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US trends in binge drinking by gender, occupation, prestige, and work structure among adults in the midlife, 2006–2018



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ABSTRACT

Background: Rates of binge drinking have nearly doubled among US women ages 30–49 since 2006. Employment influences alcohol use and varies by the prestige and structure (e.g., authority, autonomy, expertise) of one's occupation.

Methods: We examined trends in binge drinking among adults ages 30–49 in the labor force in 2006–2018 National Health Interview Surveys ($N = 108,981$) by occupation, work prestige (General Social Survey's occupational prestige score), work structure (occupational authority, autonomy, automation, expertise), and gender. We estimated odds of binge drinking by year with survey-weighted logistic regression controlled for sociodemographics, smoking, and disability.

Results: In 2018, 30% of women and 43% of men reported binge drinking; drinking increased annually from 2006–2018 (OR for women = 1.08, OR for men = 1.03). Work status, prestige, and work structure modified the association. Women in high- (OR = 1.10, 95% CI: 1.09–1.12) versus low-prestige (OR = 1.05, 95% CI: 1.04–1.06) jobs had higher increases, as did men in high-prestige jobs (OR = 1.04, 95% CI: 1.03–1.05). Respondents in higher relative to lower authority, autonomy, and expertise jobs increased binge drinking.

Conclusions: Though all strata of workforce adults increased binge drinking, increases were concentrated among women in higher-status careers, implicating gendered shifts in labor as one determinant of recent national alcohol trends.

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Introduction

Alcohol consumption causes mortality and morbidity, contributing to 10% of deaths per year in the US [1]. Binge drinking, commonly defined as the consumption of 4 or more drinks (for women) or 5 or more drinks (for men) in a short time [2], contributes to injury, and increased risk of poisoning and violence; chronic binge drinking causes cardiovascular disease, cancer, and liver damage [3]. Among working adults, excess alcohol consumption is associated with higher rates of absenteeism, reduced productivity, higher rates of psychological and physical aggression at work, and poorer job performance [4]. The cost of lost productivity

attributable to worker alcohol consumption was estimated to be \$249 billion in 2010, the most recent year of data available [5,6].

Rates of binge drinking have increased nationally since 2005 [7]. Increases vary by gender and age: though men report higher rates of binge drinking on average, increases in binge drinking are highest among women ages 30–49 [8]. Between 2006 and 2018, the prevalence of binge drinking among mid-life women nearly doubled, from 20%–36% [9]. These increases are most pronounced among women with high income and high education [10].

Women's historical labor force and educational gains are hypothesized determinants of recent trends. Mid-life women in 2005 were born in the 1960s–80s, and are the first to complete higher education, enter the workforce, and occupy high-income, high-prestige jobs at rates comparable to men's [11]. College attendance is a well-established risk factor for binge drinking [12], and occupation influences binge drinking as well [13]. Between 1965 and 2016, the percent of US women with young children who worked

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outside the home rose from 17%–65% [14,15]. In 2016, nearly half (47%) of the US civilian labor force was composed of women [16]. Regarding education, the majority of graduate students in 2017–59% of master's students and 54% of doctoral students—were women [17], and the gender gap in college enrollment and completion has narrowed and reversed such that currently over 50% of full-time college undergraduates are women [18]. Regarding occupational changes, though some industries remain majority male—for example, science, technology, engineering, and math (STEM) fields—women have nevertheless made gains in these areas, earning 60% of bachelor's degrees in biological sciences, 43% in mathematics, and 39% in physical sciences in 2016 [19]. Further, in 2016, 40% of all managers were women [20].

Occupations may influence alcohol use in various ways. Job stress may increase alcohol use for coping, and the workplace may propagate a normative culture of drinking [13]. Occupations may share psychosocial and material labor features that influence health. One such feature is *prestige*—a psychosocial construct capturing how well-regarded one's occupation is by others. Drinking patterns vary by prestige: generally, those in higher prestige occupations are more likely to consume alcohol (rather than abstain completely) but less likely to binge, drink heavily, or experience alcohol use disorders [21].

Another, more objective dimension of labor germane to alcohol consumption is work structure, which refers to the organization and character of work. Work structure denotes heterogeneity in the different physical and psychological contexts of laborers, and the ways in which work is organized [22–24]. For example, warehouse workers often have limited decision-making powers, and their work is more likely to be fast-paced and repetitive; general contractors, however, often have more decision-latitude and work characterized by problem-solving and negotiating. In the 20th century, the modal structure of labor shifted towards deskilling and automation (i.e., routinization or machine-control labor processes) [22,25,26]. Laborers in occupations that are machine-automated or require fewer skills are more replaceable—that is making their labor more precarious—and are paid less, and this type of labor is considered less intellectually or emotionally rewarding [25]. Stressors of this nature increase risks for binge drinking as a coping mechanism; indeed, unskilled laborers have elevated risks of binge drinking [13,23]. Workers in occupations with more authority and autonomy are relatively insulated from these pressures and have lower risks of binge drinking [23].

Understanding trends in binge drinking across occupations and occupational characteristics like prestige and work structure can establish which subgroups are increasing binge drinking and inform hypotheses about gender-related determinants of these increases. We examined US trends in mid-life adults' past-year binge drinking according to occupation, work prestige, and work structure, and how these trends differ by gender.

Methods

We used self-reported data from the 2006–2018 National Health Interview Surveys (NHIS) [27], an annual, nationally-representative, cross-sectional household survey of noninstitutionalized Americans. The typical annual response rate for NHIS is approximately 80% of eligible households. Eligible respondents were men and women ages 30–49 in the civilian labor force ($N = 112,438$); NHIS does not query gender identity nor gender minority status. Labor force engagement was ascertained using questions regarding past-week work status, if they were looking for work, whether they had ever worked, and occupation. We excluded respondents who were unemployed due to retirement or taking care of the house or family ($N = 12,154$), had never worked ($N = 5062$), did not provide occupation ($N = 2973$), or were in

the military ($N = 311$) (Appendix A, Table S1 for sensitivity analyses among excluded). Eligible sample varied by year, ranging from 6886 (2018) to 10,343 (2012).

Men and women were queried about the frequency of consuming 5+ drinks in a day in the past year from 2006 to 2013. Beginning in 2014, women were instead queried about the frequency of consuming 4+ drinks in a day, consistent with national alcohol guidelines [2]; measurement was unchanged for men. Therefore, binge drinking was defined as endorsing consuming 5+ drinks on a single day until 2013, then subsequently defined as endorsing consuming 5+ drinks on a single day for men or 4+ drinks on a single day for women. Despite increased measure sensitivity in 2014, previous NHIS analyses found women's trends in binge drinking were not an artifact of measurement change [9,10]. We performed a robustness check by testing the slope of binge drinking trends before and after the change (Appendix B, Fig. S1).

Working respondents reported current occupation; non-working respondents reported most recent occupation. NHIS coded these into 22 categories using the 2010 U.S. Census Standard Occupational Classification (SOC) Major Occupation Group codes; these categories were invariant over the study duration.

Average occupational prestige was measured using the General Social Survey [28]. Briefly, a sub-sample from the 2012 General Social Survey ranked occupations from low to high social standing, with rankings fitted to hierarchical linear models to predict average prestige score of each occupation with adjustment for inter-rater variability. These values were aggregated to the SOC categories to obtain an average prestige score for all 22 occupation groups. Prestige scores had a bimodal distribution around a mean of 51.7; to stratify, we categorized occupations into “high prestige” (mean or above) and “low prestige” (below mean).

Work structure was measured using scales described in Prins et al. [23], developed using the Occupational Information Network [29]. The scales characterize the levels of authority, autonomy, automation, and expertise of each occupation category. Authority was measured using 8 items: coordinate, guide, lead, and develop others; responsibility for outcomes and results; frequency of decision making; decisions impact co-workers or company; monitor and control resources; scheduling work and activities and develop objectives and strategies; make decisions and solve problems; staff organizational units. Autonomy was measured using two items: freedom to make decisions; structured versus unstructured work. Automation was measured using 3 items: degree of automation, importance of repeating same tasks, pace determined by speed of equipment. Expertise was measured using three items: on-site or in-plant training, related work experience, required level of education. Similar to prestige measures, individual occupation scores were aggregated to the 22 SOC categories; these average scores were then dichotomized into career categories that had higher (mean or above) versus lower scores for each work structure measure. The mean authority score was 39.9 (range: 34.1, 52.6), the mean autonomy score was 12.1 (range: 10.0, 13.9), the mean automation score was 7.2 (range: 5.6, 9.3), and the mean expertise score was 13.1 (range: 8.0, 17.2). Occupations characterized by high autonomy (architecture and engineering; arts, design, entertainment, sports, and media; business and financial operations; community and social services; computer and mathematical; education, training, and library; healthcare practitioners and technical; legal; life, physical, and social science; and management occupations) were all also characterized by high expertise; therefore, autonomy and expertise were grouped together in these analyses. Supplemental Table S2 shows the average prestige and work structure score for each occupation.

We controlled for variables related to alcohol consumption and labor force engagement, including race [30], education [10], smoking status [31], age [8], marriage status [32], disability status [33],

and parenthood status [9]. Though not structural confounders, we included these control variables to confirm that trends persisted beyond the impact of distributional changes or sampling variability in these covariates. We used 3 racial categories: White, Black, or other race. Disparities in both health and socioeconomic status result from racialized group membership. However, we used race as a control variable rather than stratifying by race, as tests of race by year interaction in adjusted models showed no evidence that trends in binge drinking were differential by race ($F_{856}^2 = 0.50$, $P = .61$). We categorized education as less than high school, high school or equivalent, and some college or higher; smoking status as current, former, or never smoker; marriage status as married or unmarried; disability status as being limited in work capability due to a health problem, or not; and parenthood status as whether respondents lived with children <18 years old or not. We measured age continuously.

We used survey-weighted logistic regression to estimate time trends in binge drinking within strata defined by occupation, prestige, work structure, and gender, adjusting for control variables, producing an odds ratio (OR) for the effect of survey year on the risk of binge drinking (versus not). Singleton sampling clusters were centered. We considered linear, quadratic, and cubic time terms, and chose linear models based on fit according to significance tests of time parameters. Predicted probabilities were generated from interaction models of occupation, work structure and prestige by time and graphed to show individual predicted probabilities with covariate adjustment, averaged within strata. We evaluated gender by time interactions both within and across strata.

Main models were analyzed using complete case analysis ($N = 108,981$). In our sample of 112,438 eligible respondents, 3457 (3%) were missing data, including 2840 (3%) respondents missing outcome and 1132 (1%) missing covariate data. Using multiple imputation by fully conditional specification, we imputed 10 data sets using model variables as predictors and combined ORs using Rubin's rules [34]. These were examined in sensitivity analyses, rather than shown in the main text, because of computational barriers to performing post-estimation model comparisons with imputed data sets.

Results

Our analytic sample contained 108,981 adults ages 30–49 in 2006–2018. Of these, 52% were women, 42% worked in high-prestige occupations, 36% in high-authority occupations, 37% in high-autonomy and high-expertise occupations, and 41% in high-automation occupations.

Table 1 shows the adjusted OR (AOR) for binge drinking each year according to gender and occupation (Table S3 shows unadjusted estimates), corresponding to Figures 1 and 2. Binge drinking increased for both men and women between 2006 and 2018. In 2006, 15% of women and 32% of men reported past-year binge drinking; by 2018, 30% of women and 43% of men reported past-year binge drinking (AOR = 1.08 for women, 95% CI: 1.07–1.09; AOR = 1.03 for men, 95% CI: 1.02–1.03). Occupations in Table 1 are grouped by prestige, in ascending order according to effect sizes among women. Binge drinking increased more among respondents in high versus low prestige occupations, especially among women. Among higher-prestige occupations, 11 of the 12 evidenced increases in binge drinking for women. Legal occupations evidenced the highest increases in drinking for both women (AOR = 1.16, 95% CI: 1.09–1.23) and men (AOR = 1.08, 95% CI: 1.02–1.15). Only one occupation—installation, maintenance, and repair professions—evidenced decreases, among women only, in the fully adjusted model (AOR = 0.84, 95% CI: 0.71, 0.99). Of the six occupational categories which showed evidence of divergent slopes for men and women (production; office, administrative support; sales; arts,

design, entertainment, sports, media; education, training, library; management), women increased binge drinking at faster rates than men.

Prestige modified the trends in binge drinking for both genders (Table 2, Fig. 3). Among both women and men, those in high-prestige compared to low-prestige careers had higher increases in binge drinking. In 2006, the prevalence of binge drinking was higher among those in low-prestige jobs (16% for women, 35% for men) compared to those in high-prestige jobs (15% for women, 29% for men); however, by 2018 those in higher-prestige jobs engaged in binge drinking at higher prevalence (35% for women, 45% for men) than those in lower-prestige jobs (24% for women, 42% for men). Women in high-prestige occupations had the sharpest increases of any gender/prestige group (three-way test for prestige by gender by time: $F_{852}^1 = 9.44$, $P < .01$).

Authority and autonomy/expertise findings were very similar to those of prestige (Figs. S2 and S3): men and women in high-authority and high-autonomy/expertise occupations increased binge drinking relative to those in low-authority and low-autonomy/expertise occupations. Those in high-authority and high-automation/expertise jobs engaged in binge drinking at a higher prevalence than those in low-prestige jobs by 2018. Interactions for time by gender by work structure showed women's increases were steeper than men's for autonomy/expertise ($F_{852}^1 = 9.48$, $P < .01$) and marginally steeper than men's for authority ($F_{852}^1 = 3.51$, $P = .06$). Automation was the only work structure domain to not demonstrate this patterning (Fig. S4): ORs were similar for high and low automation jobs and gender differences attenuated in 3-way interaction models, suggesting that these slopes were not meaningfully different ($F_{852}^1 = 0.29$, $P = .50$). Multiple imputation of missing data did not change results or interpretation.

Discussion

We examined gendered trends in mid-life binge drinking, stratified by occupation, prestige, and work structure. Two key findings emerged: first, both men and women in high-prestige, high-authority, and high-autonomy/expertise occupations increased binge drinking at higher rates than those in relatively low-prestige, authority, and autonomy/expertise occupations. Second, women evidenced steeper increases than men. This patterning of binge drinking trends implies labor force participation, and changes in women's labor roles, may be key contributors to national trends in binge drinking.

Consistent with previous studies [5,6], the narrowing gender gap in binge drinking was driven by increases among women. In this sample, women occupied higher-prestige, higher-authority, and higher-autonomy/expertise positions at greater proportions than men (Fig. S5); binge drinking increases were concentrated in these groups. While previous research showed that occupations with these psychosocial and structural features protect against binge drinking [15], the current study suggests these patterns have changed in recent years.

These findings illuminate further research directions for investigating determinants of these trends. It is unclear what about these professions and occupational domains have led to sharper increases for women than for men. While women had the most pronounced increases in binge drinking, men also evidenced differential increases across these labor domains; it is unknown why adults in higher-prestige, authority, autonomy, and expertise positions increased binge drinking.

Workers with high stress may cope by binge drinking [11]. We hypothesize three stress-related mechanisms may be influencing these trends. First, while careers with higher prestige, authority, autonomy, and expertise are thought to insulate workers against the strain associated with deskilling and wage stagnation, those

Table 1

Changes in binge drinking as a function of time, men and women in the workforce ages in the NHIS ages 30–49, 2006–2018, stratified by occupation and prestige, with scores for prestige, authority, autonomy, automation, and expertise

SOC Major Occupation Groups		N women	Adjusted* odds ratio for binge drinking given single year increase, women AOR (95% CI)	N men	Adjusted* odds ratio for binge drinking given single year increase, men AOR (95% CI)	Gender x year interaction in stratum
All eligible respondents		55,613	1.08 (1.07, 1.09)	53,368	1.03 (1.02, 1.03)	$F_{856}^1=109.80, P < .01$
Low prestige (below mean)	Installation, Maintenance, Repair	176	0.84 (0.71, 0.99)	3463	1.03 (1.00, 1.05)	$F_{578}^1=2.09, P = .15$
	Transportation, Material, Moving	1370	1.02 (0.97, 1.06)	4902	1.02 (1.00, 1.04)	$F_{716}^1=0.08, P = .78$
	Food Preparation, Serving	3059	1.02 (0.99, 1.05)	2107	1.00 (0.96, 1.03)	$F_{673}^1=0.78, P = .38$
	Personal Care and Service	3074	1.02 (0.99, 1.06)	675	1.05 (0.99, 1.11)	$F_{626}^1=0.23, P = .63$
	Building, Grounds Cleaning, Maintenance	2622	1.03 (0.99, 1.08)	2351	1.03 (1.00, 1.07)	$F_{655}^1=0.07, P = .80$
	Sales and Related	5273	1.06 (1.04, 1.09)	4452	1.02 (1.00, 1.04)	$F_{804}^1=4.92, P = .03$
	Office, Administrative Support	10,068	1.07 (1.05, 1.08)	3263	1.02 (0.99, 1.04)	$F_{792}^1=9.39, P < .01$
	Farming, Fishing, Forestry	286	1.09 (0.96, 1.23)	667	1.04 (0.99, 1.11)	$F_{804}^1=0.18, P = .67$
	Production	2580	1.09 (1.05, 1.13)	4630	1.01 (0.99, 1.03)	$F_{706}^1=11.44, P < .01$
	Construction, Extraction	264	1.11 (1.00, 1.23)	6201	1.01 (0.99, 1.03)	$F_{514}^1=2.72, P = .10$
High prestige	Protective Service	626	1.08 (1.00, 1.16)	1674	1.03 (1.00, 1.07)	$F_{138}^1=0.57, P = .45$
	Computer, Mathematical	1036	1.08 (1.02, 1.13)	2847	1.08 (1.05, 1.11)	$F_{589}^1=0.02, P = .89$
	Healthcare Support	2832	1.08 (1.05, 1.12)	301	1.08 (0.98, 1.19)	$F_{581}^1=0.31, P = .58$
	Community/Social Services	1513	1.09 (1.04, 1.14)	628	1.08 (1.02, 1.15)	$F_{505}^1=0.02, P = .88$
	Life, Physical, Social Sciences	577	1.10 (1.03, 1.18)	613	1.05 (0.99, 1.11)	$F_{780}^1=1.47, P = .22$
	Business/Financial Operations	3308	1.10 (1.06, 1.13)	2129	1.06 (1.03, 1.10)	$F_{703}^1=2.19, P = .14$
	Management	4667	1.10 (1.07, 1.13)	5916	1.03 (1.01, 1.05)	$F_{816}^1=16.85, P < .01$
	Healthcare Practitioners, Technical	4960	1.11 (1.08, 1.14)	1438	1.06 (1.02, 1.10)	$F_{746}^1=2.99, P = .08$
	Architecture, Engineering	389	1.12 (1.04, 1.21)	1739	1.04 (1.00, 1.07)	$F_{457}^1=2.43, P = .12$
	Education, Training, Library	5125	1.12 (1.10, 1.15)	1657	0.99 (0.96, 1.03)	$F_{767}^1=30.05, P < .01$
Arts, Design, Entertainment, Sports, Media	1040	1.14 (1.08, 1.19)	1197	1.00 (0.96, 1.04)	$F_{478}^1=13.88, P < .01$	
Legal	768	1.16 (1.09, 1.23)	518	1.08 (1.02, 1.15)	$F_{313}^1=2.52, P = .11$	

* Adjusted for education level, marriage status, smoking status, race, age, child-rearing status, and disability status.

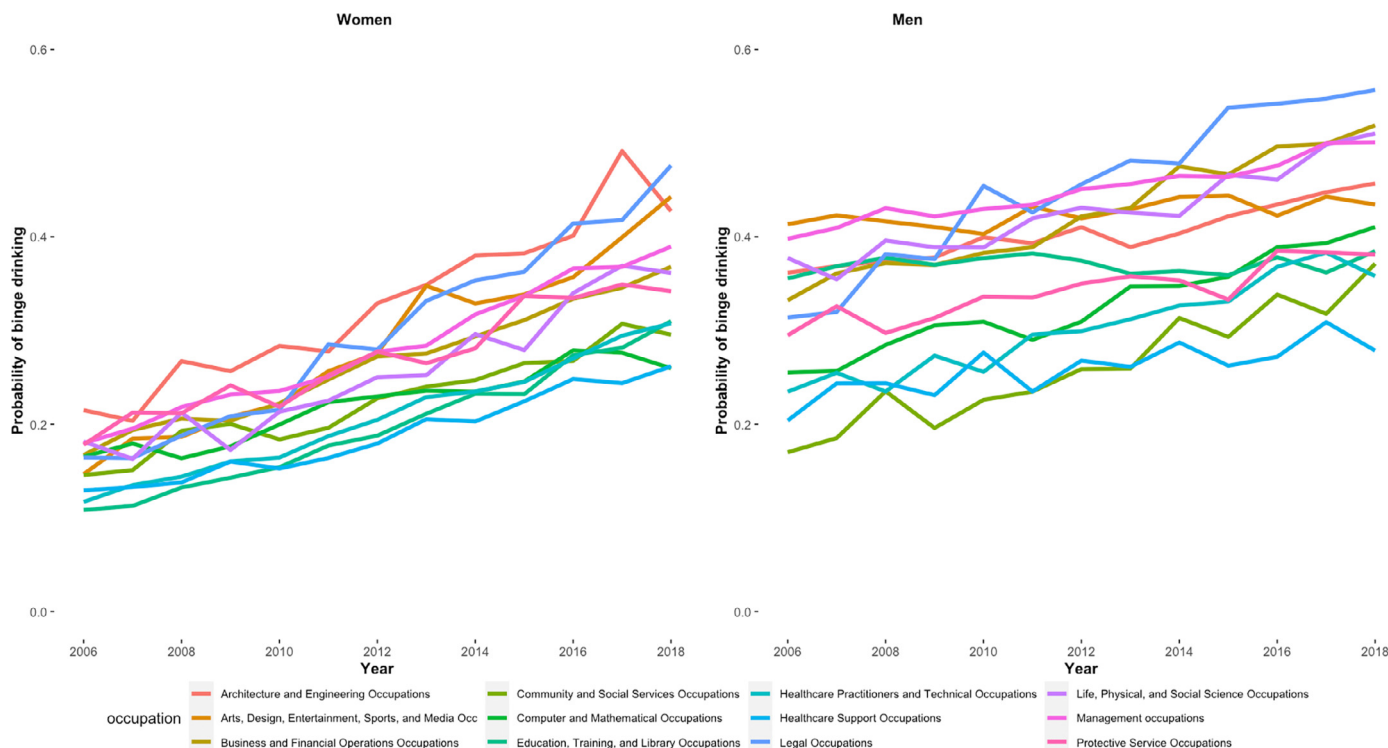


Fig. 1. Past-year binge drinking among men and women ages 30–49 in NHIS by occupation, adjusted averages for high-prestige occupations.

protections could be eroding, impacting both genders. Women are vulnerable to additional sources of stress; the second potential mechanism is that, despite women’s shifts into higher status occupations, working women still perform the majority of household and child care [24], thus experiencing dual stressors from work

and home. Third, women in higher status positions are more likely than women in lower status positions to be exposed to sexism and harassment at work [25], which increase both work-related stress and alcohol consumption [26]; notably, many high-prestige occupations were also high in authority, autonomy, and exper-

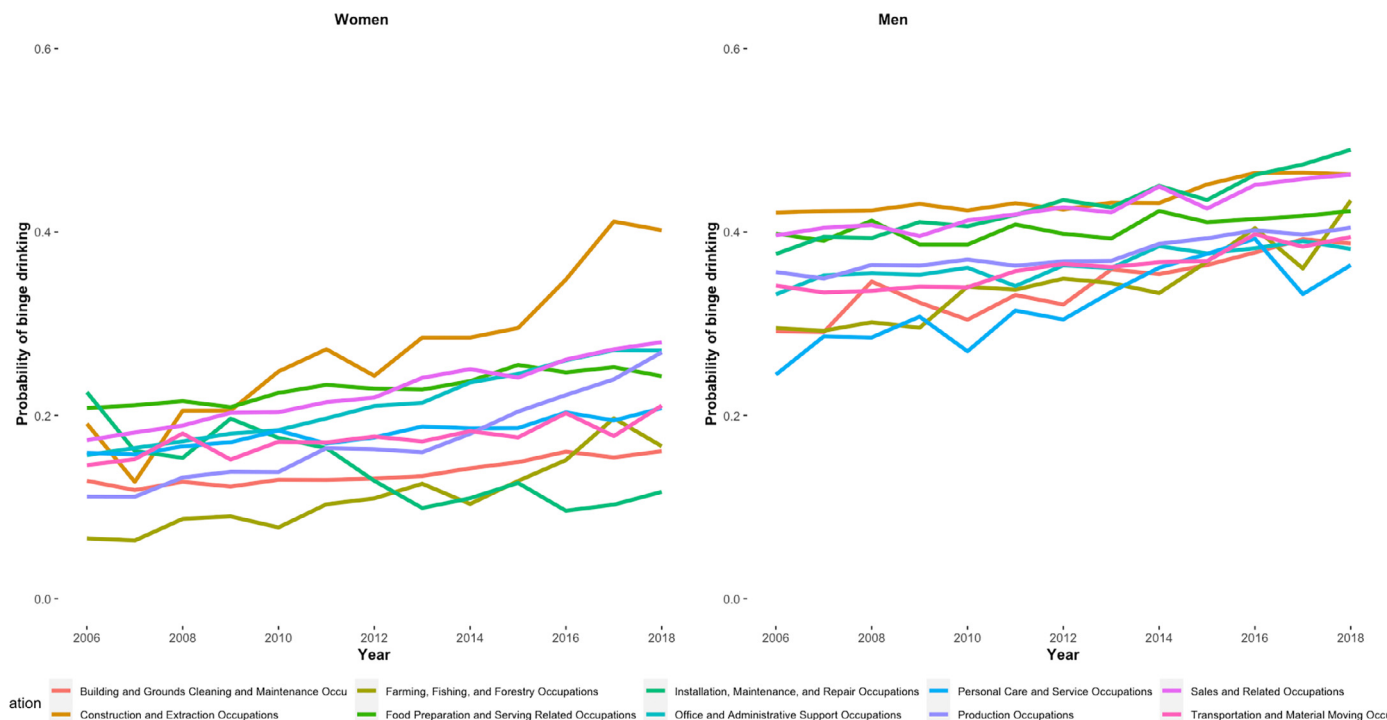


Fig. 2. Past-year binge drinking among men and women ages 30–49 in NHIS by occupation, adjusted averages for low-prestige occupations.

Table 2

Changes in binge drinking as a function of time, men and women in the workforce ages in the NHIS ages 30–49, 2006–2018, stratified by gender, prestige, and work structure

		N women	Adjusted* odds ratio for binge drinking given single year increase, women AOR (95% CI)	N men	Adjusted* odds ratio for binge drinking given single year increase, men AOR (95% CI)	Gender x year interaction in stratum
All eligible respondents		55,613	1.08 (1.07, 1.09)	53,368	1.03 (1.02, 1.03)	$F_{856}^1 = 109.80, P < .01$
Prestige and work structure domains	Prestige Low	28,772	1.05 (1.04, 1.06)	32,711	1.02 (1.01, 1.03)	$F_{856}^1 = 23.34, P < .01$
	High	26,841	1.10 (1.09, 1.12)	20,657	1.04 (1.03, 1.05)	$F_{850}^1 = 72.06, P < .01$
Prestige x year interaction		$F_{854}^1 = 25.39, P < .01$		$F_{855}^1 = 7.53, P < .01$		
Authority	Low	33,412	1.06 (1.05, 1.07)	34,727	1.02 (1.01, 1.03)	$F_{856}^1 = 39.13, P < .01$
	High	22,201	1.10 (1.09, 1.12)	18,641	1.04 (1.03, 1.05)	$F_{850}^1 = 58.39, P < .01$
Authority x year interaction		$F_{854}^1 = 25.06, P < .01$		$F_{855}^1 = 7.72, P < .01$		
Autonomy/Expertise	Low	32,230	1.05 (1.04, 1.06)	34,686	1.02 (1.01, 1.03)	$F_{856}^1 = 27.46, P < .01$
	High	23,383	1.11 (1.09, 1.12)	18,682	1.04 (1.03, 1.05)	$F_{850}^1 = 70.01, P < .01$
Autonomy x year interaction		$F_{854}^1 = 41.47, P < .01$		$F_{855}^1 = 7.02, P < .01$		
Automation	Low	35,115	1.09 (1.07, 1.10)	29,225	1.03 (1.02, 1.04)	$F_{855}^1 = 67.54, P < .01$
	High	20,498	1.07 (1.06, 1.08)	24,143	1.02 (1.01, 1.03)	$F_{855}^1 = 35.67, P < .01$
Automation x year interaction		$F_{854}^1 = 3.73, P = .05$		$F_{855}^1 = 1.27, P = .26$		

* Adjusted for marriage status, education history, race, smoking status, age, child-rearing status, disability status.

tise, suggesting that high status and work structure are closely related.

Conversely, stress may not be the determinant of these patterns. People in higher-status careers, with higher disposable incomes, might merely be engaging in more leisure spending on excessive alcohol consumption. Alcohol advertising has increasingly focused on women [27], and women in higher-status occupations have more flexible resources. Occupational drinking norms may be shifting commensurate with women's increasing presence in traditionally male spaces—women may be “catching up” to men as they are exposed to similar drinking norms, consistent with convergence between women and men in other gendered adverse health behaviors (e.g., smoking) [28]. Convergence would explain women's increased binge drinking trends, but not men's.

The overall increase in binge drinking, across all occupational domains, indicates that underlying population-level causes beyond

the employment landscape are driving national trends in this age group. Social sanctions against binge drinking may be declining; however, younger age groups (e.g., under age 25) have decreased binge drinking in this time period [8]. Cohort effects may be contributing; adults ages 30–49 in recent surveys entered the workforce after the 2008 financial crisis, and may overall experience high psychosocial or financial stress and engage in binge drinking to cope. Public health messaging about alcohol consumption has been volatile, and shifting messages about the safety of moderate consumption and its purported health benefits may contribute [29].

Finally, the increases in binge drinking were heterogeneous by occupation, even within high prestige occupations. Consistent with previous findings [35,36], this variation in trends suggests that specific occupational mechanisms beyond prestige and work structure are also salient to alcohol use among laborers. For example, the oc-

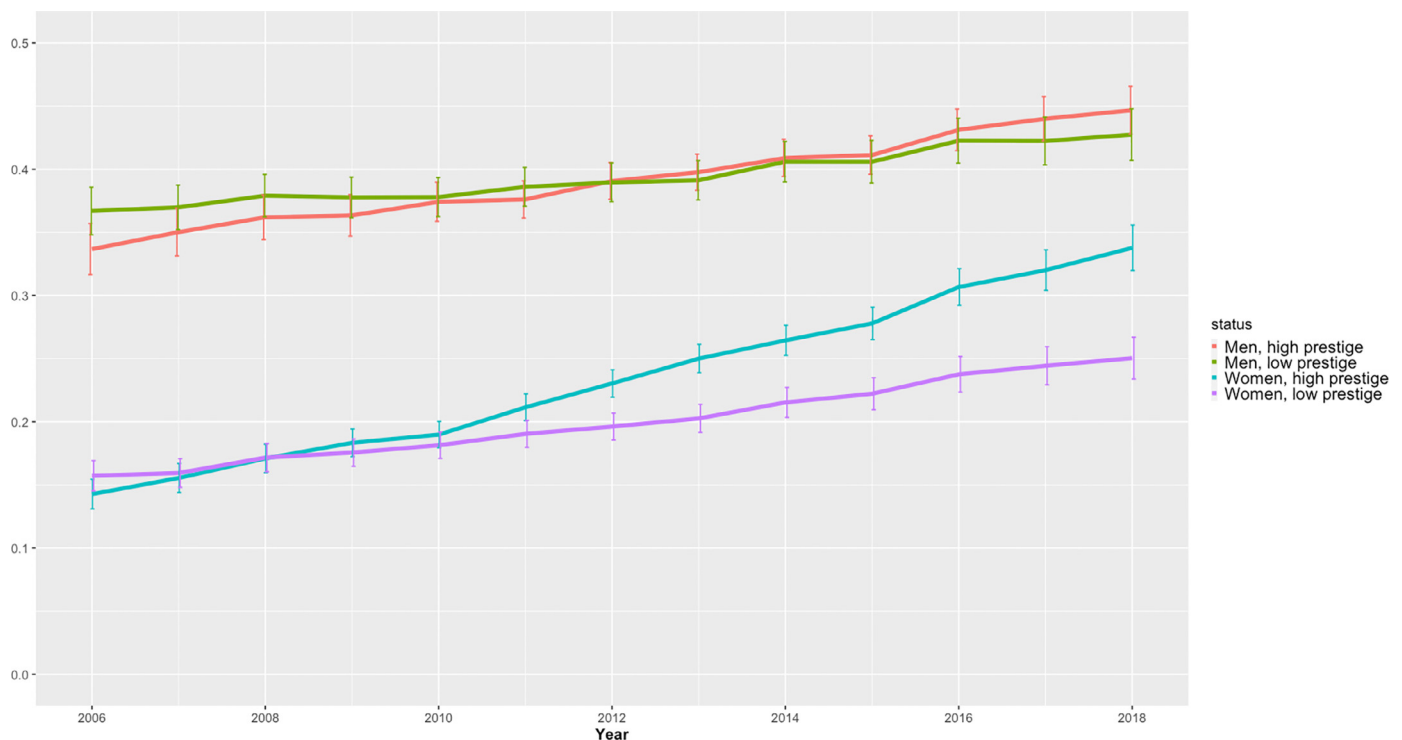


Fig. 3. Past-year binge drinking among men and women ages 30–49 in NHIS according to gender and prestige, adjusted averages 2006–2018.

Occupational norms around binge drinking may be very different in legal professions (which evidenced the highest increases) relative to other high prestige occupations like health care [37,38]. Occupational gender composition—that is, whether occupations are male-dominated, female-dominated, or approximately gender balanced—is another contributor to occupational drinking norms; historically, workers in male-dominated fields reported higher rates of excess alcohol consumption than those in female-dominated fields [39]. Women who work in male-dominated fields report higher levels of stress and adverse mental health [40–47], which may influence alcohol use for coping. However, in recent decades the gender composition of occupations has been shifting: higher status occupations have been approaching gender parity, though in lower status occupations gender segregation has been persistent. It is unknown how or whether these changes may have contributed to gendered trends in drinking in recent decades [48,49].

Alcohol use is common among US workers, with 77% of all laborers [13] and 90% of white-collar workers [50] reporting any past-year consumption and 20% reporting any past-year binge drinking [36]. Alcohol impairment is a problem for workforce safety: approximately 10% of US laborers report working under the influence of alcohol or while hungover from the previous night [51]. Fortunately, workforce interventions are effective to reducing alcohol use and shifting norms [52,53], in part because working adults spend a majority of their daytime hours in the office (making them a captive audience) and employers have financial incentives to keeping them healthy. However, while risks of binge drinking are shifting across socioeconomic and occupational dimensions, those in lower socioeconomic strata and lower status occupations are more likely to suffer adverse consequences—including morbidity and mortality—as a result of alcohol consumption [54–56], due to systems of disadvantage and exploitation that perpetuate health disadvantages among those in lower social statuses [57]. We interpret these results as a reminder of the urgency to screen all adults for alcohol use, as groups that health providers usually imagine as

“high risk” are changing. Though outpatient alcohol treatment is highly effective and screening is very sensitive and simple [58,59], primary care providers only screen for alcohol use in 10%–15% of visits, and rarely screen women [60,61].

Limitations in this study include heterogeneity within occupational subgroups: the 22 SOC Major Occupation categories represent hundreds of different jobs, which vary in prestige and work structure. For example, education occupations included both kindergarten teachers and professors, careers with different levels of autonomy and likely different risks (and consequences) for binge drinking. NHIS queried only about a single job, but many Americans work multiple jobs; these contribute to exposure to norms, stress, and flexible resources, which influence alcohol consumption. Our study is not generalizable beyond these professions, as those in the military or who did not disclose their occupations reported lower prevalence of binge drinking (Appendix A) than those included in our sample.

Psychosocial measures of occupation and work structure encapsulate meaningfully different dimensions of labor and have different evidence bases; however, we found that these measures were highly related. Every low-authority and low-autonomy/expertise occupation was also characterized as low-prestige. Therefore, we were unable to examine intersections of prestige and work structure to understand how these occupational dimensions interacted to exacerbate or attenuate drinking trends; the psychosocial elements of labor likely work in concert with the more objective work structure features.

Due to the data structure of the NHIS, the study findings described are descriptive and insufficient to test causal mechanisms, so future investigations are warranted to test the hypotheses described here. Finally, alcohol outcomes were ascertained using self-report, which is a valid and sensitive method of estimating individual consumption [30–33]. However, estimates of binge drinking may nevertheless be under-reported due to social desirability, which would result in a bias of estimates towards a null finding.

Conclusion

Increases in women's binge drinking are concentrated among those in higher-status careers, implicating gendered shifts in labor as one determinant of recent national alcohol trends. However, it remains unclear why these occupational positions and features confer higher rates of binge drinking, and why binge drinking has increased for all working adults in the mid-life. These increases—among groups not traditionally considered “at risk”—are concerning for their impacts on individual well-being and health systems. Understanding the groups most vulnerable to these increases, and identifying causes, are essential to targeting interventions and screening. While labor is key to understanding gendered differences in binge drinking trends, other population-level determinants need to be explored to understand these systematic increases.

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Data availability

Data for this analysis were publicly available and de-identified, thus exempt from IRB approval. All data used in this study are publicly available from the National Health Interview Surveys via CDC: <https://www.cdc.gov/nchs/nhis/index.htm>

References

- Stahre M, Roeber J, Kanny D, Brewer RD, Zhang X. Contribution of excessive alcohol consumption to deaths and years of potential life lost in the United States. *Prev Chronic Dis* 2014;11:E109. doi:10.5888/pcd11.130293.
- NIAAA. Drinking levels defined. National Institute on Alcohol Abuse and Alcoholism (NIAAA). Published 2016. Accessed May 22, 2019. <https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking>
- Gmel G, Kuntsche E, Rehm J. Risky single-occasion drinking: bingeing is not bingeing. *Addiction* 2011;106(6):1037–45. doi:10.1111/j.1360-0443.2010.03167.x.
- Frone MR. Alcohol and illicit drug use in the workforce and workplace. *American Psychological Association*; 2013. doi:10.1037/13944-000.
- Bouchery EE, Harwood HJ, Sacks JJ, Simon CJ, Brewer RD. Economic costs of excessive alcohol consumption in the U.S., 2006. *Am J Prev Med* 2011;41(5):516–24. doi:10.1016/j.amepre.2011.06.045.
- Sacks JJ, Gonzales KR, Bouchery EE, Tomedi LE, Brewer RD. 2010 national and state costs of excessive alcohol consumption. *Am J Prev Med* 2015;49(5):e73–9.
- Gruzca RA, Sher KJ, Kerr WC, Krauss MJ, Lui CK, McDowell YE, et al. Trends in adult alcohol use and binge drinking in the early 21st-century united states: a meta-analysis of 6 national survey series. *Alcohol Clin Exp Res* 2018;42(10):1939–50. doi:10.1111/acer.13859.
- Keyes KM, Jager J, Mal-Sarkar T, Patrick ME, Rutherford C, Hasin D. Is there a recent epidemic of women's drinking? a critical review of national studies. *Alcohol Clin Exp Res* 2019;43(7) acer.14082. doi:10.1111/acer.14082.
- McKetta S, Keyes KM. Heavy and binge alcohol drinking and parenting status in the United States from 2006 to 2018: an analysis of nationally representative cross-sectional surveys. Tsai AC, editor. *PLOS Med* 2019;16(11):e1002954. doi:10.1371/journal.pmed.1002954.
- McKetta S, Keyes KM. Trends in US women's binge drinking in middle adulthood by socioeconomic status, 2006–2018. *Drug Alcohol Depend* 2020;108026 Published online.
- Bailey MJ, DiPrete TA. Five decades of remarkable but slowing change in U.S. Women's economic and social status and political participation. *RSF* 2016;2(4):1–32. doi:10.7758/rsf.2016.2.4.01.
- White A, Hingson R. The burden of alcohol use: excessive alcohol consumption and related consequences among college students. *Alcohol Res Curr Rev* 2013;35(2) Published online.
- Frone MR. Employee psychoactive substance involvement: historical context, key findings, and future directions. *Annu rev organ psychol organ behav*; 2019. Published online.
- U.S. Department of Commerce. *Trends in Child Care Arrangements of Working Mothers*. (Census B of the, ed.); 1983.
- Women in the labor force: a databook. Bureau of Labor Statistics; 2019.
- Women in Labor Force, Women's Bureau, U.S. Department of Labor. Accessed December 7, 2019. Available at: https://www.dol.gov/wb/stats/NEWSTATS/facts/women_lf.htm#CivilianLFSex
- Okahana H, Zhou E. *Graduate Enrollment and Degrees: 2007 to 2017.*; 2018.
- Digest of Education Statistics. *Choice Rev Online* 2014;51(10) 51-5366-51-5366. doi:10.5860/choice.51-5366.
- Sax LJ, Newhouse KNS. Disciplinary Field Specificity and Variation in the STEM Gender Gap. *New Dir Institutional Res* 2018;2018(179):45–71. doi:10.1002/ir.20275.
- Women in management : career Outlook: U.S. Bureau of Labor Statistics. Accessed May 7, 2021. Available at: https://www.bls.gov/careeroutlook/2017/data-on-display/women-managers.htm#view_full
- Harford TC, Parker DA, Grant BF, Dawson DA. Alcohol use and dependence among employed men and women in the United States in 1988. *Alcohol Clin Exp Res* 1992;16(2):146–8. doi:10.1111/j.1530-0277.1992.tb01357.x.
- Braverman H. *Labor and monopoly capital: the degradation of work in the twentieth century*. NYU Press; 1998.
- Prins SJSJ, McKetta S, Platt J, Muntaner C, Keyes KMKM, Bates LMLM. Mental illness, drinking, and the social division and structure of labor in the United States: 2003-2015. *Am J Ind Med* 2019;62(2):131–44. doi:10.1002/ajim.22935.
- Jonna RJ, Foster JB. Braverman and the Structure of the U.S. Working Class: beyond the Degradation of Labor. *Empl Responsib Rights J* 2014;26(3):219–36. doi:10.1007/s10672-014-9243-4.
- Devinatz VG. Introduction to “Braverman and the Structure of the U.S. Working Class: beyond the Degradation of Labor. *Empl Responsib Rights J* 2014;26(3):217–18. doi:10.1007/s10672-014-9244-3.
- Heisig U. The deskilling and upskilling debate. In: *International handbook of education for the changing world of work*. Netherlands: Springer; 2009. p. 1639–51. doi:10.1007/978-1-4020-5281-1_110.
- Centers for Disease Control and Prevention. NHIS - national health interview survey. Accessed April 13, 2019. <https://www.cdc.gov/nchs/nhis/index.htm>
- Smith TW, Son J. *Measuring occupational prestige on the 2012 general social survey*. NORC at the University of Chicago; 2014.
- National Center for ONET Development. Available at: https://www.onetcenter.org/db_releases.html. Published 2018.
- Chartier K, Caetano R. Ethnicity and health disparities in alcohol research. *Alcohol Res Heal* 2010;33(1–2):152–60.
- McKee SA, Falba T, O'Malley SS, Sindelar J, O'Connor PG. Smoking status as a clinical indicator for alcohol misuse in U.S. adults. *Arch Intern Med* 2007;167(7):716–21. doi:10.1001/archinte.167.7.716.
- Leonard KE, Eiden RD. Marital and family processes in the context of alcohol use and alcohol disorders. *Annu Rev Clin Psychol* 2007;3(1):285–310. doi:10.1146/annurev.clinpsy.3.022806.091424.
- Korhonen T, Smeds E, Silventoinen K, Heikkilä K, Kaprio J. Cigarette smoking and alcohol use as predictors of disability retirement: a population-based cohort study. *Drug Alcohol Depend* 2015;155:260–6. doi:10.1016/j.drugalcdep.2015.06.047.
- Campion WM, Rubin DB. Multiple imputation for nonresponse in surveys. *J Mark Res* 1989;26(4):485. doi:10.2307/3172772.
- Barnes AJ, Brown ER. Occupation as an independent risk factor for binge drinking. *Am J Drug Alcohol Abuse* 2013;39(2):108–14. doi:10.3109/00952990.2012.694537.
- Shockey TM, Esser MB. Binge drinking by occupation groups among currently employed U.S. adults in 32 States, 2013–2016. *Subst Use Misuse* 2020 Published online. doi:10.1080/10826084.2020.1784947.
- Bakhshi S, While AE. Health professionals' alcohol-related professional practices and the relationship between their personal alcohol attitudes and behavior and professional practices: a systematic review. *Int J Environ Res Public Health* 2013;11(1):218–48. doi:10.3390/ijerph110100218.
- Krill PR, Johnson R, Albert L. The prevalence of substance use and other mental health concerns among american attorneys. *J Addict Med* 2016;10(1):46–52. doi:10.1097/ADM.0000000000000182.
- Kraft JM, Blum TC, Martin JK, Roman PM. Drinking patterns and the gender mix of occupations: evidence from a national survey of American workers. *J Subst Abuse* 1993;5(2):157–74. doi:10.1016/0899-3289(93)90059-K.
- Milner A, King T, LaMontagne AD, Bentley R, Kavanagh A. Men's work, Women's work, and mental health: a longitudinal investigation of the relationship between the gender composition of occupations and mental health. *Soc Sci Med* 2018;204:16–22. doi:10.1016/j.socscimed.2018.03.020.
- Taylor CJ. Relational by nature? men and women do not differ in physiological response to social stressors faced by token women. *Am J Sociol* 2016;122(1):49–89. doi:10.1086/686698.
- Elwér S, Harryson L, Bolin M, Hammarström A. Patterns of gender equality at workplaces and psychological distress. *PLoS ONE* 2013;8(1):e53246.
- Elwér S, Johansson K, Hammarström A. Workplace gender composition and psychological distress: the importance of the psychosocial work environment. *BMC Public Health* 2014;14(1):1–9.
- Hensing G, Alexanderson K. The association between sex segregation, working conditions, and sickness absence among employed women. *Occup Environ Med* 2004;61(2) e7–e7.
- Jonsson R, Lidwall U, Holmgren K. Does unbalanced gender composition in the workplace influence the association between psychosocial working conditions and sickness absence? *Work* 2013;46(1):59–66.
- Evans O, Steptoe A. The contribution of gender-role orientation, work factors and home stressors to psychological well-being and sickness ab-

- sence in male-and female-dominated occupational groups. *Soc Sci Med* 2002;54(4):481–92.
- [47] Battams S, Roche AM, Fischer JA, Lee NK, Cameron J, Kostadinov V. Workplace risk factors for anxiety and depression in male-dominated industries: a systematic review. *Heal Psychol Behav Med* 2014;2(1):983–1008. doi:10.1080/21642850.2014.954579.
- [48] Preston JA. Occupational gender segregation Trends and explanations. *Q Rev Econ Financ* 1999;39(5):611–24. doi:10.1016/s1062-9769(99)00029-0.
- [49] Jarman J, Blackburn RM, Racko G. The dimensions of occupational gender segregation in industrial countries. *Sociology* 2012;46(6):1003–19. doi:10.1177/0038038511435063.
- [50] Matano RA, Wanat SF, Westrup D, Koopman C, Whitsell SD. Prevalence of alcohol and drug use in a highly educated workforce. *J Behav Health Serv Res* 2002;29(1):30–44.
- [51] Frone MR. Prevalence and distribution of alcohol use and impairment in the workplace: a U.S. national survey. *J Stud Alcohol* 2006;67(1):147–56. doi:10.15288/jsa.2006.67.147.
- [52] Ames GM, Bennett JB. Prevention interventions of alcohol problems in the workplace. *Alcohol Res Health* 2011;34(2):175–87.
- [53] Sonnenstuhl WJ, Trice HM. The workplace as locale for risks and interventions in alcohol abuse. *Alcohol Dev Sociol Perspect use Abus* 1991:255–88 Published online.
- [54] Rehm J, Probst C. What about drinking is associated with shorter life in poorer people? *PLoS Med* 2018;15(1).
- [55] Smith K, Foster J. Alcohol, health inequalities and the harm paradox: why some groups face greater problems despite consuming less alcohol. *London Inst Alcohol Stud*. 2014 Published online.
- [56] Lewer D, Meier P, Beard E, Boniface S, Kaner E. Unravelling the alcohol harm paradox: a population-based study of social gradients across very heavy drinking thresholds. *BMC Public Health* 2016;16(1):599.
- [57] Prins SJ, McKetta S, Platt J, Muntaner C, Keyes KM, Bates LM. The serpent of their agonies: exploitation as structural determinant of mental illness. *Epidemiology* 2021;32(2):303–9. doi:10.1097/EDE.0000000000001304.
- [58] Yu J, Appel P, Rogers M, et al. Integrating intervention for substance use disorder in a healthcare setting: practice and outcomes in New York City STD clinics. *Am J Drug Alcohol Abuse* 2016;42(1):32–8. doi:10.3109/00952990.2015.1094478.
- [59] Graham LJ, Davis AL, Cook PF, Weber M. Screening, brief intervention, and referral to treatment in a rural ryan white part C HIV clinic. *AIDS Care* 2016;28(4):508–12. doi:10.1080/09540121.2015.1110235.
- [60] Mitchell AJ, Meader N, Bird V, Rizzo M. Clinical recognition and recording of alcohol disorders by clinicians in primary and secondary care: meta-analysis. *Br J Psychiatry* 2012;201(2):93–100. doi:10.1192/bjp.bp.110.091199.
- [61] Arndt S, Schultz SK, Turvey C, Petersen A. Screening for alcoholism in the primary care setting. *J Fam Pract* 2002;51(1):41–50.