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Associations of Occupational Attributes and Excessive Drinking

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Abstract

Numerous work-related drinking mechanisms have been posited and, oftentimes, examined in isolation. We combined data from over 100 occupational attributes into several factors and tested the association of these factors with measures of alcohol use. We used the NLSY79 2006 wave, a U.S. representative sample of 6,426 workers ages 41 to 49 and the 2006 Occupational Information Network database (O*NET), a nationally representative sample of nearly 1,000 occupations. We conducted exploratory factor analysis on 119 occupational attributes and found three independent workplace characteristics – physical demands, job autonomy, and social engagement - explained the majority of the variation. We then tested the association of these composite attributes with three drinking measures, before and after adjusting for gender, race/ethnicity, and a measure of human capital using count data models. We then stratified by gender and repeated our analyses. Men working in occupations with a one standard deviation higher level of physical demand (e.g. construction) reported a higher number of heavy drinking occasions (+20%, $p<0.05$). Job autonomy was not significantly associated with measures of alcohol use and when the combined association of higher levels of physical demand and lower levels of job autonomy was examined, modest support for job strain as a mechanism for work-related alcohol consumption was found. In our pooled sample, working in occupations with one standard deviation higher levels of social engagement was associated with lower numbers of drinking days (−9%, $p<0.05$) after adjustment. Physical demand and social engagement were associated with alcohol consumption measures but these relationships varied by workers' gender. Future areas of research should include confirmatory analyses using other waves of O*Net data and replicating the current analysis in other samples of workers. If our results are validated, they suggest male workers in high physical demand occupations could be targets for intervention.

Keywords

Occupation; alcohol; binge drinking; excessive drinking; heavy drinking; job autonomy; job demand; job strain

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Introduction

Understanding the association between occupations and excessive drinking is important from both public health and economic perspectives. In 2010, most (64.8%) full-time employed adults consumed alcohol while 29.7% reported binge drinking and 8.5% reported heavy drinking, defined as binge drinking on 5 or more occasions in the past 30 days (Substance Abuse and Mental Health Services Administration, 2011). Most of the 56.6 million adult binge drinkers (74.7%) and 16.5 million heavy drinkers (74.0%) were employed in 2010 (Substance Abuse and Mental Health Services Administration, 2011). For employers, consequences of employees' excessive drinking include high job turnover rates, co-worker conflict, injuries, higher health benefit costs, and workplace aggression (Mangione et al., 1999; McFarlin et al., 2001; McFarlin and Fals-Stewart, 2002; Webb et al., 1994). Economic costs resulting from lost productivity, health care costs, and legal and criminal consequences of excessive drinking were estimated $223.5 billion in 2006 (Bouchery et al., 2011).

Research on the prevalence of alcohol misuse among workers has found those employed manual occupations have higher rates of excessive drinking (Hemmingsson & Ringback Weitoft, 2001). In particular, farm workers and service industry employees have been found to have higher risk and those working in professional occupations lower risk (Jarman et al., 2007; Matano et al., 2002). Workers in construction and oil, gas, and mining extraction occupations had a higher prevalence of excessive drinking than those employed in professional and related occupations (Larson et al., 2007; Substance Abuse and Mental Health Services, 1999; Barnes & Brown, 2012). Conversely, other research finds alcohol use increases with occupational grade (Berggren & Nystedt, 2006) with managerial workers, particularly women, at increased risk of problem alcohol use when compared to non-managerial workers (Moore, Grunberg, & Greenberg, 2003).

Differences in excessive drinking across occupations may be a result of variation in exposure to distinct work-related risk factors including work stress and workplace social milieu.

Work stress

Job strain has been proposed as one model of how work stress may affect alcohol use. Under job strain theory (Karasek & Theorell, 1990), jobs are categorized along two dimensions: job demand and job autonomy. High demand, low autonomy jobs are posited to contribute to work-related stress inducing some workers to self-medicate by increasing their alcohol consumption. However, the evidence supporting job strain theory of excessive drinking among workers is contradictory (see Kouvonen et al., 2005 for a review). When examined separately, job demand and job autonomy have been found to relate to alcohol use. Physically and psychologically demanding occupations have been found to contribute to drinking risk (Crum et al., 1995; Frone, 2008). Worker's inability to make autonomous decisions has also been linked to increased alcohol misuse (Hemmingsson and Lundberg, 1998; Hingson et al., 1981).

Workplace social milieu

Social dimensions of workplace risk factors for excessive drinking documented in the literature include job alienation. In particular, alienating job conditions where workers lack contact with others or are not supported or helped has been associated with misuse of alcohol (Hemmingsson and Lundberg, 1998; Yang et al., 2001).

Prior studies on occupational attributes and excessive drinking have tended to focus on specific theoretical mechanisms even though, when considered across studies, the occupational environment appears to affect alcohol consumption through multiple pathways including job strain and job alienation. Yet, few studies have examined these potential workplace risk factors simultaneously (Gimeno et al., 2009). Additionally, many prior studies focus on young, male workers, and use non-representative U.S. samples, making inferences to female or older workers challenging. Our study used a U.S. representative sample of mid-career men and women. Further, to complement theory-driven with data-driven explanations of drinking variation across occupational attributes, we exploited the richness of O*Net, a nationally representative occupation-level database, and combined information from more than 100 occupational attributes into distinct work-related constructs. We found that physical demand-, job autonomy-, and social engagement-related workplace descriptors (i.e. those posited by job strain and job alienation theories) explained the majority of the variation in attributes across occupations. We then tested the association of these constructs with three measures of alcohol use – number of drinking days in the past month, usual number of drinks on drinking days, and number of occasions workers consumed 6 or more drinks. We hypothesized that participants employed in occupations with either high physical demands or low autonomy would have higher levels of excessive drinking. Consistent with job strain theory, we also hypothesized that the combination of higher physical demand and lower job autonomy would be associated with excessive drinking. Per job alienation theory, we hypothesized workers with lower levels of social engagement at work would report higher levels of alcohol misuse. Gender stratified models were then estimated to determine whether the associations between occupational attributes and alcohol consumption patterns varied systematically by the sex of the worker. Differences in the associations between occupational attributes and alcohol use and the implications for research on social inequality across occupational groups are discussed.

Methods

Data and participants

This study used data from the 2006 wave of the National Longitudinal Survey of Youth 1979 (NLSY79) cohort (US Department of Labor, 2006). The NLSY79 is collected by the Bureau of Labor Statistics (BLS) and is a nationally representative sample of 12,686 youths first sampled in 1979 when they were 14 to 21 years old (US Department of Labor, 2006). Participants were 41 to 49 years old in 2006. Of the 22 interviews administered between 1979 and 2006, the average number of completed interviews for respondents was 21 (US Department of Labor, 2006). In the 2006 wave, 7,654 employed and non-employed individuals responded, for a retention rate of 76.8% after adjusting for oversamples of military and disadvantaged respondents the NLSY79 dropped from interviewing prior to

2006. Reasons for non-interview in 2006 included refusal (60.3%), unable to locate (13.5%), deceased (19.7%), other (2.4%), and difficult cases (4.0%). Refusals tended to be female rather than male (70.0% vs. 52.5%) and non-Hispanic, non-African American (69.5%) rather than Hispanic (52.7%) or African American (47.9%)(US Department of Labor, 2006). A subsample of 6,500 employed persons was retained for analysis. Individuals were considered employed if they had a valid census code for the occupation of their main job.

Individuals' three digit census code for occupation in the 2006 NLSY79 was used to link respondents to occupational attribute data in the 2006 O*NET v.14.0, the Department of Labor's Occupational Information Network database, using a standardized occupation codes (SOC) crosswalk (About O*NET, 2010). O*NET collects data in six content areas: worker characteristics, worker requirements, experience requirements, occupational requirements, workforce characteristics, and occupation-specific information (O*NET Content Model, 2010). O*Net data on occupational attributes have been collected since 2001 using a two-stage design (O*NET Data Collection, 2010). The design first randomly samples businesses expected to employ workers in target occupations and then randomly samples workers in those occupations within those businesses to provide a nationally representative sample of occupational information (O*NET Data Collection, 2010). Because the O*NET data collection program includes several hundred rating scales comprising four questionnaires, to reduce burden on respondents, sampled workers are randomly assigned one of four questionnaires (O*NET Data Collection, 2010). From the O*Net content model, we focus on "occupational requirements" as these data represent job-oriented information on in the areas of generalized work activities, detailed work activities, organizational context, and work context that can be analyzed across occupations (O*NET Content Model, 2010). The occupational requirements data, which includes 119 occupational attributes for nearly 1,000 U.S. occupations, were used to represent occupation-level proxies for 2006 NLSY79 survey respondents' workplace environment. O*Net respondents endorsed Likert scale responses about the importance of each of the occupational requirements items for their current job (O*Net Questionnaires, 2010). For a recent review of articles using O*Net data when individual-level survey data contains job codes and health outcomes see Cifuentes et al. (2010).

Measures

Alcohol use—We specified three measures of prior month's alcohol consumption: 1) the number of drinking days; 2) the number of drinks consumed on a typical drinking day; and 3) the number of occasions a participant of consumed 6 or more drinks.

Occupational attributes—Three measures, physical demand, job autonomy, and social engagement were constructed using exploratory factor analysis of variables from the O*Net version 14.0 database and examined separately as predictors of alcohol use. Inspired by Zimmerman et al.,(2004), Crouter et al (2006), Meyer et al. (2007), Alterman et al. (2008) and Bell et al. (2008), exploratory factor analysis was used to combine variables from the O*Net database. Overall Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.94 indicating the occupational attribute variables had sufficient commonality to warrant a factor analysis (Kaiser, 1974). The first three factors comprised 61% of the variance among

the original complete set of 119 occupational requirements variables in the 2006 O*Net. The marginal return of additional factors was around 6% or less of total variance. The three factors retained were rotated orthogonally using varimax rotation so that items with large loadings would load onto separate factors (i.e. the factors would be independent of each other). Considering the items that loaded highly on each factor, the three factors resulting from the exploratory analysis were named physical demand, job autonomy, and social engagement (See Table 1 for items with loadings of 0.7 or higher, full table in Appendix 1). Items that loaded highly on our physical demand and job autonomy factors were similar to factors identified in prior research using O*Net data (Meyer et al., 2007; Alterman et al., 2008; Bell et al., 2008). However, the social engagement factor has not been identified in the previous literature. Higher values of the factors represent higher levels of physical demand, job autonomy, and social engagement for a given occupation. The three predicted factor values for each O*Net occupation were mapped to 2006 NLSY79 respondents using the crosswalk described above. Although there is likely considerable individual-level variation in jobs within job titles, or, for a given job, across job tenure, O*Net was designed so numerous requirements across occupations were rated using a common Likert scale. And so, the composite occupational attribute variables used here represent measures of workplace characteristics for the average worker in an occupation, rather than the individual survey respondent, per se. The mean, standard deviation, minimum, and maximum of the occupational attribute factors for each U.S. Census major occupation category are included in Appendix 2.

Covariates—Our regression models controlled for demographic measures commonly correlated with alcohol use and occupation (Naimi et al., 2003; Substance Abuse and Mental Health Services, 1999; Blazer & Wu, 2009; Yang et al., 2007). These included the three race/ethnicity indicators - African American, Hispanic, or non-Hispanic non-African American (referent) - collected by the 2006 NLSY79 and gender. We also controlled for a measure of human capital, or an individual's physical and mental aptitude and education or job experiences that have economic value (Bruce, 1990). Human capital measures have been found in previous studies to be correlated with both alcohol consumption and occupation (Barnes & Brown, 2012; Kenkel et al., 1994; MacDonald & Shields, 2001). Participants' Armed Forces Qualification Test (AFQT) scores assessed in the 1989 wave of the NLSY were used as our proxy measure of human capital (Keng & Huffman, 2005).

Statistical analysis

First, we compare the pairwise correlations of the variables of interest. We then investigate the association between occupational attributes and measures of alcohol use and misuse before and after adjustment for demographic and human capital covariates using negative binomial regression models. We report our regression results using count ratios. Goodness-of-fit tests of Poisson models and likelihood ratio tests of the overdispersion parameter in negative binomial models confirmed the negative binomial model better fit our data. To examine higher levels of physical demand and lower levels of job autonomy in combination, we include an interaction term between the two in our regression models and test for the significance of the joint effect of a one standard deviation higher level of physical demand, a one standard deviation lower level of job autonomy, and the interaction term on our drinking

outcomes using the “nlcom” command in Stata 11. Sample weights for the 2006 NLSY79 cohort were used in the descriptive statistics and regression analyses using the “svy” command and in the correlation analysis using the “svy_corr” command in Stata 11. Of the 6,500 employed respondents, 74 were missing one or more alcohol use outcome and were dropped. Among the remaining analytic sample, 247 were missing AFQT89. To avoid listwise deletion of cases with missing covariate data, a dummy variable for missing AFQT89 responses was included in our regression models. Sensitivity tests indicated our main results were robust to either the inclusion or exclusion of respondents with missing data. Standard errors in regression analyses were corrected for potential non-independence across major occupation categories. Regressions were estimated for a pooled sample of men and women and then separately for each gender.

Results

Sample characteristics

Of the 6,426 respondents weighted to be nationally representative of all individuals born in the U.S. between 1957 and 1965, the average participant drank alcohol on 4.9 days in the past 30 (standard deviation (SD) 7.1), consumed 1.5 drinks per drinking occasion (SD 2.0) and consumed 6 or more drinks on 0.3 occasions in the past 30 days (SD 0.7). By construction, each of the three job attribute factors had a sample mean of zero and standard deviation of one and the three factors were not significantly correlated with each other. Table 2 summarizes the weighted sample means, sample (unweighted) standard deviations, and ranges of the individual-, household-, and market-level controls used in our regression adjustments as well as the percent of respondents with missing data for control variables.

Pairwise correlations between occupational attributes, alcohol use, and control variables

Higher levels of physical job demands were positively correlated with the number of drinks per day consumed (0.12, $p<0.01$) and the number of times participants reported consuming 6 or more drinks on one occasion in the past month (0.16, $p<0.01$), but the effect sizes of these correlations were small. Higher levels of physical job demands were more strongly correlated with and being male (0.39, $p<0.01$) and with our AFQT89 measure of human capital (−0.27; see Table 3). Higher levels of job autonomy were positively correlated with the number of days in the past month participants consumed an alcoholic beverage (0.11, $p<0.01$) and the number of drinks per day (0.05, $p<0.01$), but again, the magnitudes of these correlations were small. Being male (0.17, $p<0.01$) and human capital (0.33, $p<0.01$) were also positively correlated with job autonomy, while being African American compared to non-Hispanic, non-African American (−0.12, $p<0.01$) had a negative correlation with job autonomy. Higher levels of social engagement were negatively correlated with days drank (−0.10, $p<0.01$), drinks per day (−0.06, $p<0.01$), heavy drinking occasions (−0.07, $p<0.01$) and being male (−0.31, $p<0.01$) with small effect sizes for the correlations among social engagement and alcohol use behaviors and moderate effect sizes for gender. Being African American compared to non-Hispanic, non-African American was negatively correlated with each drinking measure ($p<0.01$ each) while AFQT89 was positively correlated with the number of days drank (0.16, $p<0.01$) and negatively correlated with the number of heavy drinking occasions (−0.05, $p<0.05$)

Regression results of associations between occupational attributes and alcohol use before and after adjustment

Physical demand—Higher physical job demand was significantly and positively associated with each alcohol use outcome before and after adjusting for demographic and human capital covariates (See Table 4). Controlling for gender, race/ethnicity, and human capital, a one standard deviation higher level of physical job demands was associated with an 8% higher number of drinking days in the past month (95% CI 1.02, 1.15). An equivalent higher level of physical job demand was associated with consuming 6% more drinks per occasion (95% CI 1.02, 1.11) and 20% higher number of occasions where 6 or more drinks was consumed (95% CI 1.11, 1.30).

Job autonomy—Job autonomy was positively associated with the number of drinking days and number of drinks per day before adjusting for model covariates. Working in an occupation one standard deviation above the mean in job autonomy was associated with a 18% higher number of days participants reported drinking in the past month (95% CI 1.11, 1.27) and a 8% higher number of drinks per day (95% CI 1.02, 1.14). However, after adjustment for demographic and human capital measures, we found no statistically significant adjusted association between job autonomy and the number of drinking days, drinks per drinking occasion, or heavy drinking occasions.

Physical demand and job autonomy—When combined, a one standard deviation higher level of physical demand, an equivalent lower level in job autonomy, and the interaction term was not significantly associated with the number of days drank (−2%; 95% CI 0.87, 1.09) or drinks per day (4%; 95% CI 0.97, 1.12) after adjustment. However, having both a higher level of physical demand and lower level of job autonomy was significantly associated with a 30% higher number of occasions participants reported consuming 6 or more drinks (95% CI 1.04, 1.56) after adjustment.

Social engagement—Both before and after adjustment, more social engagement in an occupation was significantly and negatively associated with drinking days. In the adjusted model, an occupation with a one standard deviation higher level of social engagement was associated with an 9% lower number of days participants reported having an alcoholic drink in the past month (95% CI 0.84, 0.98). Although significant inverse associations were found between social engagement and numbers of drinks per day and times participants imbibed 6 or more drinks before adjustment, no statistically significant adjusted associations were found.

Gender-stratified regression results of associations between occupational attributes and alcohol use before and after adjustment

To examine variation in associations between occupational attributes and drinking behaviors between men and women, the pooled sample was stratified by gender and the regression analyses reported above were repeated (See Table 5). Among men, working in an occupation with a higher level of physical job demand was positively and significantly associated with the number of times participants drank 6 or more alcoholic beverages before and after adjustment. Using the adjusted estimates, a one standard deviation higher level of physical

job demand was associated with a 20% higher number of occasions 6 or more drinks was consumed (95% CI 1.07, 1.35). An equivalent difference in physical job demands for women was associated with a 13% higher number of drinking days (95% CI 1.02, 1.24) after adjustment but no difference in the number of drinks or frequency of heavy drinking before or after adjustment. For men, a one standard deviation higher level of job autonomy was associated with a 13% higher number of drinking days (95% CI Males 1.06, 1.21) before adjustment, although the estimate was imprecise after controlling for measures of race/ethnicity and human capital. We found no significant associations between a one standard deviation higher level of physical job demand in combination with a one standard deviation lower level of job autonomy and our measures of alcohol consumption for men or women. Finally, for women only, working in an occupation with a one standard deviation higher level of social engagement was associated with a 9% lower number of days drank in the past month (95% CI 0.83, 0.99) after adjustment. The magnitude of the social engagement association was similar in men but the estimate was imprecise.

Discussion

Numerous workplace contributors to excessive drinking have been posited in the literature (Ames and Janes, 1990; Crum et al., 1995; Frone, 1999; Frone, 2008; Hemmingsson and Lundberg, 1998; Marchand et al., 2011; Martin et al., 1996; Yang et al., 2001). Prior studies on occupational attributes and excessive drinking have tended to focus on specific theoretical mechanisms even though, when considered across studies, the occupational environment appears to affect alcohol consumption through multiple pathways. Further, much of the literature has been gender-specific, or used samples of younger workers. For a representative sample of U.S. mid-career workers, this study used exploratory factor analysis on more than 100 occupational attributes and found the majority of the variation in these measures across occupations was explained by factors posited by job strain (i.e. physical demand and job autonomy) and job alienation (i.e. social engagement) theories of work-related drinking behavior. We then tested the association of these factors with alcohol consumption and find they were significantly associated with measures of alcohol use and misuse.

In particular, we found strong support for our hypothesis that workers in occupations that, on average, were rated as more physically demanding drank more frequently, consumed more on usual drinking days and drank 6 or more drinks more often before and after adjustment. The adjusted effect sizes of a standard deviation higher level of physical job demands for the pooled sample of men and women were in the modest range for usual quantity (+6%) and frequency (+8%), and were more pronounced for the frequency heavy drinking occasions (+20%). After stratifying by gender, we found that men working in occupations with a one standard deviation higher physical job demand had 20% higher number of heavy drinking occasions in the past month in our adjusted model. For women, working in a job with higher physical demands was associated with 13% higher number of drinking days after adjustment. Our findings therefore suggest physical demands are more strongly associated with the frequency of heavy drinking for men and usual frequency measures for women. Prior studies by Crum et al. and Zins et al. also found physically demanding occupations were associated with increased alcohol misuse (Crum et al., 1995; Zins et al., 1999). Using O*Net 98 data, Alterman et al. (2008) found employed NHANES III respondents with

hazardous work exposures and with physically active jobs had higher odds of heavy drinking. Our findings are not consistent with those of Marchand (2008), and Marchand et al. (2011) who found no association. These discrepancies may be due to differences in the physical demand measures used in our study (physical demand factor from 119 O*Net attributes) and the Marchand studies (one item Likert scale used in Marchand, 2011; ten item measure used in Marchand, 2008). Furthermore, our results of the association between physical job demands and alcohol use and misuse for both the pooled model and gender specific models were consistent across alternative specifications. In particular, the estimates of physical demand using a limited set of exogenous confounders were not sensitive to the inclusion of additional measures of human capital (i.e. educational attainment, mental and physical component scores, job tenure, work experience), household measures (i.e. marital status, having children in the household), risk and time preference measures, and local labor market measures (i.e. region of U.S., urbanicity).

In our adjusted models, we did not find support for our hypothesis that lower levels of job autonomy would be associated with higher levels of heavy drinking. Our null finding with respect to job autonomy and heavy drinking confirm those of Zhang and Snizek (2003), who used the 1998 National Household Survey of Drug Abuse (NHSDA) and the O*Net 98, and Marchand and Marchand et al. samples of Canadian workers (Marchand et al., 2011; Marchand, 2008). We found some evidence of job strain, or the combined positive association of higher levels of physical demand and lower levels of job autonomy, as a potential mechanism for alcohol misuse. (Karasek & Theorell, 1990). A one standard deviation higher level of physical demand and an equivalent lower level of job autonomy was associated with a 30% higher number of heavy drinking occasions. However, this positive association appears to be driven by the physical demand and the interaction of physical demand and job autonomy, but not the job autonomy main effect.

We found working in more socially engaged occupations was inversely associated with the number of drinking days (−9%) in our pooled sample and that this effect size was consistent across both genders but our estimates for males were imprecise. Our finding using a representative sample of U.S. mid-career adults that less socially engaging occupations are associated with higher levels of usual drinking frequency is broadly congruent with work studying alienation and workplace social support using non-U.S. samples (Hemmingsson and Lundberg, 1998; Yang et al., 2001). Work by Gimeno et al. (2009) also suggests a correlation between social engagement and frequent drinking among U.S. workers although their estimates were imprecise, due to potential overlap in occupational exposure assessments used as covariates.

Overall, our results indicate that men working in occupations with high physical demands also report a high number of heavy drinking occasions. Occupations that ranked highest on the physical demand factors used in our study included those in construction and oil, gas, and mining extraction as well as installation, maintenance, and repair (See Appendix 2). For both men and women, working in more socially engaging occupations, like health care practitioners and support, was associated with lower numbers of drinking days but was not associated with other alcohol use measures. Interestingly, occupations with the lowest social

engagement were, like healthcare, also higher SES occupations including those in computer, mathematical, architecture, and engineering.

Although a great deal of effort was taken to ensure the internal validity of estimates produced from this study, several limitations should be considered when weighing the results. First, the results cannot be interpreted causally. Poor work conditions may drive people to drink, but drinkers may find themselves in jobs with poor work conditions. Both causal directions may be at play here. Nonetheless, the associations reported herein conditioning on a limited set of exogenous confounders offer descriptive value in contributing our understanding of how occupations and alcohol use relate.

In regard to the O*Net data, although there was a cross-walk linking the U.S. Census codes to the O*Net-SOC codes, multiple Census codes could map into a single SOC code resulting in a reduction of cross-occupation variation in our analysis. Also, the occupational attribute measures were occupation- and not individual-level measurements. We are unable to control for the influences of individual work-specific confounders such as supervisor or coworker support or workplace assistance programs. As there was likely variation across jobs within the same occupation, this analysis may mask meaningful differences in the job attributes of drinkers within occupations. Further, the relationships we observed between the aggregated job attribute factors and individual drinking behavior may not be the same as individual occupational attributes (i.e. ecologic fallacy). Therefore, it is important to interpret our estimates at the occupation- rather than the individual-level. However, we argue O*Net is a valuable data source for mapping average occupational exposure data to health outcomes in survey datasets and is gaining acceptance in the literature for the value it adds to occupational health inquiry (Cifuentes et al., 2010).

We acknowledge the binge drinking cutoff used in the 2006 NLSY79 was more conservative than the current guidelines, which uses 5 or more drinks on one occasion for men and 4 drinks for women in two hours (Centers for Disease Control and Prevention, 2011). Additionally, the analyses in this study focus on occupational attributes that necessarily limit our sample to employed participants and our results may not generalize to a non-employed sample were they to become employed. Although the NLSY79 is a “U.S. representative sample,” it is in fact a representative sample of U.S. citizens ages 14 to 21 years old in 1979 who were 41 to 49 in 2006. Due to attrition bias or migration, the sample may not represent mid-career U.S. adults today. However, as noted earlier, the average respondent in 2006 completed 21 of the 22 waves fielded since 1979 (US Department of Labor, 2006). Also, due to the very specific age range of the 2006 NLSY79, these findings may not generalize to early or late career men and women. On the other hand, given the lack of prior research on occupational attributes and alcohol misuse among mid-career men and women studied, the focus on mid-career men and women can be considered a contribution rather than a limitation, per se.

The estimated effects from the regression models were modest, with the exception of frequency of binge drinking, and several additional considerations should be made when generalizing our findings to the U.S. population and when weighing policy options. First, our job attribute factors were constructed as standard normal variables. Hence, the

distribution of these variables was concentrated around the mean suggesting, for example, few workers have jobs that are “unusually” physically demanding, or lying more than two standard deviations from the mean. Therefore, our results may not generalize to workers whose job attributes fall in the tails of the distribution. Second, the distributions of alcohol consumption measures have piling at zero and are skewed in the right tail implying the reported means are higher estimates of central tendency than medians. When combined, these considerations imply variation in job attributes, as measured, are expected to have weak effects on the distribution of usual quantity and frequency of alcohol use and potentially more moderate sized effects on the distribution of the frequency of alcohol misuse at the population level.

Additionally, while we examine job strain and social engagement as potential work-related mechanisms for alcohol use and misuse, our study was unable to investigate alternative theories of how the workplace environment and drinking relate. For example, in the effort-reward imbalance model, high effort, low reward jobs are considered stressful and an imbalance between workers’ perceived effort and reward has been found to be positively associated with excessive drinking (Head, Stansfeld, & Siegrist, 2004). Also, work-related social networks and drinking culture, including permissive alcohol use at company-sponsored events, drinking among colleagues, and drinking when workers are entertaining customers, are also believed to play a role in individuals’ excessive drinking behaviors (Ahern et al., 2008; Bacharach, Bamberger, & Sonnenstuhl, 2002; Frone and Brown, 2010; Martin et al., 1996; Yang et al., 2001;). Future studies are needed to investigate the interplay among the job strain, job alienation, social network, and drinking culture theories and work-related alcohol misuse.

Altogether, this study provides new evidence that physically demanding occupations are, on the average, associated with higher levels of alcohol use among mid-career U.S. workers and misuse among male workers. Our study did not find strong evidence that job autonomy was related to alcohol consumption measures, although the interaction between job autonomy and physical demand was associated with alcohol misuse. As a result, we found only modest support in our data for job strain theory as a mechanism for work-related alcohol misuse. The social engagement factor studied was negatively associated with usual drinking frequency across genders but did not appear to be associated with either usual quantity or frequency of heavy drinking occasions. Although more evidence is needed, our results are suggestive that the social engagement factor may have limited utility contributing to research on occupation-related epidemiology of alcohol misuse. If future studies confirm our preliminary findings, the implications are that occupations with a high degree of physical demand could be targets for employee-assistance programs focusing on primary and secondary prevention of alcohol misuse, particularly for male workers. Brief interventions for at-risk drinking in employee assistance programs have been shown to be effective in reducing drinking and increasing productivity (Osilla et al., 2008; Osilla et al., 2010). Programs such as these could be tailored for workers in physically demanding occupations to increase their likelihood of success. Additional research to further elucidate how workplace characteristics and alcohol consumption patterns relate could include confirmatory analyses using other waves of O*Net data and replicating the current analysis in other samples of workers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix 1. Factor loadings of O*Net Occupational Attributes

Variable	Physical Demand	Job Autonomy	Social Engagement
Accuracy	−0.1	0.3	−0.3
Achievement	−0.3	0.8	0.2
Achievement effort	−0.2	0.7	0.1

Variable	Physical Demand	Job Autonomy	Social Engagement
Adaptability	−0.3	0.6	0.5
Administrative activities	−0.5	0.5	0.1
Advise others	−0.1	0.8	0
Analytical thinking	−0.2	0.8	0
Analyzing data	−0.2	0.8	−0.3
Assisting others	0	0	0.8
Attention to detail	−0.3	0.4	−0.1
Automation	−0.3	0.1	−0.3
Balance	0.8	−0.3	0.1
Bend	0.8	−0.5	0.1
Climb	0.7	0	−0.2
Coaching	0.1	0.7	0.3
Communicating outside organization	−0.3	0.7	0
Communicating with coworkers	−0.2	0.7	0.2
Competition	0.2	0.5	−0.3
Concern for others	−0.2	0.1	0.8
Consequence of error	0.4	0.4	0.1
Contact with others	−0.3	0.2	0.5
Controlled indoor environment	0.6	−0.3	−0.1
Controlling machines	0.8	−0.2	−0.2
Cooperation	−0.3	0.3	0.6
Coordinate or lead	−0.1	0.6	0.4
Coordinating the work of others	0.1	0.8	0.3
Cramped spaces	0.9	−0.1	−0.1
Creative	−0.1	0.7	−0.1
Deal with aggressive people	0.1	0.1	0.7
Deal with customers	−0.2	0.2	0.4
Deal with unpleasant people	−0.1	0.1	0.6
Decision freedom	0	0.6	0.1
Decision impact	0	0.7	0.1
Dependability	−0.3	0.4	0.5
Develop strategies	−0.1	0.8	0
Develop teams	0	0.8	0.3
Direct subordinates	0.1	0.8	0.2
Document information	−0.3	0.5	0.1
Draft equipment	0.5	0.2	−0.3
Duration of work week	0.3	0.7	−0.3
Email	−0.6	0.7	−0.1
Enclosed vehicle	0.5	0.2	−0.1

Variable	Physical Demand	Job Autonomy	Social Engagement
Establish or keep personal relationships	−0.5	0.6	0.3
Estimate or quantify	0.4	0.5	−0.4
Evaluate compliance	0	0.7	−0.1
Exposure to contaminants	0.8	−0.2	0
Exposure to disease	0	−0.1	0.7
Exposure to hazardous conditions	0.8	0.1	−0.1
Exposure to hazardous equipment	0.8	0	−0.3
Exposure to heights	0.8	0.1	−0.2
Exposure to light	0.8	0	−0.2
Exposure to minor wounds	0.8	−0.3	0
Exposure to noise	0.7	−0.1	0
Exposure to radiation	0.2	0.1	0.2
Exposure to temperature	0.9	−0.1	−0.2
Exposure to vibration	0.7	−0.1	−0.2
Face to face	0	0.5	0.3
Frequent conflict	−0.1	0.4	0.5
Frequent decisions	0.1	0.5	0.2
Gather information	−0.2	0.7	−0.1
General physical activity	0.8	−0.3	0.1
Handle or move objects	0.8	−0.4	0
Identify objects	0.2	0.6	0
Independence	−0.2	0.8	0.2
Initiative	−0.2	0.7	0.2
Innovation	−0.1	0.6	0.2
Inspect things	0.8	0	−0.1
Integrity	−0.4	0.4	0.4
Interpret information for others	−0.2	0.8	0
Judge quality	0.2	0.7	0.1
Kneel	0.8	−0.3	0.1
Leadership	−0.1	0.7	0.4
Monitor processes	0.4	0.5	0.1
Monitor resources	0	0.7	−0.1
Open vehicle	0.7	−0.1	−0.3
Operate vehicles	0.8	−0.1	−0.2
Pace	0.6	−0.3	−0.2
Persistence	−0.2	0.7	0.2
Physical proximity to others	0.3	−0.2	0.7
Prioritize work	−0.3	0.8	0
Process information	−0.3	0.6	−0.3

Variable	Physical Demand	Job Autonomy	Social Engagement
Public speaking	−0.2	0.6	0.3
Recognition	−0.3	0.8	0.1
Relationships	−0.3	0.2	0.7
Repair electrical	0.5	0.1	−0.2
Repair mechanical	0.8	−0.1	−0.3
Repeating tasks	−0.3	0	−0.1
Repetitive motions	0.2	−0.5	−0.2
Resolve conflict	−0.2	0.7	0.4
Responsibility for results	0.3	0.6	0
Responsibility for the health of others	0.7	0.1	0.3
Scheduling work	−0.1	0.8	0.1
Self control	−0.2	0.2	0.8
Sell or influence others	−0.1	0.5	0
Sitting	0.7	−0.3	0.2
Social orientation	−0.2	0.2	0.8
Solve problems	0	0.9	0
Staff units	0	0.7	0.1
Standing	0.6	−0.3	0.3
Stress tolerance	−0.3	0.5	0.7
Support	0.2	0.4	0
Teamwork	−0.1	0.4	0.4
Telephone	−0.4	0.5	0.1
Time pressure	0.3	0.3	−0.3
Train others	0.2	0.6	0.3
Uncontrolled indoor environment	0.8	0	−0.3
Unstructured work	−0.3	0.6	0
Update or use knowledge	−0.2	0.8	−0.1
Use computers	−0.6	0.5	−0.2
Using hands as tools	0.6	−0.4	−0.2
Walk or run	0.7	−0.3	0.3
Wear extreme personal protective equipment	0.7	0.1	0
Wear personal protective equipment	0.8	−0.1	−0.1
Work conditions	−0.2	0.8	0.1
Work outdoors exposed	0.7	0	0
Work outdoors unexposed	0.7	0	−0.2
Work schedules	0.5	0	−0.2
Work with public	0	0	0.5
Write letters	−0.5	0.6	0.1

Appendix 2. Occupational attribute factor scores by U.S. Census major occupation category

Major occupational category	Occupational attribute	Mean	Std. Dev.	Min	Max
Management (N= 566)	Physical demand	−0.3	0.6	−1.4	1.0
	Job autonomy	1.3	0.4	0.1	2.0
	Social engagement	0.0	0.7	−1.9	1.6
Business and financial (N=259)	Physical demand	−1.1	0.4	−1.6	0.7
	Job autonomy	0.7	0.4	−0.4	1.7
	Social engagement	−0.7	0.6	−1.7	0.4
Computer and mathematics (N=148)	Physical demand	−1.1	0.3	−1.5	−0.6
	Job autonomy	0.5	0.2	0.1	1.1
	Social engagement	−1.6	0.5	−2.8	−0.8
Architectural and engineering N=108)	Physical demand	−0.2	0.3	−1.2	0.6
	Job autonomy	1.1	0.5	−0.4	1.7
	Social engagement	−1.2	0.3	−2.0	−0.7
Life, physical, and sciences (N=38)	Physical demand	−0.5	0.5	−1.4	0.3
	Job autonomy	0.8	0.5	−0.3	1.8
	Social engagement	−1.1	0.7	−2.6	1.0
Community and social work (N=119)	Physical demand	−0.6	0.2	−1.1	0.0
	Job autonomy	0.5	0.5	−0.2	1.5
	Social engagement	1.3	0.4	0.6	1.8
Legal (N=43)	Physical demand	−1.3	0.2	−1.6	−1.2
	Job autonomy	0.8	0.7	−0.8	1.4
	Social engagement	−0.6	0.4	−1.5	−0.8
Education, training, library (N=352)	Physical demand	−0.5	0.2	−1.3	0.3
	Job autonomy	0.2	0.7	−1.1	1.7
	Social engagement	1.2	0.6	−1.4	1.6
Arts, design, entertainment (N=85)	Physical demand	−0.6	0.6	−1.3	0.5
	Job autonomy	0.3	0.8	−0.9	1.6
	Social engagement	−0.6	0.7	−2.3	1.2
Healthcare practitioner (N=265)	Physical demand	0.3	0.5	−0.9	1.6
	Job autonomy	0.7	0.5	−0.5	1.8
	Social engagement	1.4	0.7	−0.2	2.1
Healthcare support (N=189)	Physical demand	0.1	0.3	−1.4	0.7
	Job autonomy	−0.6	0.2	−1.3	1.6
	Social engagement	1.7	0.9	−1.6	2.4
Protective services (N=173)	Physical demand	0.5	0.7	−0.3	2.0
	Job autonomy	0.4	0.9	−2.1	1.6
	Social engagement	0.5	0.9	−0.7	1.8
Food preparation and service (N=238)	Physical demand	−0.1	0.4	−0.6	0.6

Major occupational category	Occupational attribute	Mean	Std. Dev.	Min	Max
	Job autonomy	−0.9	0.8	−2.2	0.7
	Social engagement	0.2	1.3	−1.6	1.5
Building and grounds work (N=294)	Physical demand	1.0	0.9	−0.1	2.6
	Job autonomy	−0.3	1.2	−2.4	1.1
	Social engagement	0.2	0.3	−1.4	0.6
Personal care and service (N=211)	Physical demand	−0.3	0.3	−0.8	1.1
	Job autonomy	−0.9	0.7	−2.3	0.8
	Social engagement	−1.2	0.4	−1.1	2.4
Sales and related (N=461)	Physical demand	−0.4	0.5	−1.6	0.3
	Job autonomy	−0.2	1.0	−3.1	1.7
	Social engagement	0.4	0.6	−0.8	1.1
Office and administration (N=981)	Physical demand	−1.0	0.6	−1.9	0.8
	Job autonomy	−0.6	0.8	−1.7	1.2
	Social engagement	−0.1	0.7	−2.1	0.9
Farming, forestry, and fishing (N=30)	Physical demand	1.0	0.6	−0.5	1.6
	Job autonomy	−0.5	0.7	−2.8	0.9
	Social engagement	−0.8	0.3	−1.5	−0.4
Construction and extraction (N=428)	Physical demand	1.6	0.3	0.7	2.7
	Job autonomy	0.1	0.8	−1.2	1.4
	Social engagement	−0.3	0.4	−1.4	0.2
Installation repair and maintenance (N=266)	Physical demand	1.4	0.6	−0.4	2.4
	Job autonomy	0.2	0.6	−1.2	1.5
	Social engagement	−0.5	0.5	−1.9	0.7
Production (N=519)	Physical demand	0.7	0.6	−0.6	1.9
	Job autonomy	−0.5	0.9	−2.3	1.4
	Social engagement	−0.8	0.6	−2.0	0.3
Transportation and materials moving (N=465)	Physical demand	1.0	0.4	−0.7	1.8
	Job autonomy	−0.8	0.5	−2.3	1.6
	Social engagement	−0.5	0.5	−1.2	0.8
Unknown (N=154)	Physical demand	−1.0	0.4	−1.2	1.0
	Job autonomy	1.2	0.1	0.2	1.2
	Social engagement	−0.9	0.1	−1.7	−0.3

Highlights

- Numerous work-related drinking mechanisms have been posited
- Factor analysis identified physical demand, autonomy, & social engagement factors
- Higher physical demands were associated with heavy drinking among men
- Employees in these occupations could be targets for workplace intervention

Table 1

O*Net items with rotated factor loadings of 0.7 or higher[1]

Autonomy		**Physical demand**		**Social engagement**	
Item	**Loading**	**Item**	**Loading**	**Item**	**Loading**
Achievement	0.8	Balance	0.8	Assisting and caring for others	0.8
Achievement effort	0.7	Bend	0.8	Concern for others	0.8
Analytical thinking	0.8	Climb	0.7	Relationships	0.7
Analyzing data	0.8	Controlling machines	0.8	Self-control and composure	0.8
Coaching	0.7	Cramped spaces	0.9	Social orientation	0.8
Communicating with coworkers	0.7	Exposure to contaminants	0.8		
Coordinating the work of others	0.8	Exposure to hazardous conditions	0.8		
Creative	0.7	Exposure to hazardous equipment	0.8		
Develop strategies	0.8	Exposure to heights	0.8		
Develop teams	0.8	Exposure to light	0.9		
Directing subordinates	0.8	Exposure to minor wounds	0.8		
Evaluate compliance	0.7	Exposure to very hot/cold temperature	0.9		
Gathering information	0.7	General physical activity	0.8		
Good working conditions	0.8	Handling moving objects	0.8		
Independence	0.8	Inspect things	0.8		
Initiative	0.7	Kneel	0.8		
Interpret information for others	0.8	Operate vehicles	0.8		
Leadership	0.7	Repair mechanical	0.8		
Monitor resources	0.7	Responsibility for the health of others	0.7		
Prioritize work	0.8	Uncontrolled indoor environment	0.8		
Persistence in the face of obstacles	0.7	Wear common protective equipment	0.8		
Provide guidance or advice to others	0.8	Wear extreme protective equipment	0.7		
Recognition	0.8	Work in an open vehicle	0.7		
Scheduling work	0.8	Work outdoors exposed	0.7		
Solve problems	0.9	Work outdoors unexposed	0.7		

Autonomy		Physical demand		Social engagement	
Item	**Loading**	**Item**	**Loading**	**Item**	**Loading**
Staff units	0.7				
Update and use knowledge	0.8				
Eigen value	37.9		18.8		9.7
Proportion of variance of the 119 O*Net attributes	0.4		0.2		0.1

[1]For ease of exposition, Table 1 shows which items primarily loaded on each factor. A complete table of factor loadings displaying the loadings of each item on all factors for all 119 O*Net attributes can be found in Appendix 1.

Table 2

Sample characteristics (n=6,426)

Variable	Mean (weighted)	Standard deviation (unweighted)	Range	
			Min	Max
Alcohol use in past 30 days				
Number of days drank	4.9	7.1	0	30
Number of drinks per day	1.5	2.0	0	24
Number of days had 6 or more drinks on one occasion	0.3	0.7	0	5
Occupational attributes				
Physical demand	0.0	1.0	−1.9	2.7
Job autonomy	0.1	1.0	−3.1	2.0
Social engagement	0.0	1.0	−2.8	2.4
Male (%)	53.2			
Race/ethnicity (%)				
Non-Hispanic, Non-African	80.4			
American				
Hispanic	6.3			
African American	13.4			
Human capital				
AFQT (range 0–10)	4.8	2.9	0	9.9
AFQT missing (%)	3.8			

Table 3

Pairwise correlations of occupational attributes and measures of alcohol use and misuse in the past 30 days

	Days drank	Drinks per day	Occasions drank 6 or more	Physical demand	Job autonomy	Social engagement	Male	Hispanic	African American	AFQT89
Days drank	1.00									
Drinks per day	0.43**	1.00								
Occasions drank 6 or more	0.50**	0.63**	1.00							
Physical demand	0.031	0.12**	0.16**	1.00						
Job autonomy	0.11**	0.05**	0.01	−0.01	1.00					
Social engagement	−0.10**	−0.06**	−0.08**	0.04**	−0.01	1.00				
Male	0.17**	0.19**	0.20**	0.39**	0.17**	−0.31**	1.00			
Hispanic	−0.05**	0.02	−0.00	0.02*	−0.04**	0.02*	0.01	1.00		
African American	−0.08**	−0.08**	−0.03**	0.07**	−0.12**	−0.03**	−0..01	−0.10**	1.00	
AFQT89	0.16**	0.02	−0.05**	−0.27**	0.33**	−0.02	0.03*	−0.16**	−0.32**	1.00

Notes:

* p<0.05,

** p<0.01, n=6,426.

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Table 4

Adjusted associations of occupational attributes and measures of alcohol use and misuse in the past 30 days

	Number of					
	Days drank		Drinks per day		Occasions drank 6 or more	
Covariates	**Count ratio (95% CI)**		**Count ratio (95% CI)**		**Count ratio (95% CI)**	
Occupational attributes						
Physical demand	1.07 * (1.01, 1.15)	1.08 ** (1.02, 1.15)	1.15 ** (1.10, 1.20)	1.06 ** (1.02, 1.11)	1.48 ** (1.34, 1.64)	1.20 ** (1.11, 1.30)
Job autonomy	1.18 ** (1.11, 1.27)	1.06 (0.98, 1.15)	1.08 * (1.02, 1.14)	1.03 (0.97, 1.09)	1.06 (0.93, 1.21)	0.99 (0.86, 1.13)
Physical demand *X* job autonomy	0.96 (0.90, 1.03)	0.97 (0.91, 1.03)	1.00 (0.94, 1.06)	1.01 (0.96, 1.06)	1.05 (0.98, 1.13)	1.07 * (1.01, 1.13)
Social engagement	0.85 ** (0.79, 0.92)	0.91 * (0.84, 0.98)	0.91 ** (0.86, 0.96)	0.98 (0.93, 1.02)	0.77 ** (0.65, 0.90)	0.91 (0.78, 1.05)
Male		1.51 ** (1.34, 1.70)		1.54 ** (1.43, 1.66)		2.92 ** (2.24, 3.81)
Race/ethnicity						
Hispanic		0.79 ** (0.66, 0.94)		1.02 (0.92, 1.14)		0.76 * (0.60, 0.95)
African American		0.83 * (0.71, 0.97)		0.71 ** (0.64, 0.80)		0.60 ** (0.45, 0.79)
Human capital						
AFQT89		1.08 ** (1.06, 1.11)		0.99 (0.97, 1.01)		0.94 ** (0.91, 0.98)
AFQT89 missing		1.05 (0.76, 1.47)		0.85 ** (0.77,0.94)		0.59 ** (0.42, 0.83)
Constant		2.54 ** (2.20, 2.95)		1.25 ** (1.12, 1.39)		0.19 ** (0.15, 0.24)

Note:

* p<0.05,

** p<0.01, regression results weighted using NLSY79 sample weights, standard errors clustered by major occupation category, n=6,426.

Table 5

Adjusted associations of occupational attributes and measures of alcohol use and misuse in the past 30 days stratified by gender

	Number of days drank		Number of drinks per day		Number of occasions drank 6 or more drinks	
	Count ratio (95% CI)		Count ratio (95% CI)		Count ratio (95% CI)	
Covariates	**No controls**	**Controls**	**No controls**	**Controls**	**No controls**	**Controls**
Males (n=3,252)						
Occupational attributes						
Physical demand	0.96 (0.90, 1.03)	1.03 (0.95, 1.11)	1.05 (0.99, 1.12)	1.05 (0.99, 1.13)	1.24** (1.11, 1.40)	1.20** (1.07, 1.35)
Job autonomy	1.13** (1.06, 1.21)	1.07 (1.00, 1.16)	1.03 (0.97, 1.10)	1.03 (0.95, 1.11)	1.01 (0.89, 1.16)	1.04 (0.91, 1.20)
Physical demand *X* job autonomy	1.02 (0.94, 1.11)	1.02 (0.94, 1.12)	1.05 (0.95, 1.05)	1.04 (0.95, 1.14)	1.10 (0.96, 1.26)	1.09 (0.95, 1.24)
Social engagement	0.92 (0.83, 1.01)	0.92 (0.83, 1.01)	0.97 (0.90, 1.04)	0.97 (0.91, 1.04)	0.88 (0.76, 1.03)	0.89 (0.77, 1.04)
Females (n=3,174)						
Occupational attributes						
Physical demand	1.02 (0.91, 1.19)	1.13* (1.02, 1.24)	1.04 (0.97, 1.12)	1.05 (0.97, 1.13)	1.21 (0.96, 1.54)	1.17 (0.90, 1.52)
Job autonomy	1.10 (0.97, 1.25)	0.99 (0.90, 1.10)	1.01 (0.95, 1.07)	0.99 (0.93,1.06)	0.83 (0.66, 1.05)	0.85 (0.67, 1.07)
Physical demand *X* job autonomy	0.89 (0.78, 1.01)	0.88* (0.80, 0.97)	0.94* (0.89, 0.99)	0.94* (0.90, 0.98)	0.93 (0.71, 1.21)	0.91 (0.70, 1.19)
Social engagement	0.91 (0.82, 1.01)	0.91** (0.83, 0.99)	0.99 (0.93, 1.05)	0.99 (0.94, 1.05)	0.90 (0.72, 1.21)	0.92 (0.74, 1.16)

Note:

* p<0.05,

** p<0.01, regression results weighted using NLSY79 sample weights, standard errors clustered by major occupation category, regressions stratified by gender with controls include adjustment for race/ethnicity and human capital.