Directly alcohol-attributable mortality by industry and occupation in a Spanish Census cohort of economically active population*

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Highlights

- The unemployed had double the directly alcohol-attributable mortality as the employed
- In some occupations, mortality from this cause was 3-6 times higher than in teachers
- Much of the occupational inequality is explained by age, sex and educational level
- After adjustment, considerable excess risk remains in the hospitality/catering sector

Abstract

Aims: To assess disparities in directly alcohol-attributable (DAA) mortality by industry/occupation in Spain during 2002-2011 and the contribution of different socio-demographic factors, including socioeconomic position, to explain such disparity.

Methods: Nationwide cohort study covering 16 million economically active people living in Spain in 2001. Deaths at age 25-64 were analyzed. Subjects were classified by employment status, industry and occupation at baseline. Poisson regression models were built, calculating rate ratios (RRs) compared to all employees or those in the education sector.

Results: DAA mortality was much higher in the unemployed than in employees (Crude RR: 2.4; 95%CI: 2.3-2.6) and varied widely across industries/occupations. Crude RRs>3.0 ($p<0.05$) compared to teachers were found in employees in extractive industries/fishing, agriculture/livestock, construction, catering/accommodation and protective services. Socio-demographic factors, especially age, gender and educational attainment contributed more to explain risk disparities than other factors or potential selection bias. However, after exhaustive sociodemographic adjustment, including education attainment and material wealth, a RR >1.33 ($p<0.05$) remained in unemployed, catering/accommodation employees and unskilled construction workers. RRs were significantly larger in women than men ($p<0.05$) among mineworkers/fishworkers/sailors (RR=8.6 vs. 1.2) and drivers (RR=3.7 vs. 1.0).

Conclusions: The results could be extrapolated to all alcohol-attributable mortality since disparities for other strongly alcohol-related deaths, although smaller, were in the same direction. Given the wide occupational disparities in alcohol-attributable mortality, implementation of special measures to reduce this mortality in the highest risk groups is fully justified. Future research should better characterize the explanatory factors of disparities and their role in the causal chain.

Keywords: Alcohol-attributable mortality. Occupation. Industry. Sociodemographic factors. Population cohort

Introduction

Alcohol use, particularly regular/episodic excessive drinking, is an important risk factor for disease burden worldwide (WHO, 2014a). Unemployment has been found to be associated with an increased risk of alcohol-related problems (alcohol-related morbimortality, alcohol-use disorder, regular/episodic excessive drinking) (Alonso et al., 2017; Backhans et al., 2016; Eliason, 2014; Garcy and Vagero, 2012; Henkel, 2011; Lundin et al., 2012; Mustard et al., 2013). Focusing on employees, the association between occupation and alcohol-related problems has generally been assessed using a few (i.e., 3-5) broad occupational categories as indicators of socioeconomic position (SEP), and a consistently higher risk of such problems has been found in unskilled workers (usually in the lowest position) (Crombie and Precious, 2011; Erskine et al., 2010; Harrison and Gardiner, 1999; Herttua et al., 2008; Mackenbach et al., 2015; Makela, 1999; Probst et al., 2014). Previous studies have also shown that occupational inequalities in alcohol-related mortality are substantially higher than in all-cause mortality, and that alcohol consumption contributes considerably to inequalities in all-cause mortality (Hemstrom, 2002; Nandi et al., 2014; Probst et al., 2014; Tjepkema et al., 2013). These studies are very valuable in guiding global public policies, but such broad occupational categories are probably heterogeneous regarding the risk of alcohol-related problems, preventing

identification of the highest-risk specific industries/occupations for intervention or research purposes. Studies using smaller industry/occupation groups (not necessarily ordered by SEP) are scarce and often show that working in catering/accommodation, mining or construction is associated with the highest risk for alcohol-related problems, whereas the opposite occurs with working in healthcare/social services, education or public administration (Baker, 2008; Berry et al., 2007; Coggon et al., 2010; Hemmingsson et al., 1997; Hemmingsson and Ringback, 2001; Jarman et al., 2007; Mandell et al., 1992; Pidd et al., 2011; Pukkala et al., 2009; Romeri et al., 2007; Shaikh et al., 2015).

To identify the industry/occupation groups with higher intervention needs, it may be sufficient to analyze crude disparity measures of alcohol-related problems. However, to improve the orientation and content of intervention programs it is essential to assess the contribution of different factors to explain the disparity of such problems by industry/occupation, which requires sequential adjustment of disparity measures by these factors. There is evidence that age, gender, SEP, immigration or marital status are associated with alcohol-related problems (Bush and Lipari, 2015; Kaila-Kangas et al., 2016; Makela et al., 2006; Pidd et al., 2011; WHO, 2014a) and probably also with industry/occupation. Thus, males' overrepresentation may explain the high rates of alcohol-related problems in some industries. Assessing SEP's contribution to explaining disparities by industry/occupation requires further consideration. The SEP is a complex construct usually approximated by several indicators such as educational attainment, unemployment, occupational class, income, housing conditions, etc. Each indicator measures different, often strongly correlated aspects of socioeconomic stratification, and its relevance varies according to the analyzed outcome and life stage. Consequently, when SEP is considered as a confounding factor, an adjustment by several SEP indicators is advisable to minimize the residual confounding by unmeasured socioeconomic circumstances (Galobardes et al., 2006). However, when the association between

industry/occupation and alcohol-related problems, especially mortality, is studied, the SEP is rarely controlled, which prevents the separation of its effect (more linked to general living conditions) from the effect of other specific workplace-related factors (more linked to specific tasks or economic activities performed or the specific workplace context). Thus, the increased risk of alcohol-related problems often found in certain unskilled occupations after age-gender adjustment (Baker, 2008; Hemstrom, 2002; OEDT, 2015; Romeri et al., 2007), could be partly explained by uncontrolled factors more prevalent in lower SEPs or specific-workplace related factors. The former could include higher excessive drinking throughout life (perhaps because in lower positions alcohol is more frequently used to cope with the stress associated with worse living conditions or there are more permissive drinking social norms in extra-occupational networks), higher vulnerability to alcohol effects (perhaps due to cumulative effects and interactions with other health problems or risk behaviors such as unhealthy diet, less access to health services for alcohol-related problems, or higher stigmatization of such problems) (Mackenbach et al., 2015; Probst et al., 2014). Among specific-workplace related factors could be high alcohol availability in the workplace, weak workplace alcohol control policies, permissive drinking social norms in the workgroup, labor isolation or workplace-based stress associated with working in a hazardous environment, job insecurity, high job demands, low job control or other factors) (Ahola et al., 2006; Berry et al., 2007; Coggon et al., 2010; EAHF, 2011; Hodgins et al., 2009; Olkinuora, 1984; Pidd et al., 2011).

In this study, results will be adjusted by several SEP indicators, which will greatly minimize the residual confusion by SEP components, increasing the probability that the adjusted disparities can be explained by unmeasured factors closely related to workplace conditions or context. Moreover, most previous occupational studies on alcohol-related problems have been conducted in Anglo-Saxon or Northern European countries where there may be particularities (i.e., occupational structure, drinking patterns) limiting the spatial

extrapolation of results, so it is interesting to conduct such studies in Mediterranean Europe where drinking patterns remain quite integrated into food culture. The specific aims of this study were to assess disparities in directly alcohol-attributable mortality (DAA) by employment status and specific industry/occupation and the contribution of the main sociodemographic factors, including socioeconomic position, to explain such disparities in Spain in 2002-2011.

1. Material and Methods

1.1. Study Population

All residents in Spain on the Census date (November 2001) were followed until December 2011, determining vital status and cause of death. The National Institute of Statistics (INE) performed the record linkage between population and mortality registries using common identifiers, providing researchers with a data file excluding personal identifiers, census tract and death day to maintain confidentiality. Those Census subjects not found in population or mortality registers (1.7%) were excluded. The risk contribution of 1% of subjects was censored because they had moved abroad. The sociodemographic characteristics of excluded or censored subjects did not differ from included subjects. The analysis was restricted to economically active people in 2001 who were aged 25-64 in each calendar-year in 2002-2011 (approximately 16 million people). This study was approved by the INE Institutional Review Board.

1.2. Measurements

The main outcome was DAA mortality, referring to the underlying causes of death from the International Classification of Diseases, Tenth Edition (ICD-10), where alcohol is explicitly mentioned: alcohol-use disorders (F10), alcoholic cardiomyopathy (I42.6), alcoholic liver disease (K70), alcohol-induced pancreatitis (K85.2, K86.0), alcohol poisoning (X45, X65, Y15) and other pathologies due to alcohol (E24.4, G31.2, G62.1, G72.1, K29.2, R78.0). To assess whether the DAA results could be extrapolated to all alcohol-attributable deaths, some other strongly alcohol-related causes of death were analyzed separately, such as other alcohol-related

chronic liver diseases or ARCLiverD (B18, I85, I98.2, K71.3-K71.5, K71.7, K72.1-K74.6, K74.9, K75.8-K76.0, K76.6-K76.7, K76.9) and selected alcohol-related cancers or SARCancer (C00-C14, C15, C22, C32) (Supplementary Table S1[1]). All-cause mortality was also considered because the comparison of disparity by industry/occupation between all-cause and alcohol-related causes can offer indications on the contribution of alcohol consumption in this disparity. The completeness of cause of death in the Spanish mortality registry during 2002-2011 was 100% with around 10% of "garbage codes" (i.e., symptoms, signs and ill-defined conditions, ill-defined cardiovascular diseases, etc.) in the assignment of cause of death (WHO, 2014b).

The main independent variables (employment status, industry and occupation) refer to the week prior to the Census and were coded using national standard classifications. Less than 0.1% of participants lacked information about these variables. Other factors considered were gender, 5-year age group, calendar-year of death, immigration status, marital status, residence area, educational attainment, and material wealth indicators (household floor space and car ownership). Information on the main variables is shown in Supplementary Table S1[2].

1.3. Statistical Analysis

Each participant's follow-up time was calculated from baseline -census date- to date of death, emigration or study end. Age was considered as a time-varying covariate during follow-up. We first calculated crude mortality rates (CMRs) per 100,000 persons-year (py) by employment status and industry/occupation. To facilitate analysis, detailed industries and occupations were grouped into broader categories based mainly on hierarchical classification structure. Next, directly age-gender standardized rates were calculated using weights from the 2013 European Standard Population. Finally, crude and adjusted rate ratios (RRs) and their

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corresponding 95% confidence intervals (95%CI) compared to the category of education/teacher were estimated by Poisson regression models with robust variance estimates.

Models were built using aggregated databases containing py and various death counts (outcomes) for each single combination of covariates. In such models a death count was the dependent variable and the natural logarithm of py was the offset variable. Several models were adjusted by successively adding sociodemographic variables to assess whether the association between industry/occupation and mortality was confounded or explained by these variables. The following specific models were built: the unadjusted model or model 0, model I adjusted by 5-year age group; model II adding gender; model III adding residence area, calendar-year of death, marital and immigration status; model IV adding educational attainment; and model V adding material wealth. The analyses were performed separately for industry and occupation in all participants and in men, women, and people aged 25-49 -younger- and 50-64 -older-, using Stata 14.0 (Stata Corporation, College Station, Texas).

2. Results

2.1. General Characteristics and Alcohol-Related Mortality

Participants' characteristics at baseline are shown in Supplementary Tables S2-S5[3]. Some 12.5% were unemployed. Among employees, the most frequent industries were manufacturing/basic supplies (17.8%), trade/repair (14.8%) and construction (11.1%), and the most frequent occupations were manufacturing skilled workers (12.9%), technicians/support professionals (11.3%) and administrative employees (10.3%). More women than men were unemployed (17.1% vs. 9.5%) and they worked more often in personal services, household activities, healthcare/social work, education, sales, and administration/business support, and less often in construction, extractive industries/fishing, transport/storage, manufacturing/basic

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supplies, protective services, driving, and agriculture/livestock. There were occupational differences by age, with the younger group more frequently employed as sales or unskilled workers, administrative employees, technicians/support professionals, other university degree professions, and less frequently as farmers, managers, drivers or skilled workers (Table S3). There was an important overlap between some categories of industry and occupation (Table S4). Generally, the highest levels of education and material wealth were found in managerial, educational, health and professional/scientific/technical occupations (Table S5).

There were 5,841, 11,011, 35,546 and 325,759 deaths from DAA, ARCLiverD, SARCancer, and all-causes, respectively, among the economically active population aged 25-64 during 2002-2011. The main specific DAA cause was alcoholic liver disease (79.2%), followed by alcohol use disorder (14.8%) and acute alcohol poisoning (2.7%), with no important differences by age and gender. Relevant heterogeneity was observed in CMRs from DAA cause by age, gender, educational attainment, household floor space, car ownership, marital status, residence area and calendar-year of death (data not shown).

2.2. Directly Alcohol-Attributable Mortality by Employment Status

The CMR was 7.4 and 2.9/100,000 py among unemployed and total employees, respectively, and was significantly higher in men than women and in older (aged 50-64) than younger persons (aged 25-49) in both subgroups (Table 1). The age-sex standardized rate was also significantly higher in unemployed (10.8/100,000 py) than total employees (2.7/100,000 py) or employees in any analyzed occupation (maximum rate: 6.3/100,000 py) or industry (maximum rate: 5.2/100,000 py) (Figure 1). The RR comparing unemployed to employees changed with successive adjustments, reflecting the contribution of different factors to disparity. Finally, after exhaustive adjustment, the RR remained higher among unemployed than total employees (2.3), or employees in any analyzed occupation/industry (RR vs. employees in education for unemployed and employed in maximum-risk industry were 2.8 and

1.7, respectively) (Tables 2-3). The RR in unemployed vs. total employees was higher in men (2.3) than women (1.7) (Supplementary Table S5[4])

2.3. Directly Alcohol-Attributable Mortality by Industry

The CMR ranged from 1.2 to 5.9/100,000 py across industries, with the highest CMRs found in extractive industries/fishing, agriculture/livestock, construction, and catering/accommodation (CMR>3.8/100,000 py; $p<0.05$), and the lowest in education, personal services, and professional/scientific/technical services (CMR<1.0/100,000 py; $p<0.05$). CMRs were much higher among men than women in all categories, except extractive industries/fishing. They were also much higher in older than younger participants in all industries, although in extractive industries/fishing and personal services, these differences did not reach statistical significance. The industry ranking according to CMR was quite similar in both genders and age groups, although some heterogeneity was observed. Thus, household activities ranked near the top in both men and women, however in both genders together it ranked lower because of the predominance of women. Similarly, men in personal services have a fairly high CMR, which is not reflected in the ranking for both genders together (Table 1). This ranking changes little using age-gender directly standardized mortality rates (Figure 1).

The RRs of each industry vs. education changed with successive adjustments, with the factors responsible for major change being gender, educational attainment and age. Some relevant differences by industry remained in Model V (exhaustive adjustment), with the highest RRs found in catering/accommodation, agriculture/livestock and administration/business support (Table 2). In the age-adjusted model, a higher RR was observed in women than men in extractive industries/fishing, remaining after exhaustive adjustment. Moreover, in the age-gender adjusted model, the RR was higher in younger than older participants in most industries,

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especially extractive industries/fishing, agriculture/livestock, construction, healthcare/social services and finances, of which only the latter disparity remained in Model V (Supplementary Table[5]).

2.4. Directly Alcohol-Attributable Mortality by Occupation

The CMR ranged from 1.1 to 6.6/100,000 py across occupations, with the highest values found among unskilled construction workers, mineworkers/fishworkers/sailors, farmers, and small catering/accommodation company managers, protective services workers, and skilled construction workers (CR>4.0/100,000 py; $p<0.05$), and the lowest among professions with university degrees, and public administration/big companies' directors (CMR<1.0/100,000 py; $p<0.05$). CMRs were much higher among men than women in all occupations, except mineworkers/fishworkers/sailors, which were similar. CMRs were also much higher at age 50-64 than 24-49 in all occupations. Moreover, occupational ranking by CMR was quite similar in both gender and age groups, although some heterogeneity was observed (Table 1). This ranking changes little using age-gender directly standardized mortality rates (Figure 1).

The RRs of each occupation vs. teachers generally changed with successive adjustments, with the factors responsible for major change being gender, educational attainment and age. Some relevant differences by occupation remained in Model V, with a RR>1.33 ($p<0.05$) in catering/accommodation employees and unskilled construction workers (Table 3). In the age-adjusted model, a higher RR was observed in women than men in mineworkers/fishworkers/sailors and drivers, which remained after extensive adjustment. Moreover, in the age-gender adjusted model the RR was higher in younger than older participants for most occupations, especially mineworkers/fishworkers/sailors, farmers, and

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small catering/accommodation companies' managers, although statistical significant differences disappeared in Model V (Table S3).

2.5. Heterogeneity in All-Cause Mortality and Other Strongly Alcohol-Related Deaths

After exhaustive adjustment (Model V), all-cause mortality was 1.5 times higher in the unemployed than employed. Some excess all-cause mortality was also found in certain industries/occupations compared to education/teachers, although it was considerably lower than for DAA mortality. Mortality from other strongly alcohol-related causes was much higher in the unemployed than in employees, with RRs in Model V of 2.2 and 1.6, respectively, for ARCLiverD and SARCancer. The industries/occupations with the highest excess mortality from these causes were the same as for DAA mortality, although the RRs vs. education/teachers were somewhat lower (Table 4).

4. Discussion

4.1. *Disparity in Directly Alcohol-Attributable Mortality by Employment Status*

In this study mortality from DAA causes was considerably higher in the unemployed than in total employees or employees in any analyzed industry/occupation category at baseline, even after exhaustive sociodemographic adjustment, which is consistent with previous evidence generally showing an increased risk of alcohol-related morbimortality among the unemployed (Backhans et al., 2016; Browning and Heinesen, 2012; Eliason, 2014; Garcy and Vagero, 2012; Gili et al., 2013; Henkel, 2011; Lundin et al., 2012; Mustard et al., 2013). Disparities in the same direction were found for other strongly alcohol-related causes of death and all-cause mortality, although of smaller magnitude than for DAA deaths, which is also consistent with some previous studies (Hemstrom, 2002; Nandi et al., 2014; Probst et al., 2014; Tjepkema et al., 2013) and suggests that alcohol consumption plays a relevant role in all-cause mortality disparity by employment status. Excess mortality from alcohol-related causes in the

unemployed can be explained by several factors and mechanisms (Eliason, 2014; Roelfs et al., 2011). There is considerable evidence, with some inconsistencies, that unemployment or job loss leads to unfavorable changes in alcohol consumption, especially more risky drinking patterns (Bor et al., 2013; Bosque-Prous et al., 2015; Colell et al., 2015; Compton et al., 2014; Davalos et al., 2012; Khlat et al., 2004; Mossakowski, 2008; Nandi et al., 2013), possibly through increased stress due to uncertainty, decreased self-esteem, stigmatization or financial deprivation, or through mechanisms linked to the change of daily routines and social networks or greater availability of free time. It is also possible that such excess mortality is partly explained by previous health or behavioral problems or unmeasured characteristics that lead to unemployment (or both to unemployment and excessive drinking) or even by more difficult access to prevention and care services for alcohol-related problems among the unemployed. In addition, the unemployed are probably not a uniform group. Thus, although in this study excess DAA mortality was found in all gender and age unemployed groups, it was significantly lower in women than men. This moderating effect of the female gender could be explained by a lesser undermining effect of unemployment on women's traditional family role, the lesser linkage of women's identity to their labor role or their lesser disposition to use alcohol for coping with stress (Eliason, 2014). Likewise, among the unemployed in this study, especially unfavorable changes were previously observed during the economic recession beginning in 2008 in those with medium/high material wealth, which was attributed to difficulties in coping with the expenses of their possessions, mainly repaying loans (Alonso et al., 2017).

4.2. Differences in Directly Alcohol-Attributable Mortality by Industry and Occupation

There were wide differences in DAA mortality across industries/occupations in Spain, with a crude rate approximately five times higher in the highest than lowest category. The highest crude rates were found in extractive industries/fishing, agriculture/livestock,

construction, and catering/accommodation, where unskilled workers predominate, and the lowest in the highest managerial and professional occupations and household activities. The findings suggest that most of the excess risk in extractive industries/fishing, agriculture/livestock and skilled construction workers compared to education/teachers can be explained by the unequal distribution of participants by gender, educational attainment and age. Generally, after age-gender adjustment, the excess risk decreased in industries/occupations dominated by men or older persons such as managers, protective services workers and drivers, whereas it increased in those with a predominance of women or younger persons (i.e., household activities, personal services or sales workers) (data not shown). Some of the differences that persisted after age-gender adjustment declined substantially after adjustment for educational attainment. Finally, after exhaustive adjustment, excess mortality remained higher among catering/accommodation employees, unskilled construction workers, protective services workers and farmers (RR >1.33 vs. education, $p<0.05$). These findings are quite consistent with those from previous studies on alcohol-related mortality (Baker, 2008; Coggon et al., 2010; Pukkala et al., 2009; Romeri et al., 2007), alcohol use disorders (Hemmingsson et al., 1997; Mandell et al., 1992), other alcohol-related disease (Hemmingsson and Ringback, 2001), excessive drinking (Benavides et al., 2013; Berry et al., 2007; Bush and Lipari, 2015; Jarman et al., 2007; Shaikh et al., 2015), or working under the influence of alcohol (Pidd et al., 2011). Thus, among Spanish men in 2007, the highest heavy drinking prevalence was observed in catering/accommodation, primary sector and construction, and the lowest in administration, education, healthcare/social services and transports (Benavides et al., 2013). As with employment status, disparities in the same direction were found for other strongly alcohol-related causes of death and all-cause mortality, although of smaller magnitude than for DAA deaths, which is also consistent with some previous studies referring to occupational class

(Hemstrom, 2002; Probst et al., 2014; Tjepkema et al., 2013), and suggests that alcohol consumption plays a relevant role in all-cause mortality disparities by industry/occupation.

The fact that the industries/occupations with the highest and lowest risk of alcohol-related mortality are quite similar in Spain and in Anglo-Saxon and Northern European countries suggests that the main factors explaining disparities by industry/occupation are not country-specific contextual factors, but socioeconomic or workplace-related factors that are similar across countries. However, we cannot determine to what extent the disparities that persist after exhaustive socio-demographic adjustment are due to workplace-related factors such as those noted in the introduction, SEP components that are not fully controlled by SEP indicators entered in the models, or even selection bias (different probability of being recruited and retaining work in people with alcohol-related problems) (Hemmingsson et al., 1997; Hemmingsson and Ringback, 2001). However, it should be borne in mind that selection bias may not only contribute to creating or widening disparities on alcohol-related mortality by industry/occupation, but also sometimes reducing or eliminating them (i.e., heavy drinkers may be less likely to work as drivers because they exclude themselves, are not admitted, or stop working due to strict workplace alcohol testing) (Berry et al., 2007).

The association between occupation and DAA mortality was higher in women than men for mineworkers/fishworkers/sailors and drivers, which could also occur for other occupations (Erskine et al., 2010; Hemmingsson and Ringback, 2001; Mackenbach et al., 2015; Probst et al., 2015; Savikko et al., 2008). The reasons are unknown, but women in male-dominated occupations have increased social opportunities to drink and could tend to adopt men's drinking patterns. A greater difference in DAA mortality across industries/occupations was found in younger than older people, although after exhaustive adjustment the statistical significance remained only for finance. Such findings are consistent with previous studies (Erskine et al., 2010; Harrison and Gardiner, 1999; Morikawa et al., 2014; Siegler et al., 2011) and are

surprising given that alcohol-related harm generally takes many years to develop. It could be explained by a lower survival bias and a greater outflow to retirement of older people with alcohol-related problems in unskilled occupations. Also, the greater relative increase in DAA mortality by age in the reference category (education/teachers) compared to all others contributes to the reduction of all RRs among the older group. Finally, some differential birth cohort effects by occupation/industry cannot be ruled out. Thus, the predominance of some risky drinking patterns (i.e., binge drinking) in recent compared to older generations could be higher in certain occupations/industries (Harrison and Gardiner, 1999; Siegler et al., 2011).

4.3. Strengths and Limitations

This study assesses DAA mortality by industry/occupation in a European Mediterranean country in one of the largest population cohorts ever studied, allowing examination of the effect of employment status and detailed industries/occupations after adjusting for multiple factors. However, there are limitations. Since the analysis focused mainly on DAA deaths, the total effect on alcohol-attributable mortality cannot be assessed. Nevertheless, the consistency of results for other strongly alcohol-related causes suggests that findings could be extrapolated to all alcohol-attributable deaths. Alcohol-use measures were not available, and some participants might not have been free of alcohol-related harm at baseline, so causal relationships cannot be established. Specifically, we cannot rule out selection factors or differences by industry/occupation in recruitment or outflow to unemployment/retirement of participants with alcohol-related problems (Berry et al., 2007; Hemmingsson and Ringback, 2001; Hemstrom, 2002; Mackenbach et al., 2015). The industry/occupation might have changed during follow-up and not be entirely representative of participants' occupational history. DAA deaths were few in some analyzed strata, leading to wide confidence intervals. Some causes of death may have been misclassified (i.e., unrecognized DAA or alcohol-related deaths), although a differential distribution by industry/occupation is unlikely (Schwarz and Pamuk, 2008).

Specifically, it is likely that in Spain deaths from alcohol poisoning are underestimated - being codified, for example, as injuries of undetermined intent or illegal drug poisoning-, mainly due to the very low proportion of deaths with forensic assessment -only 6% in Catalonia in 2013-, the poor transfer of forensic data to mortality statistics or practices of certification and codification privileging illegal drugs when multiple substances are found (Alonso et al., 2017). However, this should not have affected the results because these deaths represent a very small proportion of the total deaths from DAA causes and all-causes. In checking the model assumptions, a certain data overdispersion was found. Consequently, the confidence intervals were obtained from robust variance estimates. In addition, a sensitivity analysis was performed assuming negative binomial distribution and the results were practically identical. Limitations in analyses by age were mentioned above.

5. Conclusions

The findings suggest an urgent need for preventive measures to reduce alcohol-related problems among people working in industries/occupations with the highest DAA mortality, even if factors other than working conditions contribute to the excess mortality. Workplace-based interventions can be very efficient in reducing alcohol-related problems, since most adults are employed and spend a lot of time at work. Moreover, restrictive drinking social norms in the workgroup are also strongly associated with decreased drinking behaviors outside the work environment, suggesting a potential long reach of worksite-based public health interventions (Barrientos-Gutierrez et al., 2007). The large number of production units and their dispersion can hinder interventions in some target industries (i.e., catering, agriculture/livestock), so innovative and participatory strategies are needed, together with a system to monitor alcohol-related problems. More research is needed to identify the specific factors that increase DAA mortality in certain industries/occupations.

Author Disclosures

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Contributors

José Pulido (JP) and Gregorio Barrio (GB) conceived the article and coordinated the design of the study and writing of the article; Fernando Villar carried out the search for information, Ignacio Alonso and Fernando Vallejo carried out the analysis and reviewed the consistency of data included in the paper; JP, GB and Luis de la Fuente (LF) wrote the first draft of the manuscript; Antonia Domingo-Salvany, Enrique Regidor and LF contributed to the interpretation of the results and wrote the final version given their experience in analyzing information systems; all authors critically reviewed and approved the final version. All authors believe in the overall validity of the paper and take public responsibility for its contents.

Conflict of Interest

None of the authors has any economic or other types of conflict of interest that could inappropriately influence (bias) their work.

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Figure Legends

Figure 1. Age-sex standardized mortality rate directly attributable to alcohol among economically active population aged 25-64 by employment status, industry and occupation. Spain. 2002-2011

1a. Standardized rate by employment status and industry

1b. Standardized rate by employment status and occupation

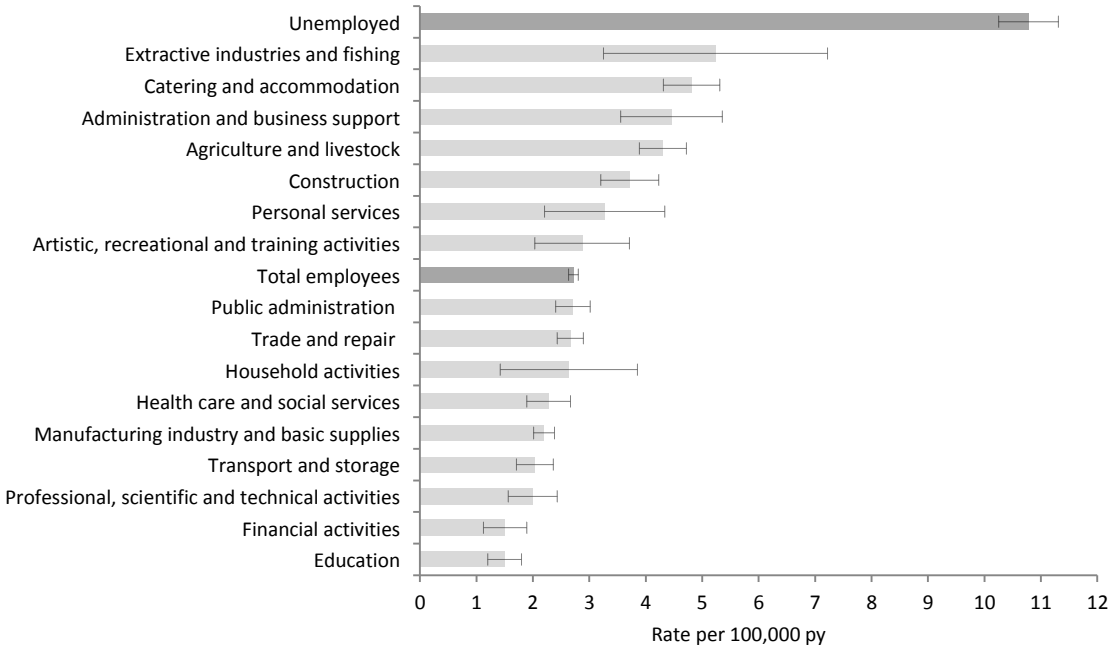
Footnotes

py: person-years of follow-up; **Error bars**: 95% confidence intervals; [a]: Industries and occupations were ordered by decreasing magnitude of the standardized rate.

Details on specific industries or occupations included in each category can be consulted in Table S1.

Figure 1

1A.



1B.

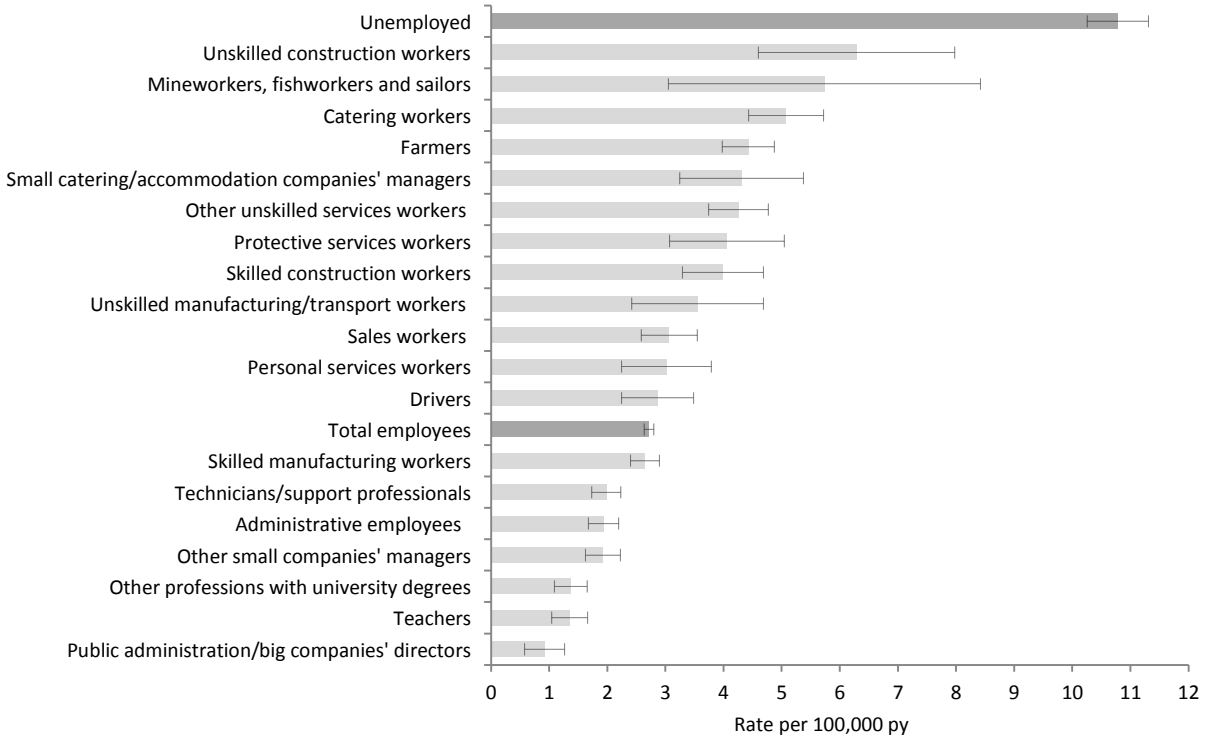


Table 1. Crude mortality rate directly attributable to alcohol among economically active population aged 25-64 by employment status, industry and occupation. Spain, 2002-2011

	Total participants				**Men**				**Women**				**Aged 25-49**				**Aged 50-64**			
	Deaths	CMR	95%CI		Deaths	CMR	95%CI		Deaths	CMR	95%CI		Deaths	CMR	95%CI		Deaths	CMR	95%CI	
Employment status																				
Unemployed	1670	7.4	7.0	7.8	1488	14.7	14.0	15.5	182	1.5	1.3	1.7	757	4.3	4.0	4.6	913	19.2	17.9	20.4
Employed	4171	2.9	2.8	3.0	3751	4.2	4.1	4.4	420	0.7	0.7	0.8	1596	1.5	1.5	1.6	2575	6.3	6.1	6.6
Industry[a]																				
Extractive industries/fishing	57	5.9	4.6	7.6	51	6.1	4.6	8.0	6	4.6	2.1	10.3	30	4.6	3.2	6.6	27	8.6	5.9	12.6
Agriculture/livestock	460	5.9	5.4	6.4	436	7.7	7.0	8.4	24	1.1	0.8	1.7	173	3.5	3.0	4.0	287	10.1	9.0	11.3
Construction	789	4.8	4.4	5.1	778	5.0	4.7	5.4	11	1.0	0.5	1.7	326	2.7	2.4	3.0	463	10.5	9.5	11.5
Catering/accommodation	379	4.3	3.9	4.8	324	7.0	6.3	7.8	55	1.3	1.0	1.7	161	2.5	2.1	2.9	218	9.5	8.3	10.9
Administration/business support	110	3.0	2.5	3.6	91	5.9	4.8	7.3	19	0.9	0.6	1.4	39	1.5	1.1	2.0	71	7.0	5.5	8.8
Public administration	339	2.9	2.6	3.2	302	4.4	3.9	4.9	37	0.7	0.5	1.0	103	1.3	1.0	1.5	236	6.6	5.8	7.5
Manufacturing industry/basic supplies	683	2.6	2.4	2.8	635	3.3	3.1	3.6	48	0.7	0.5	0.9	250	1.3	1.2	1.5	433	5.7	5.2	6.2
Artistic/recreational/training activities	51	2.6	1.9	3.4	45	3.7	2.8	5.0	6	0.8	0.3	1.7	22	1.4	0.9	2.1	29	6.7	4.6	9.6
Transport/storage	245	2.5	2.2	2.8	236	3.1	2.7	3.5	9	0.4	0.2	0.8	83	1.2	0.9	1.4	162	6.0	5.1	7.0
Trade/repair	537	2.4	2.2	2.6	462	3.8	3.5	4.2	75	0.7	0.6	0.9	212	1.3	1.1	1.5	325	5.8	5.2	6.4
Household activities	60	2.0	1.5	2.5	24	6.1	4.1	9.2	36	1.3	1.0	1.9	22	1.1	0.7	1.6	38	3.7	2.7	5.1
Healthcare/social services	156	1.7	1.4	1.9	113	3.9	3.2	4.7	43	0.7	0.5	0.9	70	1.1	0.8	1.4	86	3.0	2.4	3.7
Finance	80	1.6	1.3	2.0	70	2.4	1.9	3.1	10	0.5	0.3	0.9	36	1.0	0.7	1.4	44	2.9	2.2	3.9
Professional/scientific/technical services	97	1.4	1.2	1.7	85	2.1	1.7	2.6	12	0.4	0.2	0.7	33	0.6	0.4	0.8	64	5.4	4.2	6.9
Personal services	22	1.3	0.9	2.0	15	4.2	2.5	6.9	7	0.5	0.2	1.1	12	0.9	0.5	1.6	10	2.7	1.5	5.1
Education	106	1.2	1.0	1.4	84	2.6	2.1	3.2	22	0.4	0.3	0.6	24	0.4	0.3	0.6	82	2.8	2.2	3.5
Occupation[a]																				
Unskilled construction workers	189	6.6	5.7	7.6	186	6.9	5.9	7.9	3	2.1	0.7	6.4	87	3.8	3.1	4.7	102	18.4	15.2	22.4
Mineworkers/fishworkers/sailors	51	6.3	4.8	8.3	46	6.4	4.8	8.5	5	5.8	2.4	0.0	28	5.1	3.5	7.4	23	8.9	5.9	13.4
Farmers	442	6.2	5.7	6.8	417	8.0	7.3	8.8	25	1.3	0.9	1.9	172	3.8	3.3	4.4	270	10.3	9.1	11.6
Small catering/accommodation companies' managers	74	5.9	4.7	7.4	67	8.4	6.6	10.7	7	1.5	0.7	3.2	31	4.2	3.0	6.0	43	8.4	6.2	11.3
Protective service workers	80	5.5	4.4	6.8	79	6.1	4.9	7.6	1	0.6	0.1	4.3	30	2.7	1.9	3.8	50	15.0	11.3	19.8
Skilled construction workers	654	5.1	4.7	5.5	643	5.2	4.8	5.6	11	1.9	1.0	3.4	258	2.8	2.5	3.2	396	10.4	9.4	11.4
Catering workers	264	4.3	3.9	4.9	223	6.8	6.0	7.8	41	1.5	1.1	2.0	112	2.5	2.1	3.0	152	9.9	8.4	11.6
Drivers	259	3.6	3.1	4.0	249	3.7	3.3	4.2	10	1.8	1.0	3.4	91	1.8	1.5	2.2	168	7.4	6.4	8.6
Other unskilled services workers	293	3.2	2.8	3.6	212	7.4	6.4	8.4	81	1.3	1.0	1.6	107	1.8	1.5	2.1	186	5.8	5.0	6.7
Skilled manufacturing workers	601	3.1	2.9	3.4	556	3.8	3.5	4.1	45	1.0	0.7	1.3	204	1.5	1.3	1.7	397	6.9	6.3	7.6
Unskilled manufacturing/transport workers	53	2.8	2.2	3.7	48	3.5	2.6	4.6	5	1.0	0.4	2.5	23	1.5	1.0	2.3	30	8.9	6.2	12.8
Other small companies' managers	168	2.7	2.3	3.2	155	3.9	3.3	4.5	13	0.6	0.3	1.0	56	1.5	1.2	2.0	112	4.4	3.6	5.3
Sales workers	178	2.0	1.7	2.3	140	4.2	3.5	4.9	38	0.7	0.5	0.9	80	1.1	0.9	1.4	98	5.3	4.3	6.4
Technicians/support professionals	293	1.8	1.6	2.0	262	2.8	2.5	3.1	31	0.4	0.3	0.6	122	1.0	0.8	1.2	171	4.5	3.9	5.2
Personal service workers	79	1.6	1.3	2.0	53	5.2	3.9	6.8	26	0.7	0.5	1.0	37	1.1	0.8	1.5	42	3.2	2.4	4.3
Administrative employees	236	1.5	1.3	1.7	196	2.9	2.5	3.3	40	0.5	0.3	0.6	93	0.8	0.6	0.9	143	4.1	3.5	4.9
Public administration/big companies' directors	54	1.3	1.0	1.7	51	1.6	1.2	2.1	3	0.3	0.1	0.9	15	0.5	0.3	0.9	39	2.6	1.9	3.6
Teachers	80	1.1	0.9	1.4	66	2.4	1.9	3.1	14	0.3	0.2	0.5	16	0.3	0.2	0.5	64	2.7	2.1	3.4
Other professions with university degrees	123	1.1	0.9	1.3	102	1.6	1.4	2.0	21	0.4	0.3	0.6	34	0.4	0.3	0.6	89	3.3	2.7	4.1

CMR: Crude mortality rate directly attributable to alcohol per 100,000 person-years at risk; **Deaths**: Number of deaths directly attributable to alcohol; **95% CI**: 95% Confidence Interval; **[a]**: Industries and occupations were ordered by CMR magnitude in total employed population. Details on specific industries or occupations included in each category can be consulted in Table S1.

Table 2. Risk ratio of directly alcohol-attributable mortality by employment status and industry among economically active population aged 25-64. Spain 2002-2011

	Model 0			Model I			Model II			Model III			Model IV			Model V		
	RR[h]	95%CI		RR[h]	95%CI		RR[h]	95%CI		RR[h]	95%CI		RR[h]	95%CI		RR[h]	95%CI	
Employment status																		
Unemployed	2.4	2.3	2.6	3.1	2.8	3.3	3.8	3.5	4.0	3.0	2.8	3.2	2.7	2.5	2.9	2.3	2.1	2.4
Employed	1.0			1.0			1.0			1.0			1.0			1.0		
Employment status and industry[a]																		
Unemployed	6.2	5.0	7.7	8.3	6.7	10.2	7.2	5.8	8.8	6.1	5.0	7.4	3.2	2.6	3.9	2.8	2.3	3.4
Extractive industries/fishing	5.0	3.6	6.9	5.0	3.6	7.0	2.8	2.0	3.9	2.6	1.9	3.6	1.4	1.0	1.9	1.3	0.9	1.8
Agriculture/livestock	4.9	4.0	6.2	4.6	3.6	5.7	2.9	2.3	3.7	2.8	2.3	3.5	1.4	1.1	1.7	1.5	1.2	1.9
Construction	4.0	3.2	5.0	4.6	3.7	5.7	2.4	1.9	3.0	2.5	2.1	3.1	1.3	1.1	1.6	1.3	1.1	1.6
Catering/accommodation	3.6	2.9	4.5	4.3	3.4	5.3	3.4	2.7	4.2	3.3	2.7	4.1	1.8	1.4	2.2	1.7	1.4	2.2
Administration/business support	2.5	1.9	3.3	2.8	2.1	3.7	2.9	2.2	3.8	2.9	2.2	3.8	1.6	1.2	2.1	1.5	1.1	2.0
Public administration	2.4	1.9	3.0	2.5	2.0	3.2	1.8	1.5	2.3	1.9	1.5	2.3	1.3	1.0	1.6	1.3	1.0	1.6
Manufacturing industry/basic supplies	2.2	1.8	2.7	2.4	2.0	3.0	1.5	1.2	1.8	1.6	1.3	2.0	0.9	0.7	1.1	1.0	0.8	1.2
Artistic/recreational/training activities	2.2	1.5	3.0	2.8	2.0	3.9	1.9	1.4	2.7	1.9	1.4	2.6	1.2	0.8	1.7	1.1	0.8	1.6
Transport/storage	2.1	1.6	2.7	2.3	1.9	3.0	1.4	1.1	1.7	1.5	1.2	1.9	0.8	0.7	1.1	0.9	0.7	1.1
Trade/repair	2.0	1.6	2.5	2.4	2.0	3.0	1.8	1.5	2.2	2.0	1.6	2.4	1.1	0.9	1.4	1.2	0.9	1.5
Household activities	1.6	1.2	2.3	1.6	1.2	2.3	2.7	2.0	3.8	2.8	2.1	3.9	1.4	1.0	2.0	1.2	0.9	1.7
Healthcare/social services	1.4	1.1	1.8	1.5	1.2	1.9	1.7	1.3	2.2	1.7	1.3	2.1	1.3	1.0	1.6	1.2	1.0	1.6
Finance	1.4	1.0	1.8	1.5	1.1	2.0	1.0	0.8	1.4	1.1	0.8	1.5	0.8	0.6	1.1	0.9	0.6	1.2
Professional/scientific/technical services	1.2	0.9	1.6	1.7	1.3	2.3	1.2	0.9	1.6	1.3	1.0	1.7	1.1	0.8	1.4	1.1	0.9	1.5
Personal services	1.1	0.7	1.7	1.4	0.9	2.3	1.8	1.2	2.9	1.8	1.1	2.9	1.0	0.6	1.6	1.0	0.6	1.6
Education	1.0			1.0			1.0			1.0			1.0			1.0		

Model 0: Unadjusted RR; **Model I**: RR adjusted by age; **Model II**: RR adjusted by age and gender; **Model III**: RR adjusted by age, gender, area of residence, calendar-year of death, marital status and immigration status; **Model IV**: RR adjusted by covariates in model III plus educational attainment; M**odel V:** RR adjusted by covariates in model IV plus material wealth (useful floor space and household car ownership); **RR**: Risk ratio. For each category it was calculated in comparison to education (RR=1); **95% CI**: 95% Confidence Interval; [a]: Categories were ordered by RR magnitude in Model 0. Details on specific industries included in each category can be consulted in Table S1.

Table 3. Risk ratio of directly alcohol-attributable mortality by employment status and specific occupation among economically active population aged 25-64. Spain 2002-2011

	Model 0			Model I			Model II			Model III			Model IV			Model V		
	RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI	
Employment status and occupation[a]																		
Unemployed	6.7	5.2	8.5	9.0	7.1	11.4	8.0	6.3	10.0	6.8	5.4	8.5	3.5	2.7	4.5	3.0	2.3	3.8
Unskilled construction workers	6.0	4.5	7.9	8.5	6.5	11.1	4.5	3.4	5.9	4.3	3.3	5.6	2.1	1.5	2.7	1.8	1.4	2.4
Mineworkers/fishworkers/sailors	5.7	4.0	8.2	5.9	4.1	8.4	3.3	2.3	4.8	3.1	2.2	4.4	1.5	1.1	2.2	1.4	1.0	2.0
Farmers	5.6	4.3	7.2	5.2	4.0	6.6	3.4	2.6	4.4	3.2	2.5	4.2	1.6	1.2	2.0	1.6	1.2	2.1
Small catering/accommodation companies' managers	5.3	3.9	7.4	4.6	3.3	6.4	3.4	2.5	4.7	3.5	2.5	4.8	1.9	1.3	2.6	2.0	1.4	2.8
Protective service workers	5.0	3.6	6.8	6.1	4.4	8.3	3.3	2.4	4.5	3.4	2.5	4.6	1.8	1.3	2.6	1.8	1.3	2.4
Skilled construction workers	4.6	3.6	5.8	5.0	3.9	6.4	2.6	2.1	3.4	2.8	2.2	3.6	1.4	1.1	1.8	1.4	1.1	1.8
Catering workers	3.9	3.0	5.1	4.7	3.7	6.1	3.9	3.0	5.0	3.8	3.0	4.9	2.0	1.5	2.6	1.8	1.4	2.4
Drivers	3.2	2.5	4.2	3.3	2.5	4.3	1.8	1.4	2.3	2.0	1.5	2.5	1.0	0.8	1.3	1.0	0.8	1.4
Other unskilled services workers	2.9	2.2	3.7	2.8	2.1	3.6	3.3	2.6	4.3	3.4	2.6	4.3	1.7	1.3	2.2	1.5	1.1	2.0
Skilled manufacturing workers	2.8	2.2	3.6	3.1	2.4	4.0	1.9	1.5	2.4	2.1	1.7	2.7	1.1	0.8	1.4	1.1	0.9	1.4
Unskilled manufacturing/transport workers	2.6	1.8	3.7	3.8	2.7	5.5	2.5	1.7	3.5	2.5	1.8	3.5	1.3	0.9	1.8	1.2	0.8	1.7
Other small companies' managers	2.5	1.9	3.2	2.1	1.6	2.8	1.5	1.2	2.0	1.7	1.3	2.2	0.9	0.7	1.3	1.1	0.8	1.4
Sales workers	1.8	1.4	2.4	2.5	1.9	3.2	2.4	1.8	3.1	2.5	1.9	3.2	1.3	1.0	1.7	1.3	1.0	1.7
Technicians/support professionals	1.6	1.2	2.1	2.0	1.6	2.6	1.5	1.2	1.9	1.6	1.2	2.0	1.0	0.8	1.3	1.0	0.8	1.3
Personal service workers	1.5	1.1	2.0	1.7	1.2	2.4	2.4	1.7	3.3	2.3	1.7	3.2	1.3	0.9	1.8	1.3	0.9	1.7
Administrative employees	1.4	1.1	1.8	1.8	1.4	2.3	1.5	1.2	2.0	1.6	1.2	2.1	1.0	0.7	1.3	0.9	0.7	1.2
Public administration/big companies' directors	1.1	0.8	1.6	1.1	0.8	1.6	0.7	0.5	1.0	0.8	0.6	1.1	0.6	0.4	0.9	0.7	0.5	1.0
Teachers	1.0			1.0			1.0			1.0			1.0			1.0		
Other professions with university degrees	1.0	0.7	1.3	1.2	0.9	1.6	8.0	6.3	10.0	1.0	0.7	1.3	1.0	0.7	1.3	1.0	0.8	1.4

Model 0: Unadjusted RR; **Model I**: RR adjusted by age; **Model II**: RR adjusted by age and gender; **Model III**: RR adjusted by age, gender, area of residence, calendar-year of death, marital status and immigration status; **Model IV**: RR adjusted by covariates in model III plus educational attainment; M**odel V**. RR adjusted by covariates in model IV plus material wealth (useful floor space and household car ownership); **RR:** Risk ratio. For each occupation category it was calculated in comparison to teachers (RR=1); **95% CI**: 95% Confidence Interval;
[a]: Categories were ordered by RR magnitude in Model 0. Details on specific occupations included in each category can be consulted in Table S1.

Table 4. Risk ratio of all-cause and selected alcohol-related causes of death by employment status, industry and occupation among economically active population aged 25-64. Spain 2002-2011

	Model II									Model V								
	Other alcohol-related chronic liver diseases			Selected alcohol-related cancers			All-cause			Other alcohol-related chronic liver diseases			Selected alcohol-related cancers			All-cause		
	RR	CI95%		RR	CI95%		RR	CI95%		RR	CI95%		RR	CI95%		RR	CI95%	
Employment status																		
Unemployed	3.1	2.9	3.3	2.1	2.0	2.3	1.9	1.8	1.9	2.2	2.1	2.3	1.6	1.6	1.7	1.5	1.5	1.6
Employed	1.0			1.0			1.0			1.0			1.0			1.0		
Employment status and industry																		
Unemployed	4.6	4.0	5.3	3.3	3.0	3.6	2.3	2.2	2.3	2.3	2.0	2.6	1.9	1.7	2.1	1.6	1.5	1.6
Extractive industries/fishing	1.9	1.5	2.4	2.1	1.8	2.5	1.5	1.4	1.6	1.2	0.9	1.5	1.3	1.1	1.6	1.2	1.1	1.2
Agriculture/livestock	1.5	1.3	1.7	1.5	1.3	1.6	1.3	1.3	1.4	1.0	0.8	1.1	1.0	0.9	1.1	1.0	1.0	1.0
Construction	1.8	1.5	2.0	2.0	1.8	2.2	1.4	1.3	1.4	1.1	1.0	1.3	1.3	1.2	1.5	1.1	1.1	1.1
Catering/accommodation	2.5	2.1	2.9	2.1	1.9	2.4	1.5	1.4	1.5	1.5	1.3	1.7	1.4	1.2	1.6	1.1	1.1	1.2
Administration/business support	2.2	1.9	2.7	1.9	1.7	2.2	1.4	1.4	1.5	1.3	1.1	1.6	1.2	1.1	1.4	1.1	1.1	1.1
Public administration	1.6	1.4	1.9	1.6	1.5	1.8	1.2	1.2	1.3	1.2	1.1	1.4	1.2	1.1	1.4	1.1	1.0	1.1
Manufacturing industry/basic supplies	1.2	1.0	1.4	1.4	1.3	1.6	1.1	1.1	1.2	0.8	0.7	1.0	1.0	0.9	1.1	1.0	0.9	1.0
Artistic/recreational/training activities	2.0	1.6	2.5	1.8	1.6	2.1	1.4	1.4	1.5	1.3	1.1	1.6	1.3	1.1	1.5	1.1	1.1	1.2
Transport/storage	1.4	1.2	1.7	1.5	1.3	1.6	1.2	1.2	1.3	1.0	0.9	1.2	1.1	0.9	1.2	1.0	1.0	1.1
Trade/repair	1.4	1.3	1.7	1.3	1.2	1.5	1.2	1.1	1.2	1.0	0.9	1.2	1.0	0.9	1.1	1.0	0.9	1.0
Household activities	2.3	1.9	2.9	2.2	1.8	2.5	1.4	1.3	1.5	1.2	1.0	1.5	1.3	1.1	1.5	1.0	1.0	1.0
Healthcare/social services	1.6	1.3	1.8	1.5	1.3	1.7	1.2	1.2	1.2	1.2	1.1	1.5	1.2	1.1	1.4	1.1	1.0	1.1
Finance	1.1	0.9	1.4	1.2	1.1	1.4	1.0	1.0	1.1	1.0	0.8	1.1	1.0	0.9	1.1	1.0	0.9	1.0
Professional/scientific/technical services	1.0	0.8	1.2	1.0	0.9	1.2	1.0	1.0	1.0	0.9	0.7	1.1	1.0	0.8	1.1	0.9	0.9	1.0
Personal services	1.6	1.2	2.2	1.1	0.9	1.5	1.2	1.1	1.3	1.0	0.7	1.4	0.7	0.6	1.0	0.9	0.9	1.0
Education	1.0			1.0			1.0			1.0			1.0			1.0		
Employment status and occupation																		
Unemployed	5.7	4.9	6.6	3.5	3.1	3.9	2.4	2.3	2.5	2.6	2.2	3.0	1.9	1.7	2.2	1.6	1.6	1.7
Unskilled construction workers	3.0	2.5	3.7	2.8	2.5	3.2	1.8	1.8	1.9	1.4	1.2	1.8	1.6	1.4	1.9	1.3	1.2	1.3
Mineworkers/fishworkers/sailors	2.4	1.9	3.1	2.4	2.0	2.9	1.6	1.5	1.7	1.3	1.0	1.7	1.4	1.2	1.7	1.2	1.1	1.2
Farmers	2.0	1.7	2.4	1.7	1.5	1.9	1.4	1.4	1.5	1.1	0.9	1.4	1.1	1.0	1.2	1.0	1.0	1.1
Small catering/accommodation companies' managers	3.2	2.6	4.0	2.0	1.7	2.4	1.4	1.4	1.5	2.0	1.6	2.6	1.4	1.2	1.7	1.2	1.1	1.2
Protective service workers	2.6	2.0	3.2	2.2	1.9	2.6	1.6	1.5	1.6	1.4	1.1	1.8	1.4	1.2	1.7	1.2	1.2	1.3
Skilled construction workers	2.1	1.8	2.5	2.1	1.8	2.3	1.4	1.4	1.5	1.2	1.0	1.5	1.3	1.2	1.5	1.1	1.1	1.1
Catering workers	3.0	2.5	3.6	2.3	2.0	2.6	1.6	1.5	1.6	1.6	1.3	1.9	1.4	1.2	1.6	1.1	1.1	1.2
Drivers	1.8	1.5	2.1	1.6	1.4	1.8	1.4	1.3	1.4	1.1	0.9	1.3	1.1	1.0	1.2	1.1	1.1	1.1
Other unskilled services workers	2.9	2.5	3.5	2.2	2.0	2.5	1.5	1.5	1.6	1.5	1.2	1.7	1.3	1.1	1.5	1.1	1.0	1.1
Skilled manufacturing workers	1.6	1.3	1.9	1.7	1.5	1.8	1.3	1.2	1.3	0.9	0.8	1.1	1.1	1.0	1.2	1.0	1.0	1.0
Unskilled manufacturing/transport workers	2.1	1.7	2.7	2.3	1.9	2.7	1.5	1.4	1.5	1.1	0.9	1.4	1.4	1.2	1.6	1.1	1.0	1.1
Other small companies' managers	1.6	1.3	1.9	1.2	1.0	1.3	1.2	1.1	1.2	1.2	1.0	1.4	0.9	0.8	1.0	1.0	1.0	1.0
Sales workers	2.0	1.7	2.4	1.5	1.3	1.7	1.3	1.2	1.3	1.2	0.9	1.4	1.0	0.9	1.1	1.0	0.9	1.0
Technicians/support professionals	1.6	1.3	1.9	1.4	1.2	1.6	1.2	1.1	1.2	1.1	0.9	1.3	1.0	0.9	1.2	1.0	1.0	1.0
Personal service workers	2.1	1.7	2.6	1.7	1.5	2.0	1.3	1.3	1.4	1.2	0.9	1.5	1.1	1.0	1.3	1.0	1.0	1.1
Administrative employees	1.8	1.5	2.1	1.6	1.4	1.8	1.3	1.2	1.3	1.1	1.0	1.4	1.1	1.0	1.3	1.0	1.0	1.1
Public administration/big companies' directors	1.0	0.8	1.2	0.9	0.8	1.1	1.0	0.9	1.0	0.9	0.7	1.1	0.9	0.8	1.0	1.0	0.9	1.0
Teachers	1.0			1.0			1.0			1.0			1.0			1.0		
Other professions with university degrees	1.3	1.1	1.6	1.0	0.9	1.2	1.0	0.9	1.0	1.3	1.1	1.6	1.1	0.9	1.2	1.0	1.0	1.0

RR: Risk ratio. For each industry and occupation category and for those unemployed it was calculated in comparison to teachers (RR=1). For the unemployed it was also calculated in comparison to the total employed population (RR=1). **95% CI**: 95% Confidence Interval. **Model II**: RR adjusted by sex and age group. **Model V**. RR adjusted by sex, age group, area of residence, calendar-year of death, marital status, immigration status, educational attainment, useful floor space and household car ownership. [a]: Categories of industry/occupation were ordered by crude mortality rate magnitude in total participants. Details on specific industries and occupations included in each category of cause of death and industry/occupation can be consulted in Table S1.