*, 2016; Grotmol *et al.*, 2010).

Research has consistently supported the alcohol harm paradox, proposing that more alcohol is consumed by well-educated and affluent persons, while alcohol-related harm more often affects less educated and poorer persons (Collins, 2016; Katikireddi *et al.*, 2017; Probst *et al.*, 2014). In the current study, the association with education level was not statistically significant. Further, the results for employment might be considered partly in conflict with the stated alcohol harm paradox, as participants who were unemployed (and

thus, presumably less fortunate economically) had higher odds of drinking alcohol on a daily basis. This is not to state that the majority of daily drinkers are unemployed – instead, it speaks about the risk of falling into the category of daily drinkers while taking group sizes (and the covariation between the other employed variables) into account. However, high-frequent use of alcohol places them in particular risk of experiencing harmful consequences of alcohol. In fact, examples of harmful consequences may include problems with coming to work (in time) and reduced productivity at work (Buvik *et al.*, 2018; Thørrisen *et al.*, 2019). In view of other studies, in which the responsibility for children has been associated with lower risk of harmful use of alcohol (Dumas *et al.*, 2017; Thørrisen *et al.*, 2018), one might reflect on the possibility that employment also represents a diversity of responsibilities: for productivity in the workplace, for relationships to co-workers and the work environment in general, and for oneself in the worker role. For those without employment, lack of such responsibilities may undermine one's sense of belonging to people who matter, and may in turn make it harder to refrain from high-frequent drinking.

The higher odds of daily drinking among persons who reported current psychological distress is also consistent with previous findings. Considering the coping (Kuntsche *et al.*, 2005) or relief (Ertl *et al.*, 2018) motives for drinking, there is a logical chain from experiencing psychological distress to seeking remedy and relief from difficult emotions by high-frequent use of alcohol. Longitudinal population studies have also been in support of this line of reasoning, suggesting that alcohol may be used as an attempt to self-medicate among persons with high psychological symptom levels (Berg *et al.*, 2018). However, while people may experience short-term relief effects from using alcohol (e.g., reduced anxiety and depression, being able to fall into sleep), its long-term effects may instead be increased symptoms. Nonetheless, the cross-sectional design of this study does not allow for specifying the direction of the association between distress and use of alcohol. Further, a bi-

directional or cyclical relationship between the two variables is possible. Lack of employment may also interact with psychological distress, potentially influencing levels of distress and the way distress is associated with drinking pattern.

Study limitations and future studies

The study had a relatively low response rate, and a large number of items in the questionnaire may have contributed towards reducing the response rate, and possibly towards a skewed sample distribution with more participants tolerating the comprehensive questionnaire format. However, low response rates are frequently the case in general population studies (Holbrook *et al.*, 2007), and when comparing the sample with non-responders, no significant differences were detected for age, sex and proportions living in rural and urban areas (Bonsaksen *et al.*, 2019). Comparing the study sample with Norwegian population statistics regarding employment, education and relationship status, differences were found to be minor (Bonsaksen *et al.*, 2019; Schou-Bredal *et al.*, 2017; Statistics Norway, 2018).

One issue of potential concern is the response categories concerned with drinking frequency. As there was no response category between ‘daily’ and ‘weekly’ drinking, some individuals would marginally be classified within the one group whereas others would marginally be classified within the other. Nonetheless, there would be a considerable overall difference in alcohol consumption between the two groups.

As seen in several studies of substance abuse, participants may have underestimated (deliberately or not) their alcohol use. Unfortunately, there is no way of controlling the accuracy or truthfulness of the participants’ responses. There is no standard procedure for reporting pattern of alcohol use (Rehm *et al.*, 2003), such that the comparisons with other studies should be interpreted cautiously. Only a small proportion of the participants reported that they used alcohol on a daily basis, and the 2.2 % prevalence estimate may be in the

lower range. However, it was found to be similar to a previously established Norwegian prevalence estimate for daily alcohol use (Eurostat, 2018). Some of the heaviest drinkers may not have had a permanent address, thus being unable to receive the postal survey, and may not have responded to the survey if they had received it. Future studies trying to reach the heaviest drinkers may be advised to use interviews instead of postal or e-mailed surveys. The size of the group of daily drinkers may represent a problem for the validity of the adjusted regression model. However, the 'ten events per predictor' rule of thumb has been questioned in previous research (Vittinghoff and McCulloch, 2006). Moreover, the regression model employed in the study appeared to be fairly stable even after adjustments.

While this study has focused on daily drinkers, those with less frequent, yet high-level alcohol consumption may be specifically targeted in future studies. Moreover, population studies concerned with binge drinking may be addressed in future studies, and studies combining measures of drinking frequency and drinking volume may be particularly valuable. In view of reports on a closing sex gap related to use of alcohol, future studies should continue to monitor use of alcohol and its related consequences in a sex perspective.

Conclusion

Using data from a sample representative of the Norwegian general population, a proportion of 2.2 % reported to drink alcohol on a daily basis. Adjusting for all included variables, daily use of alcohol was higher among men, among individuals who were unemployed and not in education, and among persons reporting current psychological distress. Thus, the results regarding correlates of daily drinking point towards a distinct sex difference, but also towards aggregated burden concerned with unemployment and mental health problems among daily drinkers. Public health initiatives aiming at reducing harmful use of alcohol should therefore be aware that unemployment and mental health problems constitute a relevant context for high-frequent drinking, and research studies may seek a deeper

understanding of the interrelationships between factors that contribute to harmful use of alcohol.

List of abbreviations

CI: Confidence Interval

DALY: Disability Adjusted Life Years

EPQ: Eysenck Personality Questionnaire

GBD: Global Burden of Disease Study

GSE: General Self-Efficacy Scale

LOT-R: Life Orientation Test-Revised

NORPOP: The Norwegian Population Study

OR: Odds Ratio

Declarations

Ethics approval and consent to participate: The Regional Committee for Healthcare

Research Ethics was consulted and, due to the anonymous data collected, no formal ethical approval was required. Consent to participate was given by completing and returning the questionnaire.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: ISB designed the study. The whole research group contributed to the collection of data. TB performed the statistical analyses and drafted the manuscript. All authors read, provided input to, and approved the final manuscript.

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Table 1

Characteristics of participants in the NorPop study by alcohol use

Characteristics	All	Alcohol use		<i>p</i>
		Daily use	Less frequent or never	
<i>Age group (n = 1746)</i>	<i>N</i>	<i>n (%)</i>	<i>n (%)</i>	0.05
18-30 years	207	0 (0.0)	207 (100.0)	
31-40 years	184	1 (0.5)	183 (99.5)	
41-50 years	353	9 (2.5)	344 (97.5)	
51-60 years	348	7 (2.0)	341 (98.0)	
61-70 years	391	14 (3.6)	377 (96.4)	
71 years and over	263	6 (2.3)	257 (97.7)	
<i>Sex (n = 1753)</i>				< 0.05
Men	819	25 (3.1)	794 (96.9)	
Women	934	13 (1.4)	921 (98.6)	
<i>Education level (n = 1753)</i>				0.59
12 years or less	814	16 (2.0)	798 (98.0)	
More than 12 years	939	22 (2.3)	917 (97.7)	
<i>Employment (n = 1764)</i>				< 0.001
Employed/in education	1154	13 (1.1)	1141 (98.8)	
Unemployed/not in education	610	26 (4.3)	584 (95.7)	

Daily use of alcohol		28		
<i>Civil status (n = 1764)</i>				0.97
Living with spouse/cohabitant	1262	28 (2.2)	1234 (97.8)	
Not living with spouse/cohabitant	502	11 (2.2)	491 (97.8)	
<i>Size of place of residence (n = 1742)</i>				0.20
< 2,000	353	5 (1.4)	348 (98.6)	
2,000-19,999	481	8 (1.7)	473 (98.3)	
20,000-99,999	421	8 (1.9)	413 (98.1)	
100,000 and over	487	16 (3.3)	471 (96.7)	
<i>Mental health problems</i>				
Anxiety (n = 1723)	117	7 (6.0)	110 (94.0)	< 0.01
No anxiety	1606	32 (2.0)	1574 (98.0)	
Depression (n = 1730)	145	7 (4.8)	138 (95.2)	< 0.05
No depression	1585	30 (1.9)	1555 (98.1)	
Insomnia (n = 1730)	375	9 (2.4)	366 (97.6)	0.63
No insomnia	1355	27 (2.0)	1328 (98.0)	
<i>Personal resources and personality</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	
General self-efficacy (n = 1762)	29.0 (6.2)	29.1 (6.4)	29.0 (6.2)	0.88
Optimism (n = 1759)	17.3 (3.0)	16.8 (2.9)	17.3 (3.1)	0.37
Extraversion (n = 1691)	3.9 (1.8)	4.0 (1.6)	3.9 (1.8)	0.69

Note. Statistical tests are independent *t*-test (personal resources and personality variables) and χ^2 -tests (all other variables).

Table 2

Unadjusted and adjusted logistic regression analyses showing associations between the study variables and daily alcohol use (n = 1738)

Independent variables	<u>Unadjusted model</u>			<u>Adjusted model</u>		
	OR	95 % CI	<i>p</i>	OR	95 % CI	<i>P</i>
Age increase in 10 years	1.35	1.09-1.67	< 0.01	1.08	0.83-1.42	0.56
Sex						
Male	2.23	1.13-4.39	< 0.05	2.18	1.08-4.40	< 0.05
Female			Reference category			
Education						
Education > 12 years	1.20	0.62-2.29	0.59	1.64	0.83-3.25	0.16
Education ≤ 12 years			Reference category			
Employment						
Without employment/education	3.91	1.99-7.66	< 0.001	3.10	1.27-7.56	< 0.05
With employment/in education			Reference category			
Psychological distress						
Anxiety and/or depression	2.66	1.31-5.42	< 0.01	3.12	1.47-6.63	< 0.01
No anxiety nor depression			Reference category			

Note. Adjusted model parameters: Nagelkerke $R^2 = 0.09$, Cox & Snell $R^2 = 0.02$, Model $\chi^2 = 28.4$, $p < 0.001$.