Work-related stress factors associated with problem drinking. A study of the Spanish working population.

Short title: Work stress and problem drinking.

Esther Colell, MPH(a,b)

Albert Sánchez-Niubò, ABD(a)

Fernando G. Benavides, MD, PhD(b,c)

George L. Delclos, MD, PhD(b,c,d)

Antònia Domingo-Salvany, MD, PhD(a)

(a) Drug Abuse Epidemiology Research Group. IMIM-Institut Hospital del Mar d'Investigacions Mèdiques, Barcelona, Spain.

(b) Research Centre in Occupational Health. Pompeu Fabra University, Barcelona, Spain

(c) CIBER en Epidemiología y Salud Pública (CIBERESP), Spain

(d) The University of Texas School of Public Health, Houston, USA

Corresponding Author: Antònia Domingo-Salvany

IMIM-Hospital del Mar, Doctor Aiguader 88, E-08003 Barcelona, Spain

adomingo@imim.es

Phone: + 34 933 160 700

Disclosure Statement: The authors report no conflicts of interest.

Word count:

Abstract: 154

Main text: 3,661 (excluding abstract and references)

ABSTRACT

Background: Workers may drink to cope with stress or to overcome negative emotions arising from an aversive working context, but results of previous studies are inconclusive on the specific work features affecting alcohol use.

Methods: A cross-sectional study was designed with data on 13,005 working individuals from the Household Survey on Alcohol and Drugs in Spain (EDADES)-2007. We examined the associations between two drinking patterns and four measures of work-related stress factors.

Results: Moderate and high levels of exposure to a noxious working environment (OR=2.15 [95%CI=1.51-3.06] and OR=2.23 [95%CI=1.49-3.36]) and a high level of lack of social support (OR=1.62 [95%CI=1.16-2.28]) were associated with heavy drinking, and precariousness with binge drinking for both moderate (OR=1.22 [95%CI=1.01-1.46]) and high (OR=1.33 [95%CI=1.04-1.70]) levels (OR=1.21; 95%CI=1.04-1.40) in men. Significant associations among women were only found when stress factors were analysed separately.

Conclusions: Preventive practices in the workplace targeting alcohol abuse should consider specific production processes and organisational features.

Key words: Alcohol Drinking, Epidemiology, Workplace, Cross-Sectional Studies.

INTRODUCTION

The European Union (EU) is the heaviest drinking region of the world [Anderson and Baumberg, 2006] and alcohol is the most important risk factor for disability and premature death in the age range when the population is more likely to be employed [World Health Organization, 2011].

The most significant direct costs in the workplace of alcohol misuse are due to productivity lost through absence from work, poor performance on the job and accidents resulting in death or disability [European Commission, 2011]. Heavy drinking, particularly episodic heavy drinking, increases the risk of absence from work [Bacharach et al., 2010]. Alcohol-related presenteeism, when workers are present at work but their job performance is impaired, may lead to greater losses in productivity than absence from work through decreased efficiency, errors and work-related injuries [Mangione et al., 1999]. Alcohol problems may also increase the risk of unemployment [Romelsjo et al., 2004].

Reducing the impact of alcohol on the workplace is one of the five priorities of the EU strategy to reduce alcohol-related harm [Communication from the Commission, 2006]; therefore, understanding the factors that cause or explain general alcohol use by workers, are of special interest not only to occupational and public health professionals but also to researchers in the management and economics fields.

It has been stated that the work environment may influence alcohol use among workers in different ways [Ames and Janes, 1992]. There are two basic perspectives on the influence of the workplace on alcohol use [Frone, 1999]. The first focuses on prevailing norms surrounding alcohol use and its availability in the workplace. It has been argued that workplaces where alcohol is easily available will encourage its use

among employees. The existence of occupational subcultures that share values and expectations with respect to alcohol consumption has also been noted [Ames and Janes, 1992]. The second perspective suggests that the way work is organised, the technical and social arrangements and the characteristics of production processes may represent important sources of stress. From the general notion of tension reduction, workers will drink to cope with stress or to overcome negative emotions arising from the physical and psychosocial characteristics of the work environment.

Most of the studies that have analysed the association of work-related stress with alcohol consumption or alcohol problems have based their work-related stress measures on the Demand-Control [Karasek and Theorell, 1990] or the Effort-Reward Imbalance [Siegrist, 1996] models. Although longitudinal studies [Crum et al., 1995; Head et al., 2004; Allard et al., 2011] have yielded more consistent results than cross-sectional studies [Gimeno et al., 2009; Hiro et al., 2007; Kouvonen et al., 2005; Bobak et al., 2005; San Jose et al., 2000], in general these are contradictory and inconclusive about the specific work features or their combinations affecting alcohol use. For example, while one study found that low control was associated with alcohol use in men [Niedhammer et al., 1998], another registered an increase of alcohol use in women with high control [van Loon et al., 2000]. Furthermore, high demands were associated with increased alcohol use in men and women [Lallukka et al., 2004] and with lower use among young male workers [Wiesner et al., 2005]. Social support in the workplace has been considered to help workers cope with job strain [Karasek and Theorell, 1990] and some studies have found increased use of alcohol among workers reporting low levels of support [Hemmingsson and Lundberg, 1998]. However, it has also been suggested that the role of social support as a mediator in the relation

between work-stress and alcohol consumption will be contingent on the type of social support and the characteristics defining the groups [Hagihara et al., 2003].

Other studies focusing on occupational self-direction, measured as closeness of supervision, routinisation and complexity of work, have reported higher alcohol consumption among people working in low complexity jobs compared with those in jobs with high substantive complexity [Roxburgh, 1998; Gimeno et al., 2009; Wiesner et al., 2005]. Moreover, noxious or hazardous physical working conditions have also been associated with higher levels of alcohol use [Roxburgh, 1998; San Jose et al., 2000].

Conversely, the proliferation of flexible forms of employment, as opposed to full-time permanent employment, has resulted in a growing insecurity concerning job loss and a deterioration of employment conditions [Vives et al., 2011]. Work is a core social role in defining an individual's identity, and holding unstable jobs with low pay and no promotion prospects may impair personal self-regulation through social reward deficiency, predisposing to addictive behaviours [Siegrist, 2000]. The interest in the effects of precarious employment on health has increased in recent years and various studies have found a relation between precarious or unstable work and poor mental health [Vives et al., 2013; Sirvio et al., 2012] and with changes in health-related lifestyle, including alcohol consumption [Virtanen et al., 2008].

In this study we examined the association between work-related stress and alcohol use in a representative sample of the Spanish working population, considering four measures of work-related stressors, namely noxious working environment, workload, precariousness and social support; and two measures of drinking that would include any drinking irrespective of time and location. Gender differences in alcohol

consumption and labour market position prompted the analysis of men and women separately.

METHODS

Source of information and study population

All data were drawn from the Household Survey on Alcohol and Drugs in Spain (EDADES) 2007. EDADES is a biennial nationwide representative household survey carried out since 1995 to monitor use, perceptions and opinions of 15 to 64 year old residents in Spain with respect to alcohol and drug consumption. In 2007 a tri-stage clustered probability sample was applied considering census tracts, homes and individuals, with a total sample size of 23,715 individuals. The participation rate of 50.3%, similar to previous editions, was accounted for in the originally selected sample. For the purpose of this study we selected those individuals over 15 years of age who held paid jobs at the time of the survey. The resulting sample consisted of 13,005 individuals. The study was based on anonymised data collected through a household survey and was approved by the institutional review board (2011/4392/1).

Alcohol consumption and problem drinking

Alcohol consumption data came from the survey's self-administered standardised questionnaire registering substance use. The daily average of alcohol intake in the last month was calculated in grams (g) of pure ethanol considering the standard drink unit that varies for each kind of drink, the number of units, and their frequency. A glass of wine was estimated to contain 12.7g of pure ethanol, beer or cider 12.4g, fruit liquors 11.2g, and mixed drinks and hard liquors 24.9g. A total weekly amount was calculated from average weekday and weekend consumption. Individuals were classified in three categories according to their daily average of alcohol intake: those who reported zero consumption were categorised as non-drinkers; men consuming up to 39.99g and women consuming up to 23.99g were categorised as

moderate drinkers; and those who reported daily averages above these measures ($\geq 40\text{g}$ for men and $\geq 24\text{g}$ for women) were categorised as heavy drinkers [Rehm et al., 2007]. An additional measure of binge drinking was used for those reporting having had 5 or more drinks on a single drinking occasion (within 2 hours) at least once in the previous month. Heavy drinking and binge drinking were both considered problem drinking.

Work-related stress factors and covariates

EDADES 2007 included a module with questions on work-related stress factors with 5-point Likert scale category answers ranging from “nothing” to “very much”. We performed an exploratory factor analysis with the relevant items of the module using half of the sample, randomly selected. The structure obtained was subsequently validated with the other half of the sample through a confirmatory factor analysis. Data on the results of the factor analysis and the reliability of the structure can be found elsewhere [Colell et al., 2013]. The resulting structure contained four dimensions comprising three items each: (1) *noxious working environment*, including dangerous work, hot or cold conditions, and unpleasant smell, noise or uncomfortable position; (2) *workload*, including piecework or working at full throttle, extended working hours, and long journeys or absences from home; (3) *precariousness*, including being overqualified, insecurity with respect to the future of the job, and not feeling adequately remunerated; and (4) *social support*, including feeling satisfied with supervisors, and co-workers, and feeling adequately trained to perform the work. A high correlation was observed between noxious working environment and workload (0.708) and between these two and precariousness (0.547 and 0.528, respectively). The rest of correlations were lower than 0.35. We imputed the average of the non-

missing items to the missing items for those who had answered at least two items, to include the maximum number possible of individuals in the study (9% of the sample). These four scores were calculated and z-standardised (mean 0 and variance 1) separately for men and women, divided in tertiles (cut-points of the standard normal distribution -0.43 and 0.43) and categorised as low, moderate and high exposure to noxious working conditions, workload, precariousness or lack social support. Low levels of exposure were used as the reference category.

Regarding covariates, we included age as a continuous variable; education level was grouped in three categories and coded as (1) up to primary school, (2) secondary level, and (3) university degree (reference category); and self-perceived health was collapsed into two categories (1) poor health including very poor, poor and fair, and (2) good health including good and very good (reference category).

Statistical analysis

We fitted logistic regression models separately for men and women to obtain the odds ratio (OR) and corresponding 95% confidence intervals (95%CI) of the association between the measures of problem drinking and each of the work-related stress factors separately, and a final model including the four work-related stress factors. All models were adjusted for age and education. Among men, models for heavy drinking were also adjusted for self-perceived health as it showed a significant association in prior bivariate models. Non-drinkers were excluded from the reference category to avoid the role of ill health on the current level of abstention affecting the results. People decrease their alcohol consumption when they become ill or increase use of medications. If these people are included in the reference category, their compromised health might be elevating the risk of the outcome and obscure the

results [Fillmore et al., 2007]. Hosmer & Lemeshow tests were carried out to check the goodness of fit of all the models. Analyses were performed applying sample weights using SPSS statistical software v. 18©.

RESULTS

Of the 13,005 individuals working at the time of the survey, 60% were men; mean ages were 38.9 years for men (SD 10.9) and 37.7 for women (SD 10.7). Table I shows the descriptive characteristics of the sample. Overall, men more than doubled women's level of problem drinking: 5% of men and 2.3% of women reached levels of alcohol use categorised as heavy drinking; and 19.5% of men and 8% of women qualified for binge drinking, the latter clearly more prevalent among the youngest group in both sexes. Conversely, rates of non-drinking were higher among females (46% vs. 26%). Both men and women had higher proportions of non-drinkers among those reporting poor health, besides, men reporting poor health had a higher rate of heavy drinking (7.3%) whereas this was not the case among women.

With respect to work-related stress factors, more men reported a high level of exposure to a noxious working environment than women (32% vs. 26%), while women reported a higher level of precariousness (28% vs. 22.5%). Conversely, similar proportions of men and women reported high workload (29% and 28%) and lack of social support (17% and 16%). The youngest age groups registered larger proportions of the high level of all stress factors except of lack of social support in women that did not show differences by age groups (table I). A clear gradient was observed regarding education, with those with only primary schooling registering the greatest proportions of high exposure to a noxious working environment, high workload and high precariousness.

Regression analyses showed that the four work-related stress measures were positively associated with heavy drinking in men and women when analysed separately adjusting for covariates (table II). This association was strong ($p < .001$) in men for the

high level of the four work-stress measures and also for the moderate level of noxious working environment. In the case of women the association was weaker and involved high level of noxious working environment and lack of social support, moderate level of workload and both moderate and high levels of precariousness. In the joint model, both moderate and high levels of noxious working environment (OR=2.15 [95%CI=1.51-3.06] and OR=2.23 [95%CI=1.49-3.36]) and high level of lack of social support (OR=1.62 [95%CI=1.16-2.28]) maintained a robust association in men, while all associations disappeared in women. Similarly, the four stress measures were positively associated with binge drinking when analysed separately in men (table III), but only precariousness maintained a significant association for both moderate (OR=1.22 [95%CI 1.01-1.46]) and high (OR=1.33 [95%CI=1.04-1.70]) levels in the joint model. In the case of women, high levels of precariousness and of lack of social support were significant when analysed separately, but none remained significant in the joint model.

These analyses additionally showed that men with poor health and both men and women with primary education had higher odds of heavy drinking (table II). Conversely, the odds of binge drinking decreased with age in both men and women while men with primary education had also greater likelihood of binge drinking (table III).

DISCUSSION

In most cases, all four work stress factors were associated with heavy drinking and binge drinking in both men and women. Independent associations were observed for heavy drinking in men exposed to noxious working environments and to lack of social support at work, and for binge drinking in men experiencing precariousness. No independent associations between the work stress measures adjusting for each other and either heavy or binge drinking were found among women.

Although contrasting our results with those of other studies entails some difficulty due to the diversity of measures employed to categorize problem drinking, they can still be compared with those using similar work-related stress measures. Like the main results of our study, a community-based study in Toronto found that job noxiousness (highly dangerous work or involving a lot of dirt and noise) increased alcohol consumption in men but not women [Roxburgh, 1998]. Conversely, another study of the general population in The Netherlands [San Jose et al., 2000] found that hazardous physical working conditions were associated with heavy drinking in both men and women. Conversely, low rewards in terms of income and job benefits and recognition, equivalent to our measure of precariousness, were associated with higher likelihood of heavy drinking only in men in a study of Finnish municipal sector employees [Kouvonen et al., 2005]. Finally, although it has been suggested that the implications of social support in relation to alcohol use will depend on the working context [Hagihara et al., 2003], an association between low social support and alcohol abuse has also been found in a study of young men [Hemmingsson and Lundberg, 1998].

Our results present differential associations between work environment factors and the pattern of drinking in men. A connection has been reported in the literature between certain types of work characterised by their toughness and physical demands and high levels of cirrhosis mortality linked to chronic heavy drinking [Harford and Brooks, 1992]. Conversely, engaging in binge drinking could represent a response to the frustration generated by perceived insecurity with respect to the future of the job, feeling inadequately remunerated or being overqualified when the position held is inconsistent with the educational background [Siegrist, 2000].

Evidence of the effects of adverse working conditions on women's alcohol consumption is considerably scarcer compared with that found in men. Women consistently report lower alcohol consumption levels than men, although recent epidemiological studies suggest that the gender gap for alcohol use is closing in younger cohorts [Colell et al., 2012; Keyes et al., 2011]. Gender roles and traditional culture affecting women's and men's drinking would be the main reasons for this differential drinking behaviour [Wilsnack et al., 2000]. It has been suggested that female workers may tend to manifest work stress through other types of psychopathology, such as depression [Lennon, 1987] and be more prone to use other substances, such as sedatives [Benavides et al., 2013]. Nevertheless, current research warns against generalizations about gender differences in psychiatric morbidity and stresses the need to take into account the context of employment, and domestic and socioeconomic circumstances [Emslie et al., 2002].

Furthermore, the fact that fewer women in our sample reported working in noxious environments can provide some insight into the differential gender composition of the labour market. About 70% of the women were employed in public

services, social and personal services and trade and repair shops (data not shown), activities where other exposures such as emotional demands may be more relevant. Likewise, the stress measure used was mainly based on environment characteristics and quantitative demands, exposures more applicable to blue collar occupations, and the inclusion of measures on qualitative demands and work performance would have broadened the scope of reported psychosocial risks across job positions and made the study more generalizable to the entire working population.

Other limitations of this study need to be mentioned. The first is that its cross-sectional design does not allow the identification of the causal chain or its directionality. In this regard, it has been suggested that individuals holding hazardous positions have personal characteristics which predispose them to substance use [Lehman and Bennett, 2002]. However, personal background would interact with the work environment (stress, drinking norms) to trigger or precipitate problem drinking. Moreover, prospective cohort studies have found that psychosocial risks of work, such as high strain [Crum et al., 1995] and effort-reward imbalance [Head et al., 2004], tend to precede alcohol problems. A second limitation, also related to the cross-sectional design, is the possibility of reporting bias affecting the validity of self-reported measures of alcohol use and work stress. Survey alcohol measures tend to underestimate the amount of alcohol consumed; however, studies suggest that both sporadic and heavy drinkers tend to declare the actual amount of alcohol consumed [Stockwell et al., 2004]. In our study, both the methodology of the survey as well as the design of the questionnaire would favour maximum validity of the measures collected. However, the use of a single question to be answered by both sexes to collect information on binge drinking may have resulted in an under-estimation of the

prevalence of binge drinking among women. Conversely, self-assessed measures of work stress may be influenced by specific personality features, moods and contexts, and heavy-drinking employees may tend to perceive work context as more stressful. Strategies to minimise this error, such as performing contextual validation to obtain objective indicators, were not possible in this study. Also, as the study population only included individuals currently working, we may have incurred a selection bias (healthy worker effect) by excluding those with serious drinking problems who were already out of the labour market and who might have been employed in the worst working environments – likely resulting in a bias towards the null value. A further selection bias may derive from the low response rate as those not reachable or refusing to answer the questionnaire may be heavier drinkers. In addition, workers facing job stress appear to be less likely to participate in research studies [Cifuentes et al., 2008].

Thirdly, occupation-based indicators of socioeconomic position that could confound the association between stress and problem drinking were not available and the occupational categories used in the survey were not useful for ranking persons into a hierarchy. However, education has been presented as a strong determinant of employment and income and a predictor of various health outcomes [Galobardes et al., 2006]. In order to account for the variation of the meaning of education in the different birth cohorts, analyses stratifying by age groups were performed with similar results to those obtained with the full sample (data not shown).

Lastly, there are some important factors that were not measured in this study. The hypothesis that individuals will drink alcohol for its tension-reducing properties needs to consider differences in individuals' responses to stress depending on personality characteristics, coping skills and beliefs about the positive effects of

alcohol. Also, the position in other social roles, such as domestic work, is very important, especially when assessing women's health [Artazcoz et al., 2007]. Neither domestic responsibilities nor the difficulties or conflicts arising from combining paid and unpaid work, which may have helped in the interpretation of results in women, were measured in the survey providing data for our study.

In summary, the determinants of alcohol consumption are very complex and many of them arise from cultural and social factors outside the workplace [Ragland et al., 1995]. Even though the extent to which occupational environments contribute to maintaining or exacerbating potentially damaging drinking behaviours may be modest, identifying work features that affect vulnerable individuals may still be useful for prevention purposes. The results of our study suggest that workplaces involving noxious working environments could benefit from interventions resulting in primary or secondary prevention of alcohol abuse. Also, promoting social support in the workplace by enhancing work-group strengths and team awareness, and ensuring better training to perform one's job, would not only provide a buffer for work-related stress but also favour peer referral and help-seeking in workers with problematic alcohol use. Similarly, the damaging effects of poor employment conditions on individuals' mental health should be further analysed in the present context of economic crisis and labour market restructuring. This is particularly relevant for young people, as entering the labour force in precarious working circumstances may present an additional risk for consolidating future harmful drinking habits. The implementation of prevention policies to reduce the risk of heavy drinking, either specific or embedded in broader workplace programs of health promotion and well-being, may improve wellness and productivity as well as reducing the wider social costs of alcohol.

FUNDING

Grant sponsors: Delegación del Gobierno para el Plan Nacional sobre Drogas. Ministerio de Salud y Política Social; Grant number: PNSD 2011/I073. FIS-Redes de investigación cooperativa; Grant numbers: RD06/0001/1018 and RD12/0028/0018. AGAUR; Grant number: 2009 SGR 00718. Albert Sánchez-Niubò was supported by the Instituto de Salud Carlos III; Grant number: CA08/00214.

ACKNOWLEDGEMENTS

We are grateful to David Gimeno for his comments on a previous version of this manuscript and to Dave MacFarlane for his help with English language usage.

REFERENCES

- Allard KO, Thomsen JF, Mikkelsen S, Rugulies R, Mors O, Kaergaard A, Kolstad HA, Kaerlev L, Andersen JH, Hansen AM, Bonde JP. 2011. Effects of psychosocial work factors on lifestyle changes: a cohort study. *J Occup Environ Med* 53:1364-1371.
- Ames GM, Janes C. 1992. A cultural approach to conceptualizing alcohol and the workplace. *Alcohol Health & Research World* 16:112-119.
- Anderson, P. and Baumberg, B. 2006. *Alcohol in Europe. A Public Health Perspective.* Institute of Alcohol Studies, London.
- Artazcoz L, Borrell C, Cortes I, Escriba-Aguir V, Cascant L. 2007. Occupational epidemiology and work related inequalities in health: a gender perspective for two complementary approaches to work and health research. *J Epidemiol Community Health* 61 Suppl 2:ii39-ii45.
- Bacharach SB, Bamberger P, Biron M. 2010. Alcohol consumption and workplace absenteeism: the moderating effect of social support. *J Appl Psychol* 95:334-348.
- Benavides FG, Ruiz-Fores N, Delclos J, Domingo-Salvany A. 2013. [Consumption of alcohol and other drugs by the active population in Spain.]. *Gac Sanit* 27:248-253.
- Bobak M, Pikhart H, Kubinova R, Malyutina S, Pajak A, Sebakova H, Topor-Madry R, Nikitin Y, Caan W, Marmot M. 2005. The association between psychosocial characteristics at work and problem drinking: a cross-sectional study of men in three Eastern European urban populations. *Occup Environ Med* 62:546-550.

Cifuentes M, Boyer J, Gore R, d'Errico A, Scollin P, Tessler J, Lerner D, Kriebel D, Punnett L, Slatin C. 2008. Job strain predicts survey response in healthcare industry workers. *Am J Ind Med* 51:281-289.

Colell E, Sanchez-Niubo A, Benavides FG, Domingo-Salvany A. 2013. [Exploration and validation of the questions on work environment included in the Spanish Household Survey on Alcohol and Drugs]. *Arch Prev Riesgos Labor* 16:130-135.

Colell E, Sanchez-Niubo A, Domingo-Salvany A. 2012. Sex differences in the cumulative incidence of substance use by birth cohort. *Int J Drug Policy*.

Communication from the Commission. 2006. A EU Strategy to support Member States in reducing alcohol-related harm. Available at: http://eur-lex.europa.eu/LexUriServ/site/en/com/2006/com2006_0625en01.pdf.

Crum RM, Muntaner C, Eaton WW, Anthony JC. 1995. Occupational stress and the risk of alcohol abuse and dependence. *Alcohol Clin Exp Res* 19:647-655.

Emslie C, Fuhrer R, Hunt K, Macintyre S, Shipley M, Stansfeld S. 2002. Gender differences in mental health: evidence from three organisations. *Soc Sci Med* 54:621-624.

European Commission. 2011. Alcohol, work and productivity. Scientific Opinion of the Science Group of the European Alcohol and Health Forum. Brussels. Available at: http://ec.europa.eu/health/alcohol/docs/science_02_en.pdf.

Fillmore KM, Stockwell T, Chikritzhs T, Bostrom A, Kerr W. 2007. Moderate alcohol use and reduced mortality risk: systematic error in prospective studies and new hypotheses. *Ann Epidemiol* 17:S16-S23.

Frone MR. 1999. Work stress and alcohol use. *Alcohol Res Health* 23:284-291.

Galobardes B, Shaw M, Lawlor DA, Lynch JW, Davey SG. 2006. Indicators of socioeconomic position (part 1). *J Epidemiol Community Health* 60:7-12.

Gimeno D, Amick BC, III, Barrientos-Gutierrez T, Mangione TW. 2009. Work organization and drinking: an epidemiological comparison of two psychosocial work exposure models. *Int Arch Occup Environ Health* 82:305-317.

Hagihara A, Tarumi K, Nobutomo K. 2003. Positive and negative effects of social support on the relationship between work stress and alcohol consumption. *J Stud Alcohol* 64:874-883.

Harford TC, Brooks SD. 1992. Cirrhosis mortality and occupation. *J Stud Alcohol* 53:463-468.

Head J, Stansfeld SA, Siegrist J. 2004. The psychosocial work environment and alcohol dependence: a prospective study. *Occup Environ Med* 61:219-224.

Hemmingsson T, Lundberg I. 1998. Work control, work demands, and work social support in relation to alcoholism among young men. *Alcohol Clin Exp Res* 22:921-927.

Hiro H, Kawakami N, Tanaka K, Nakamura K. 2007. Association between job stressors and heavy drinking: age differences in male Japanese workers. *Ind Health* 45:415-425.

Karasek R, Theorell T. 1990. Healthy work. Stress, productivity, and the reconstruction of working life. New York: Basic Books.

Keyes KM, Li G, Hasin DS. 2011. Birth cohort effects and gender differences in alcohol epidemiology: a review and synthesis. *Alcohol Clin Exp Res* 35:2101-2112.

Kouvonen A, Kivimäki M, Cox SJ, Poikolainen K, Cox T, Vahtera J. 2005. Job strain, effort-reward imbalance, and heavy drinking: a study in 40,851 employees. *J Occup Environ Med* 47:503-513.

Lallukka T, Sarlio-Lahteenkorva S, Roos E, Laaksonen M, Rahkonen O, Lahelma E. 2004. Working conditions and health behaviours among employed women and men: the Helsinki Health Study. *Prev Med* 38:48-56.

Lehman WE, Bennett JB. 2002. Job risk and employee substance use: the influence of personal background and work environment factors. *Am J Drug Alcohol Abuse* 28:263-286.

Lennon MC. 1987. Sex Differences in Distress: The Impact of Gender and Work Roles. *J Health Soc Behav* 28:290-305.

Mangione TW, Howland J, Amick B, Cote J, Lee M, Bell N, Levine S. 1999. Employee drinking practices and work performance. *J Stud Alcohol* 60:261-270.

Niedhammer I, Goldberg M, Leclerc A, David S, Bugel I, Landre MF. 1998. Psychosocial work environment and cardiovascular risk factors in an occupational cohort in France. *J Epidemiol Community Health* 52:93-100.

Ragland DR, Greiner BA, Krause N, Holman BL, Fisher JM. 1995. Occupational and nonoccupational correlates of alcohol consumption in urban transit operators. *Prev Med* 24:634-645.

Rehm J, Klotsche J, Patra J. 2007. Comparative quantification of alcohol exposure as risk factor for global burden of disease. *Int J Methods Psychiatr Res* 16:66-76.

Romelsjo A, Stenbacka M, Lundberg M, Upmark M. 2004. A population study of the association between hospitalization for alcoholism among employees in different socio-economic classes and the risk of mobility out of, or within, the workforce. *Eur J Public Health* 14:53-57.

Roxburgh S. 1998. Gender differences in the effect of job stressors on alcohol consumption. *Addict Behav* 23:101-107.

San Jose B, van de Mheen H, van Oers JA, Mackenbach JP, Garretsen HF. 2000. Adverse working conditions and alcohol use in men and women. *Alcohol Clin Exp Res* 24:1207-1213.

Siegrist J. 1996. Adverse health effects of high-effort/low-reward conditions. *J Occup Health Psychol* 1:27-41.

Siegrist J. 2000. Place, social exchange and health: proposed sociological framework. *Soc Sci Med* 51:1283-1293.

Sirvio A, Ek E, Jokelainen J, Koiranen M, Jarvikoski T, Taanila A. 2012. Precariousness and discontinuous work history in association with health. *Scand J Public Health* 40:360-367.

Stockwell T, Donath S, Cooper-Stanbury M, Chikritzhs T, Catalano P, Mateo C. 2004. Under-reporting of alcohol consumption in household surveys: a comparison of quantity-frequency, graduated-frequency and recent recall. *Addiction* 99:1024-1033.

van Loon AJ, Tijhuis M, Surtees PG, Ormel J. 2000. Lifestyle risk factors for cancer: the relationship with psychosocial work environment. *Int J Epidemiol* 29:785-792.

Virtanen P, Vahtera J, Broms U, Sillanmaki L, Kivimaki M, Koskenvuo M. 2008. Employment trajectory as determinant of change in health-related lifestyle: the prospective HeSSup study. *Eur J Public Health* 18:504-508.

Vives A, Amable M, Ferrer M, Moncada S, Llorens C, Muntaner C, Benavides FG, Benach J. 2013. Employment precariousness and poor mental health: evidence from Spain on a new social determinant of health. *J Environ Public Health* 2013:978656.

Vives A, Vanroelen C, Amable M, Ferrer M, Moncada S, Llorens C, Muntaner C, Benavides FG, Benach J. 2011. Employment precariousness in Spain: prevalence, social distribution, and population-attributable risk percent of poor mental health. *Int J Health Serv* 41:625-646.

Wiesner M, Windle M, Freeman A. 2005. Work stress, substance use, and depression among young adult workers: an examination of main and moderator effect model. *J Occup Health Psychol* 10:83-96.

Wilsnack RW, Vogeltanz ND, Wilsnack SC, Harris TR, Ahlstrom S, Bondy S, Csemy L, Ferrence R, Ferris J, Fleming J, Graham K, Greenfield T, Guyon L, Haavio-Mannila E, Kellner F, Knibbe R, Kubicka L, Loukomskiaia M, Mustonen H, Nadeau L, Narusk A, Neve

R, Rahav G, Spak F, Teichman M, Trocki K, Webster I, Weiss S. 2000. Gender differences in alcohol consumption and adverse drinking consequences: cross-cultural patterns. *Addiction* 95:251-265.

World Health Organization. 2012. *Global Status Report on Alcohol and Health*. Geneva.

Table I. Distribution of drinking and work-related stress factors in men and women.

MEN				Drinking				Work-related stress factors											
				Non drinking ^a	Moderate drinking ^b	Heavy drinking ^c	Binge drinking ^d	Noxious working environment			Workload			Precariousness			Lack of social support		
		N	%	%	%	%	%	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Total		7186	59.8	25.7	69.3	5.0	19.5	37.7	30.2	32.2	32.6	38.1	29.3	25.8	51.7	22.5	26.9	56.1	17
Age-groups				<i>p</i> =.863			<i>p</i> <.001	<i>p</i> <.001			<i>p</i> <.001			<i>p</i> <.001			<i>p</i> =.003		
16 to 34		3394	38.0	25.9	69.0	5.1	26.9	33.8	31.7	34.5	26.7	41.0	32.3	21.1	52.5	26.4	26.6	54.6	18.8
35 to 64		3792	62.0	25.5	69.5	4.9	14.9	40.1	29.2	30.7	36.3	36.3	27.4	28.7	51.2	20.1	27	57.1	15.9
Age mean		38.9 (SD 10.9)																	
Self-perceived health				<i>p</i> <.001			<i>p</i> =.335	<i>p</i> =.003			<i>p</i> =.339			<i>p</i> =.005			<i>p</i> =.039		
Good		6518	89.4	24.9	70.4	4.7	19.6	38.1	30.4	31.6	32.5	38.4	29.1	26.2	51.6	22.2	27.2	56.1	16.7
Poor		643	10.6	32.7	60.0	7.3	18.3	33.8	28.9	37.3	33.1	36	31	21.5	52.8	25.7	23.7	57.0	19.3
Education				<i>p</i> <.001			<i>p</i> =.001	<i>p</i> <.001			<i>p</i> <.001			<i>p</i> <.001			<i>p</i> <.001		
Primary		1178	17.6	27.7	63.8	8.5	18.8	19.5	31.1	49.4	23.3	37.9	38.8	19.2	51.8	29.0	24.5	57.5	17.9
Secondary		4460	59.5	26.3	69.1	4.6	20.7	32.5	32.7	34.8	29.6	39.5	30.9	22.0	53.4	24.5	25.1	56.2	18.7
University		1506	22.9	22.5	74.5	3.1	16.7	64.1	23.1	12.8	47.2	34.5	18.3	40.2	47.5	12.3	33.1	54.9	12.1
WOMEN				Drinking				Work-related stress factors											
				Non drinking ^a	Moderate drinking ^e	Heavy drinking ^f	Binge drinking ^d	Noxious working environment			Workload			Precariousness			Lack of social support		
		N	%	%	%	%	%	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Total		5819	40.2	46.4	51.4	2.3	8.0	33.6	39.6	26.8	31.6	40.4	28.0	28.8	43.2	28.0	28.9	54.7	16.4
Age-groups				<i>p</i> =.117			<i>p</i> <.001	<i>p</i> <.001			<i>p</i> <.001			<i>p</i> <.001			<i>P</i> =.479		
16 to 34		2682	42.9	45.1	52.2	2.6	11.4	30.6	40.7	28.7	27.9	42	30.1	25.1	43.3	31.6	28.4	55.7	16.0
35 to 64		3137	57.1	47.3	50.7	2.0	5.4	35.9	38.7	25.4	34.5	39.2	26.3	31.8	43	25.2	29.3	54.0	16.7
Age mean		37.7 (SD 10.7)																	
Self-perceived health				<i>p</i> =.001			<i>p</i> =.006	<i>p</i> <.001			<i>p</i> <.001			<i>p</i> =.014			<i>p</i> <.001		
Good		5140	88.1	45.4	52.2	2.3	8.3	34.8	39.6	25.6	32.6	40.4	27.1	29.4	43.1	27.5	29.3	55.2	15.5
Poor		656	11.9	53.1	45.1	1.8	5.2	24.8	39.2	36.1	24.9	40.2	34.9	24.7	43.1	32.2	26.1	50.9	23.0
Education				<i>p</i> <.001			<i>p</i> =.050	<i>p</i> <.001			<i>p</i> <.001			<i>p</i> <.001			<i>p</i> <.001		
Primary		795	14.7	57.1	39.4	3.5	5.8	25.0	40.1	34.9	27.2	38.4	34.5	24.1	42.6	33.4	26.7	54.1	19.2
Secondary		3349	56.2	47.7	50.3	2.1	8.3	31.9	39.2	28.9	31.6	40.3	28.0	26.3	43.6	30.1	27.2	54.3	18.5

University	1645	29.1	38.1	60.0	1.9	8.3	41.1	40.1	18.8	33.9	41.9	24.2	36.3	42.8	20.8	33.6	55.4	11.0
------------	------	------	------	------	-----	-----	------	------	------	------	------	------	------	------	------	------	------	------

^a 0g/day; ^b 0 - <40g/day; ^c ≥40g/day; ^d ≥5 drinks on the same drinking occasion; ^e 0 - <24g/day; ^f ≥24g/day
N from raw data; % from weighted data. P-values correspond to X² test.

Table II. Association of heavy drinking with work-related stress factors adjusted for socio-demographic variables in men and women^a.

	MEN					WOMEN				
	Noxious working environment	Workload	Precariousness	Lack of social support	Joint model	Noxious working environment	Workload	Precariousness	Lack of social support	Joint model
	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)
Age	0.99 (0.98-1.00)	0.99 (0.98-1.00)	0.99 (0.98-1.00)	0.99 (0.98-1.00)	0.99 (0.98-1.00)	0.98 (0.96-0.99)*	0.98 (0.96-0.99)*	0.98 (0.97-1.00)	0.98 (0.96-1.00)*	0.98 (0.97-0.99)*
Poor health	1.66 (1.23-2.24)**	1.68 (1.25-2.27)**	1.65 (1.22-2.23)**	1.67 (1.24-2.26)**	1.65 (1.22-2.24)**					
Education (ref. university)										
Primary	2.23 (1.57-3.17)***	2.79 (1.99-3.90)***	2.85 (2.04-3.99)***	3.12 (2.24-4.34)***	2.27 (1.60-3.22)***	3.25 (1.86-5.70)**	3.42 (1.96-5.96)**	3.20 (1.83-5.60)**	3.42 (1.96-5.98)***	3.09 (1.76-5.45)***
Secondary	1.14 (0.82-1.56)	1.35 (0.99-1.83)	1.34 (0.99-1.82)	1.41 (1.04-1.91)*	1.13 (0.83-1.55)	1.39 (0.89-2.20)	1.45 (0.91-2.29)	1.37 (0.86-2.17)	1.38 (0.87-2.19)	1.33 (0.34-2.12)
Noxious working environment (ref. low)										
Moderate	2.12 (1.57-2.86)***				2.15 (1.51-3.06)***	1.38 (0.85-2.22)				0.97 (0.52-1.79)
High	2.42 (1.80-3.26)***				2.23 (1.49-3.36)***	1.73 (1.05-2.85)*				1.25 (0.58-2.72)
Workload (ref. low)										
Moderate		1.26 (0.95-1.68)			0.85 (0.60-1.19)		1.73 (1.06-2.82)*			1.39 (0.75-2.60)
High		1.93 (1.46-2.55)***			1.10 (0.74-1.63)		1.67 (0.99-2.82)			0.98 (0.43-2.22)
Precariousness (ref. low)										
Moderate			1.32 (0.99-1.77)		.92 (0.65-1.29)			1.69 (1.00-2.85)*		1.41 (0.79-2.52)
High			1.89 (1.37-2.60)***		0.92 (0.60-1.41)			2.10 (1.23-3.61)**		1.65 (0.82-3.29)
Lack of social support (ref. low)										
Moderate				1.07 (0.82-1.39)	1.10 (0.77-1.34)				1.39 (0.87-2.22)	1.20 (0.74-1.96)
High				1.85 (1.36-2.51)***	1.62 (1.16-2.28)**				1.96 (1.12-3.43)*	1.54 (0.85-2.81)
Hosmer & Lemeshow test	x2=8.959 p=.346	x2=2.241 p=.973	x2=12.647 p=.125	x2=3.753 p=.879	x2=13.872 p=.085	X2=9.289 p=.318	X2=11.308 p=.185	x2=14.333 p=.074	x2=10.268 p=.247	X2=5.050 p=.752

^a Heavy drinkers vs. moderate drinkers, non-drinkers excluded from the analysis. Heavy drinking: ≥40g/day for men and ≥24g/day for women.

OR=Odds Ratio; CI95%=Confidence Interval 95%.

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

Table III. Association of binge drinking with work-related stress factors adjusted for socio-demographic variables in men and women^a.

	MEN					WOMEN				
	Noxious working environment	Workload	Precariousness	Lack of social support	Joint model	Noxious working environment	Workload	Precariousness	Lack of social support	Joint model
	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)	OR (CI95%)
Age	0.95 (0.94-0.96)***	0.95 (0.94-0.96)***	0.95 (0.94-0.96)***	0.95 (0.94-0.96)***	0.95 (0.95-0.96)***	0.95 (0.94-0.96)***	0.95 (0.94-0.96)***	0.95 (0.94-0.96)***	0.95 (0.94-0.96)***	0.95 (0.94-0.96)***
Education (ref. university)										
Primary	1.30 (1.06-1.61)*	1.38 (1.13-1.69)**	1.37 (1.12-1.68)**	1.48 (1.21-1.80)***	1.33 (1.08-1.64)**	1.26 (0.86-1.85)	1.29 (0.88-1.88)	1.25 (0.85-1.84)	1.29 (0.88-1.89)	1.25 (0.85-1.83)
Secondary	1.14 (0.97-1.33)	1.19 (1.02-1.39)*	1.17 (1.01-1.37)*	1.22 (1.05-1.42)*	1.14 (0.97-1.34)	1.08 (0.86-1.37)	1.10 (0.87-1.39)	1.07 (0.85-1.36)	1.07 (0.85-1.36)	1.06 (0.84-1.35)
Noxious working environment (ref. low)										
Moderate	1.31 (1.12-1.53)**				1.12 (0.93-1.34)	1.14 (0.88-1.47)				1.10 (0.78-1.54)
High	1.37 (1.17-1.60)***				1.06 (0.85-1.32)	1.26 (0.95-1.67)				1.04 (0.65-1.64)
Workload (ref. low)										
Moderate		1.28 (1.10-1.48)**			1.10 (0.92-1.32)		1.01 (0.78-1.31)			0.89 (0.64-1.25)
High		1.45 (1.23-1.70)***			1.16 (0.93-1.46)		1.24 (0.94-1.64)			1.01 (0.64-1.58)
Precariousness (ref. low)										
Moderate			1.36 (1.16-1.59)***		1.22 (1.01-1.46)*			1.12 (0.85-1.45)		1.05 (0.77-1.42)
High			1.64 (1.36-1.97)***		1.33 (1.04-1.70)*			1.40 (1.05-1.86)*		1.24 (0.85-1.81)
Lack of social support (ref. low)										
Moderate				1.08 (0.94-1.25)	0.90 (0.80-1.02)				1.20 (0.93-1.55)	1.16 (0.89-1.51)
High				1.43 (1.19-1.72)***	1.10 (0.99-1.22)				1.46 (1.05-2.02)*	1.31 (0.93-1.87)
Hosmer & Lemeshow test	x ² =9.427 p=.308	x ² =9.680 p=.288	x ² =6.225 p=.622	x ² =8.280 p=.407	x ² =6.144 p=.631	x ² =12.317 p=.138	x ² = 12.834 p=.118	x ² =8.066 p=.427	X ² =14.760 p=.064	X ² =11.716 p=.164

^a Non-drinkers excluded from the analysis. Binge drinking: ≥5 drinks on the same drinking occasion.

OR=Odds Ratio; CI95%=Confidence Interval 95%.

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