Published in final edited form as:
Ind Relat (Berkeley). 2013 April ; 52(2): 444–466. doi:10.1111/irel.12019.

Does Unemployment Lead to Greater Alcohol Consumption?

Ioana Popovici[a] and **Michael T. French**[b,*]

[a]Department of Sociobehavioral and Administrative Pharmacy, College of Pharmacy, Nova Southeastern University, 3200 South University Drive, Fort Lauderdale, Florida, USA, 33328-2018; Telephone: 954-262-1393; Fax: 954-262-2278; Ioana.Popovici@nova.edu

[b]Health Economics Research Group, Department of Sociology, Department of Epidemiology and Public Health, and Department of Economics, University of Miami, 5202 University Drive, Merrick Building, Room 121F, P.O. Box 248162, Coral Gables, FL, USA, 33124-2030; Telephone: 305-284-6039; Fax: 305-284-5310; mfrench@miami.edu

Abstract

Using panel data from Waves 1 and 2 of the NESARC, we estimate gender-specific effects of changes in employment status on overall alcohol consumption, binge drinking episodes, and a diagnosis of alcohol abuse and/or dependence. We employ various fixed-effects models to address potential bias from unobserved and time-invariant individual heterogeneity. All results show a positive and significant effect of unemployment on drinking behaviors and the findings are robust to numerous sensitivity tests. Perhaps macroeconomic policy decisions intended to stimulate the economy during economic downturns should also consider the avoided personal costs and externalities associated with alcohol misuse.

Keywords

Unemployment; Alcohol use; Fixed-effects analysis; Panel data

Introduction

Economists and other analysts have actively investigated the relationships between alcohol use and labor market outcomes. Most of these studies find that alcohol misuse negatively affects employment and earnings in a variety of ways (Johansson et al. 2007; MacDonald and Shields 2004; Mullahy and Sindelar 1996; Terza 2002). Namely, alcohol misuse impacts productivity directly through a higher probability of injury, absenteeism, and poor job performance and indirectly through lower education and on-the-job training. In a competitive labor market, lower productivity is linked to a higher likelihood of job loss and reduced earnings.

Despite an abundance of empirical research on the causal mechanism running from alcohol use to labor market outcomes, theory also supports a reverse effect of unemployment on alcohol use. First, from a psychological perspective, the financial challenges associated with unemployment could increase tension, anxiety, and family discord, thus leading to increased alcohol use (Peirce et al. 1994; Wilson and Walker 1993; Catalano et al. 2011). On the other hand, some argue that working causes most of the stress in everyday life (Karasek and Theorell 1990). Individuals might drink alcohol to relieve stress caused by dangerous work

[*]**Corresponding author:** Michael T. French, Ph.D., Professor of Health Economics, University of Miami, Department of Sociology, 5202 University Drive, Merrick Building, Room 121F, P.O. Box 248162, Coral Gables, FL 33124-2030; 305-284-6039 (phone); 305-284-5310 (fax); mfrench@miami.edu.

conditions, product deadlines, and/or long work hours (Arkes 2007; Catalano et al. 2011). Second, consistent with the "frustration aggression mechanism," some individuals drink to cope with unexpected job separation and the associated perception of unfair loss of earned rewards (Catalano et al, 1999; Catalano et al, 2011). However, it is possible that employed people may actually decrease their alcohol intake during an economic downturn to avoid potential job loss or decreased earnings (Catalano et al. 2002). Third, actual or potential unemployment during a declining economy forces individuals to redirect resources that they would have otherwise invested in health-enhancing behaviors such as exercise, good nutrition, and preventive care (Bruckner, 2008; Catalano et al, 2011).

From a purely economic perspective, if alcohol is a normal good, then a decline in income due to unemployment will lead to reduced alcohol consumption. On the other hand, unemployment results in greater leisure time, which might encourage social drinking (Arkes 2007; Dee 2001; Ettner 1997). The work environment itself is another trigger for drinking due to the occurrence of professional gatherings where alcohol is common. These alternative conceptual pathways demonstrate that both the causal mechanism and the sign of the relationship are indeterminate a priori.

While many empirical studies examining the relationships between alcohol misuse and labor market outcomes recognize the potential of reverse causality, few studies have explored whether problem drinking, alcohol abuse, or alcohol dependence are a result of unemployment. Some analysts have estimated the effect of macroeconomic conditions (usually proxied by the state unemployment rate) on alcohol consumption at the aggregate level (Brenner 1979; Freeman 1999; Ruhm 1995). This line of research has focused on the net effect of economic indicators on the population. Other studies have examined whether a declining economy (again, proxied by the state unemployment rate) affects the drinking behaviors of individuals (Arkes 2007; Dee 2001; Ruhm and Black 2002; Dávalos, et al. 2011). These studies address the hypothesis that a contracting economy is a risk factor for alcohol misuse. The results here are mixed as some find that alcohol misuse is pro-cyclical (Dee 2001; Ruhm and Black 2002), while others find the opposite (Arkes 2007; Dávalos, et al. 2011). However, none of these studies examine how the effects might differ by type of unemployment (e.g., voluntary separation, being laid off, fired) or among those who are actually unemployed versus at risk of becoming unemployed (Catalano et al. 1993a).

Whereas the studies noted above focused on the effects of macroeconomic conditions on individual behavior or its net effect on the population, a few authors have examined whether individual labor market experiences (e.g., job loss) affect individual drinking. Again, the results are mixed. While some find a positive association between unemployment and alcohol consumption (Janlert and Hammarström 1992; Catalano et al. 1993a; Dooley and Prause 1998), others are only able to uncover an effect for long term unemployment (Khan et al. 2002; Mossakowski 2008). Moreover, some analysts find no association or conflicting results (Hammer 1992; Ettner 1997; Gallo et al. 2001).

Our study seeks to rectify some of the ambiguities in this literature by examining the effects of individual labor market experiences (i.e., job loss) on person-specific alcohol consumption. We further examine the question of whether job loss is a risk factor for alcohol misuse. To address potential omitted variable bias (i.e., important unobserved factors that affect both drinking behavior and employment status), we estimate fixed-effects models using individual-level panel data from Waves 1 and 2 of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC). Fixed-effects models eliminate any time-invariant unobserved individual heterogeneity that could otherwise lead to biased coefficient estimates.

This study contributes to the existing literature in several other respects. Whereas most prior studies use past-month measures of drinking, we base our three alcohol use measures on consumption during the past year. Moreover, our main alcohol use variable, average daily ethanol consumption, is a comprehensive measure based on drinking frequency, beverage type/brand, and ethanol content. Finally, we consider additional measures for binge drinking and alcohol abuse/dependence diagnosis that offer a broader view of the effects of unemployment on drinking behaviors.

A deeper understanding of the relationships between employment status and alcohol use has important policy implications. If unemployment leads to increased alcohol use, macroeconomic policy decisions intended to stimulate the economy in recessions should take into account the potential indirect benefits for society of fewer adverse consequences related to alcohol misuse (Ettner 1997). A strong positive association between alcohol use and unemployment has important implications for alcohol abuse prevention and treatment programs, as it might be necessary to intensify efforts to treat alcohol use disorders in periods of high unemployment (Ruhm 1995; McLellan et al. 2000). Finally, expanded regulatory oversight by federal and state governments could lead to more layoffs and higher unemployment in the private sector, at least in the short-term. If this action is followed by increases in problem drinking, then the associated externalities might offset the regulation's beneficial effects (Ettner 1997).

Literature Review

A vast literature examines the effects of a declining economy on various health indicators (for a recent and comprehensive review, see Catalano et al. 2011). This literature has developed along two different yet interconnected lines of research. The first uses state or national-level data to analyze the net effect of a declining economy on population health. A second track examines the effects of an economic downturn on individual health outcomes by analyzing individual-level data.

Several studies find that involuntary job loss increases the risk or severity of depression and anxiety symptoms (Paul and Moser 2009). While job loss or declining incomes seem to increase violent behavior among those directly affected, such behaviors are less common in the employed population, possibly due to a fear of employer retribution (Catalano et al. 1993b; Catalano et al. 1997; Catalano et al. 2002; Kessell et al. 2006; Catalano et al. 1999). A considerable amount of research shows that economic decline increases the incidence of suicide (Fergusson et al. 2007; Khan et al. 2008; Kposowa 2001; Lewis and Sloggett 1998; Qin et al. 2003; Yang 1992; Tapia 2005). Results are less clear when considering economic conditions and cardiovascular health (Gallo et al. 2004; Gallo et al. 2006; Martikainen et al. 2008; Gerdtham and Ruhm 2006; Ruhm 2007) or infant mortality (Bruckner 2008; Cutler et al. 2002; Friedman and Schady 2009; Paxson and Schady 2005). However, job loss seems to increase the risk of premature mortality among adults (Eliason and Storrie 2009; Lundin et al. 2010; Osler et al. 2003).

While several studies have explored the impact of alcohol use on employment status (Feng et al. 2001; Johansson et al. 2007; Kenkel and Ribar 1994; MacDonald and Shields 2004; Mullahy and Sindelar 1996), these findings are also inconsistent. Some studies suggest that alcohol abuse/misuse increases the probability of being unemployed (Johansson et al. 2007; MacDonald and Shields 2004; Terza 2002), while others contradict these results or do not find a statistically significant relationship between alcohol abuse and employment status (Feng et al. 2001; Mullahy and Sindelar 1996).

Although most of these authors acknowledge the possibility of reverse causality (i.e., unemployment affecting alcohol use), few have rigorously examined the issue. Most early

studies on this topic find that alcohol use decreases when the unemployment rate increases. Brenner (1979) uses aggregate data to show that, in the long term, alcohol consumption per capita increases with personal income even though, in the short term, alcohol use increases shortly after recessions. Ruhm (1995), using fixed-effects estimation with state-level panel data from 1975 to 1988, finds that per-capita alcohol consumption is pro-cyclical. He argues that the income effect offsets any increases in alcohol use that may be caused by the emotional stress of experiencing financial difficulties.

Freeman (1999) reexamines Ruhm's (1995) findings using an extended state panel from 1970 to 1995. Results show that Ruhm's estimates are subject to large variation and can change signs when choosing alternative sample periods. While Freeman's results generally confirm Ruhm's primary hypothesis that alcohol consumption is pro-cyclical, they raise questions about the stability of the estimates.

All of these early studies use aggregate data on alcohol consumption and show a pro-cyclical relationship with the macro economy. During a recession, however, overall alcohol use might decrease due to reduced consumption by moderate and light drinkers, but such a reduction might mask increased consumption by heavy drinkers. These group-specific differences in drinking behavior are important because recent evidence suggests that the more severe consequences of alcohol use are concentrated among heavy drinkers. Furthermore, the epidemiological, medical, and economics literatures report a variety of benefits, mainly reduced stress and a lower risk of cardiovascular disease, related to moderate alcohol use (French and Zavala 2007; Peele and Brodsky 2000; Shaper 1993).

A growing body of literature analyzes individual-level data on labor market status and alcohol consumption. Two studies (Janlert and Hammarstöm, 1992; Hammer, 1992) use longitudinal data on young people from Sweden and Norway to examine the relationships between alcohol use and unemployment. Janlert and Hammarström (1992) find a positive correlation between unemployment and drinking, while Hammer (1992) finds that unemployment does not affect alcohol use. Catalano et al (1993a) use panel data to show that alcohol abuse is associated with being laid off from a job. Ettner (1997) analyzes cross-sectional data from the 1988 National Health Interview Survey. Recognizing the possibility that important unobserved factors that affect both drinking behavior and employment status might bias the estimated coefficients, she uses an identification strategy that relies on cross-state variation in unemployment rates. She finds that non-employment reduces alcohol consumption and dependence but that the effects of unemployment per se are mixed: job loss increases alcohol use in the overall sample, but it reduces dependence symptoms in individual respondents. Using data from the National Longitudinal Survey of Youth, Dooley and Prause (1998) find that job loss is positively associated with alcohol misuse. Gallo et al. (2001) find a modest effect of job loss on subsequent alcohol consumption among respondents who were abstainers at baseline. Khan et al (2002) analyze both cross-sectional and longitudinal data and find that short-term unemployment is related to a reduction in drinking, while long-term unemployment increases alcohol use. Mossakowski (2008) finds that longer unemployment spells during a 13-year period are a risk factor for heavy drinking.

Some studies employ state fixed-effects models using data from the Behavioral Risk Factor Surveillance System (BRFSS), which consists of repeated cross-sectional surveys. Using the 1984 to 1995 cross-sections of BRFSS, Dee (2001) confirms earlier findings that overall drinking decreases during economic downturns. However, he also finds the contradictory result that binge drinking is counter-cyclical. Ruhm and Black (2002) argue that this inconsistency could stem from the fact that early BRFSS waves contain data on a selected number of states, a critical limitation of state fixed-effects estimation. They improve on Dee's (2001) study by using BRFSS data from 1987 to 1999 and by controlling for several

additional confounders. Their study confirms that when state unemployment rates increase, overall drinking decreases, largely due to changes among existing drinkers. Their results also suggest that decreases in drinking during bad economic times are concentrated among heavy drinkers, whereas light drinkers increase their use. Arkes (2007) uses data from 1996 to 2004 from the National Longitudinal Survey of Youth to examine the impact of economic conditions on substance use among adolescents. In contrast to earlier studies on adults, Arkes finds some evidence that a weaker economy is linked to increased adolescent drinking. Similarly, Dávalos and French (2011) examine data from 2001–2006 and find that various forms of adult problem drinking (e.g., driving while impaired, binge drinking) increase when the unemployment rate increases.

Although most of the existing studies find that overall alcohol consumption is pro-cyclical, several authors find contradictory results when considering more harmful drinking behaviors (Arkes 2007; Dee 2001; Dávalos et al. 2011). However, these effects are not differentiated by individual employment status (i.e., employed versus unemployed), type of unemployment (i.e., voluntary versus involuntary), or duration of unemployment. An overall decrease in drinking during economic downturns could mask increased drinking among those who lose their jobs for performance reasons.

The main objective of our paper is to extend the existing literature by further examining the impact of unemployment on various alcohol consumption patterns. Unlike much of the previous research, our study examines the link between individual employment status changes and drinking behavior at the individual level.

Data and Measures

Sample

We analyze data from Waves 1 and 2 of the NESARC, a longitudinal study collecting information on non-institutionalized citizens and non-citizens living in the United States who were 18 years or older at Wave 1. The survey includes people living in households, military personnel living off base, and residents of boarding or rooming houses, non-transient hotels and motels, shelters, facilities for housing workers, college quarters, and group homes.

A total of 43,093 respondents were interviewed face-to-face through computer-assisted personal interviewing in 2001 and 2002. Of those respondents interviewed in Wave 1, 34,653 were re-interviewed in 2004 and 2005 as part of Wave 2. The overall survey response rate was 81% in Wave 1, which is equal to or higher than most national co-morbidity surveys (Division of Health Interview Statistics, National Center for Health Statistics 2004). Missing data due to item non-response was corrected through hot-deck imputation, a process whereby other information from the individual or another respondent with similar characteristics was used to impute a response for that item. Waves 1 and 2 of the NESARC provide detailed information on topics concerning alcohol and illicit drug use, abuse, and dependence. For additional information on the NESARC, see Grant et al. (2004, 2008) and Ruan et al. (2008).

The analysis sample for the present study includes 6,631 women and 7,775 men between the ages of 21 and 60 (inclusive) in Wave 1. We set the age thresholds at these points to exclude those who were below the legal drinking age in the U.S. and those who would near typical retirement age in Wave 2. The analysis sample also excluded observations with missing information for the key variables used in the analysis in either wave. Finally, we dropped women who were pregnant at any time during the past year and all respondents who reported that they were retired, full- or part-time students, or full-time homemakers. We

excluded these categories of respondents in order to construct a more homogenous comparison group, which allowed us to compare the drinking patterns of those unemployed during the past year with those employed during the same time period.

Variables

Alcohol use—To fully understand the relationships between alcohol use and unemployment, we selected three measures of alcohol use during the past year: average daily ethanol consumption, number of binge drinking days, and a diagnosis of alcohol abuse and/or dependence. The NESARC survey calculates the average daily volume of ethanol (in ounces) based on the respondents' answers to questions about their past year consumption of four types of alcoholic beverages: coolers, beer, wine, and spirits. For each type of beverage, interviewers asked about the frequency of drinking during the past year, the number of drinks consumed on a typical day, and the type/brand usually consumed. The NESARC administrators used these answers and the ethanol content by volume of beverage brand usually consumed to calculate the volume of ethanol consumed during the past year for each of the four types of beverages. Then, they added the numbers across the four types of beverages and divided by 365 to obtain the average daily volume of ethanol. The number of binge drinking days is equal to the number of days on which male (female) respondents drank five (four) or more drinks during the past year. Finally, we constructed a dichotomous variable indicating a diagnosis of abuse and/or dependence in the past year. Alcohol abuse and dependence diagnoses follow the criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) of the American Psychiatric Association (APA 1994).

Unemployment—The key regressor is a dichotomous variable equal to one if the respondent reported being unemployed and looking for work for more than one month during the past year and zero otherwise. These are respondents who lost their jobs at any time during the past year regardless of their employment status at the end of the year (i.e. at the interview date). As mentioned before, our analysis sample consisted of respondents who were in the labor force as we excluded respondents who reported that they were retired, full- or part-time students, full-time homemakers, and women who were pregnant at any time during the past year. Unfortunately, the NESARC does not distinguish between those who were fired or laid off from those who left their jobs voluntarily. However, we conduct a sensitivity test using an alternative unemployment measure based on a question that asks whether the respondent was "fired or laid off from job in the last 12 months."

Control variables—The models with pooled panel data included the following covariates: age, race/ethnicity (African American, American Indian/Alaska Native, Asian or Pacific Islander, and Hispanic), marital status (an indicator for the combined group of divorced, separated, or widowed and a separate indicator for never married, with married as the comparison group), number of household members, number of years of schooling, inflation- and cost-of-living-adjusted total annual household income, residence in a Metropolitan Statistical Area (MSA), whether the individual was born outside the U.S., general health and mental health scales, current smoking status, and use of illicit drugs in the past year. Only the time-varying measures listed above were added to the fixed-effects specifications. Finally, we included state-specific, cost-of-living-adjusted prices of beer, wine, and spirits from the American Chamber of Commerce Researchers Association (ACCRA 2007) as well as state dummies to capture any remaining unobserved state heterogeneity.

Descriptive statistics

Table 1 presents summary statistics for the variables used in the analysis by gender and wave. As expected, men and women display quite different mean values for all the alcohol

use measures. The average daily ethanol consumption for men (0.608 ounces) is almost three times as large as the average value for women (0.210 ounces). The mean number of binge drinking days is 24.05 for men compared to 9.44 for women, and 14.94% of men were diagnosed with alcohol abuse and/or dependence in the past year compared to only 6.55% of women.

About 9% of men were unemployed and looking for work for more than one month during the past year at Wave 1. This figure increased to almost 10% in Wave 2. The unemployment rate for women similarly increased about one percentage point, from 8% to 9%, between the two waves.

Econometric Approach

Because nationally representative longitudinal or panel data with good measures for substance use and related consequences are rare, most analysts estimate single-equation models (e.g., Ordinary Least Squares) or some extension (e.g., IV estimation) with cross-sectional data. For this reason, depending on the type of outcome variable being analyzed (e.g., continuous, count, or dichotomous), we first estimate OLS, negative binomial, or logit models with pooled data to establish a benchmark for the fixed-effects models. The basic linear specification with pooled panel data from the two waves is as follows:

$$A_{it}^{*}=\beta_0+\beta_1 U_{it}+\beta_2 X_{it}+\beta_3 S_{it}+u_i+e_{it}, t=1, 2 \quad (1)$$

where A_{it}^{*} is a latent measure of alcohol use for individual i in wave t, U_{it} is a dichotomous measure of unemployment, X_{it} is a vector of control variables, S_{it} is a vector of state dummies, u_i represents unobserved individual factors that do not vary over time, e_{it} is a random time-varying error, and β ’s are coefficients to be estimated.

When A_{it}^{*} is not observable, we can define a dichotomous variable (A_{it} = 1 if $A_{it}^{*}>0$ and A_{it} = 0 otherwise) and estimate the above relationship using the logit technique. If A_{it}^{*} is observable and continuous ($A_{it}=A_{it}^{*}$), we can estimate Equation (1) with OLS. Estimation of single-equation models such as Equation (1) generates consistent coefficient estimates if there are no unmeasured or unobservable characteristics that are significantly correlated with our alcohol use measures and the indicator variable for unemployment (Wooldridge 2002). Theoretically, however, there are reasons to believe that this is not the case. Examples of such variables include pre-existing personality traits or time preferences (i.e., high discount rates) that encourage risky behavior and discourage investment in health. If u_i is correlated with the unemployment variable, estimates of the β ’s will be biased, and results could lead to inappropriate policy recommendations.

The two most common ways to control for the potential endogeneity of the employment status variable are to estimate longitudinal models or to implement instrumental variable (IV) methods (e.g., Ettner 1997). Since the NESARC is a panel dataset, we selected the former and implemented a fixed-effects approach as our core model. The fixed-effects approach is an efficient way to control for unobserved, omitted, and time-invariant factors (e.g., person-specific traits) because they drop out of the estimating equation. We intended to estimate fixed-effects IV models as well, but it proved difficult to obtain highly predictive and excludable instruments for unemployment. In this case, proceeding with weak instruments would have probably introduced more bias than it would have removed (French and Popovici 2011).

The fixed-effects model is obtained by averaging Equation (1) over time for each of the i individuals (Wooldridge 2002):

$$\bar{A}_i=\beta_0+\beta_1\bar{U}_i+\beta_2\bar{X}_i+\beta_3 S_i+u_i+\bar{e}_i \quad (2)$$

Because S_i and u_i are fixed over time, they remain in Equation (2). Next, subtract Equation (2) from Equation (1) for each t:

$$A_{it}-\bar{A}_i=\beta_0+\beta_1\left(U_{it}-\bar{U}_i\right)+\beta_2\left(X_{it}-\bar{X}_i\right)+\left(e_{it}-\bar{e}_i\right), t=1,2 \quad (3)$$

The unobserved individual heterogeneity included in u_i drops out of Equation (3) along with all time-invariant variables, generating a consistent estimate of the coefficient for employment status (Wooldridge 2002). When the outcome under analysis is continuous, we conducted fixed-effects OLS estimation. When the dependent variable is binary, we used a conditional fixed-effects logit model that assumes a logistic distribution for the disturbance term. We used the conditional fixed-effects negative binomial model for a count dependent variable.

The fixed-effects model can neither account for individual unobservable factors that vary over time nor address potential reverse causality from alcohol use to unemployment (Wooldridge 2002). In other words, finding significant associations between unemployment and alcohol consumption cannot be taken as definitive evidence that being unemployed causes people to drink more since it is possible that alcohol misuse leads to job loss (Johansson et al. 2007; MacDonald and Shields 2004; Terza 2002). IV estimation methods are superior in this respect, as they can address reverse causality (Angrist and Pischke 2009). Although it is a powerful tool when used correctly, IV estimation comes with a steep price if the instruments are weak (French and Popovici 2011). We discuss our attempt to implement IV methods in the Sensitivity Analyses section.

Many studies have shown that men and women have different consumption patterns and experience different effects from alcohol (Caetano 1994; Hupkens et al. 1993; Robbins and Martin 1993; Wilsnack et al. 2000). Moreover, several studies have found significant gender differences in the relationships between alcohol consumption and labor market outcomes (Mullahy and Sindelar 1991, 1992, 1996) as well as the behavioral determination of labor force participation (DiCecio et al. 2008; Hotchkiss 2006; Juhn and Potter 2006). Kulik (2000) finds that gender has a significant effect on attitudes and reactions to unemployment. Thus, we follow the substance use and labor economics literatures and estimate separate models for men and women.

Estimation Results

Table 2 reports selected estimation results for the effect of unemployment on our three alcohol use measures for men (top panel) and women (bottom panel). We report coefficient estimates using pooled panel data to create a point of comparison with earlier studies, and we report baseline values for the dependent variables to provide a reference point for assessing the practical significance of the coefficient estimates. Overall, the coefficient estimates are always positive (OLS specifications) or above one (incident rate ratios [IRRs][1] from negative binomial and odds ratios [ORs] from logit specifications), suggesting a positive association between unemployment and drinking. The majority of the pooled panel

[1]IRRs are the exponentiated coefficients and represent the difference in the rate of binge drinking days predicted by the model when the variable of interest is increased by one unit above its mean value (e.g., becoming unemployed) while all other variables are kept constant at their means (see Table 1 for the means and units of measure for all variables used in the analysis). A value greater than one indicates a positive relationship between the rate of binge drinking days and the particular regressor, and a value less than one indicates the opposite.

estimates are statistically significant at the 5% level or better. When we employ the fixed-effects techniques, most of the coefficient estimates become smaller in magnitude, supporting our hypothesis that important omitted individual factors might have biased the results of some earlier studies. Nevertheless, the results are consistent in direction with the pooled panel regressions, and all but one of the estimated coefficients remain statistically significant at conventional levels.[2]

Quantitatively, we focus on the fixed-effects estimation results. The findings for men show that being unemployed in the past year is associated with a 0.261 ounce increase in daily ethanol consumption. This represents a large fraction (about 43%) of the average daily ethanol consumption for the men in our sample. The conditional fixed-effects negative binomial and logit models do not use the observations that lack within-group variation in the dependent variable, thus reducing the sample size to 7,418 observations for the binge drinking days model and 2,416 for the alcohol abuse and/or dependence model. Men who were unemployed during the past year have an estimated binge-drinking rate 1.119 times greater than men who were employed, with the men in our sample engaging in a mean of 24.06 binge drinking days per year. Men who were unemployed during the past year have 31.6% higher odds of being diagnosed with alcohol abuse and/or dependence.

For women, being unemployed in the past year is associated with a 0.107 ounce increase in daily ethanol consumption (about half of the average daily ethanol consumption for women in our sample). For the reasons stated above, the conditional fixed-effects negative binomial and logit models use 4,006 and 1,006 observations, respectively. For women, unemployment during the past year increases the rate of binge drinking days by 19.2%, with the average woman in our sample engaging in 9.44 binge drinking days per year. Unemployed women have 67.4% greater odds of being diagnosed with an abuse and/or dependence condition in the past year, compared to a baseline prevalence of 6.5%.

Table 3 presents full estimation results for average daily ethanol consumption during the past year. Smoking or using illicit drugs during the past year is associated with an increase in average daily ethanol consumption, which is consistent with intuition and the empirical literature. The number of persons in the household, residence in an urban area for men, and a better mental health status are associated with less drinking. Most of the cost-of-living-adjusted alcohol prices are not significantly related to daily ethanol consumption, possibly due to measurement error in these variables (Young and Bielinska-Kwapisz 2003).

Sensitivity Analyses

We conducted several sensitivity tests to examine the robustness of our findings.[3] First, we re-estimated all models using a larger sample, including groups that we previously excluded from the analysis: retired respondents, full- or part-time students, full-time homemakers, and women who were pregnant at any time during the past year. We initially excluded these categories because most of these individuals were out of the labor force for at least part of the past year. Even with this larger and more heterogeneous sample, the estimates are similar in direction and statistical significance to those obtained from our core analysis. To examine robustness from the other direction, we then dropped those currently employed part time from the original sample and re-estimated all models. Again, the results are consistent with those obtained in the core analysis.

[2]The estimated IRR for unemployed in the alcohol abuse and/or dependence specification for men is significant at the 10% level.
[3]We do not report most of the results in the tables, but will provide them upon request.

Second, we re-estimated all models with an alternative measure of unemployment: a dichotomous variable equal to one if the respondent reported "being fired or laid off" during the past year. This is a rather unconventional definition of unemployment because some people who are fired or laid off will be able to find work quickly and those who become unemployed after leaving a job voluntarily are not included. Despite this caveat, for men, the results are smaller in magnitude but consistent in direction and statistical significance to our core model. For women, the coefficient estimates are similar in direction, but they are much smaller in magnitude and generally not statistically significant. Although it would have been interesting to conduct separate analyses for those fired and laid off, the NESARC questions do not allow for such a distinction.

Third, we argued earlier that the emotional distress and financial hardship associated with job loss is one of the mechanisms through which unemployment could prompt an increase in alcohol use. Our core model controls for mental health status and household income, but these measures could serve as mediators in the effect of unemployment on drinking. Thus, we dropped these two control variables and re-estimated all specifications. Again, the estimated coefficients for the unemployment variable are similar to the core model.

Fourth, we re-estimated the models in which the dependent variable is dichotomous (diagnosis of abuse and/or dependence in the past year) or count (number of binge drinking days) using linear regression. Overall, the results are consistent in direction with our core models and statistically significant at the 5% level or better, but the effect sizes are larger. According to the fixed-effects linear models for men, unemployment is associated with an extra 6.27 binge drinking days during the past year and a 2.27 percentage point increase in the probability of an alcohol abuse and/or dependence diagnosis. For women, unemployment is associated with an extra 5.18 binge drinking days during the past year and a 2.51 percentage point increase in the probability of an alcohol abuse and/or dependence diagnosis.

Fifth, we re-estimated the models with average daily ethanol consumption and annual number of binge drinking days using a first-differencing strategy with linear regression. With the exception of the unemployment variable, Wave 1 values were subtracted from Wave 2 values for all time-varying measures used in the analysis. To characterize unemployment transitions, we constructed four dichotomous variables: (1) no unemployment in Wave 1 and no unemployment in Wave 2; (2) no unemployment in Wave 1 and unemployment in Wave 2; (3) unemployment in Wave 1 and no unemployment in Wave 2; and (4) unemployment in Wave 1 and unemployment in Wave 2. We then estimated the first-difference models with the first three dummy variables, keeping the last condition as the reference group. Coefficient estimates for all variables in the average daily ethanol models are presented in Appendix Table A.[4] Compared to the reference condition (unemployment in both waves), men (women) that reported no unemployment in Wave 1 and unemployment in Wave 2 consumed 0.317 (0.195) more ounces of ethanol daily, on average. Both estimates are statistically significant at the 5% level. In comparison, going from unemployment to no unemployment is associated with lower daily ethanol consumption. However, the estimates are not statistically significant and the value for women is quite small. Compared to unemployment in both waves, employment in both waves is associated with higher daily ethanol consumption, but the estimate for men is not statistically significant and the estimate for women is only significant at the 10% level. These results are generally consistent with our core findings, suggesting that the income

[4]Results for the binge drinking models are qualitatively similar. The only exception is going from no unemployment in Wave 1 to unemployment in Wave 2 decreases the number of binge drinking episodes for men. However, the coefficient estimate is not statistically significant. These results for binge drinking are available upon request.

effect is dominant for employed individuals (relative to those unemployed in both periods) and transitioning from employment to unemployment has a large and statistically significant positive influence on alcohol consumption.

Finally, we attempted to address the endogeneity of unemployment by implementing an alternative approach: instrumental variables estimation. In contrast to fixed-effects estimation, the IV technique can address both types of unobserved individual heterogeneity, time invariant and time varying. We chose the monthly average statewide unemployment rate (obtained from the Bureau of Labor Statistics, Local Area Unemployment Statistics [LAUS] Database) as the sole instrument for our individual unemployment variable. To assure time consistency with our alcohol use and unemployment measures, we calculated the average unemployment rate in the state of residence for the 12 months prior to the interview and assigned these values to each individual accordingly. In first-stage logit regressions with pooled data, a one-point increase in the state unemployment rate is associated with a 13.23% (15.51%) increase in the odds of being unemployed for men (women). The odds ratios are statistically significant at the 5% level for both men and women. The regressions included state fixed effects that control for any other state heterogeneity, enhancing confidence in the validity of this state-level instrument. Because our key regressor, unemployment, is a dichotomous variable, we used treatment-effects models (Wooldridge 2002) of daily ethanol consumption and the state-specific unemployment rate as an instrument for the individual measure of unemployment. To preserve variation in the state unemployment rate, we replaced the wave dummy used in our core analysis with a dummy indicating the month in which the interview took place.

Consistent with our core findings, the results indicate that being unemployed increases daily ethanol consumption during the past year by 0.445 ounces for men and 0.121 ounces for women. The coefficient estimates are statistically significant at the 1% level. Although the inclusion of state fixed effects enhanced our confidence in the validity of the state-level instrument, it is still possible that the state unemployment rate might be correlated with unobserved determinants of cross-state variation in the alcohol use variable. For example, state-specific cultural attributes or social attitudes that affect the state unemployment rate could be correlated with state policies that also affect alcohol use. In this case, the IV results would be biased. Thus, we caution against placing greater confidence in the IV estimates vis-à-vis the fixed effects or first difference results.

Discussion and Conclusion

The present study re-examines the relationships between employment status and alcohol use by assuming the direction of causality runs from unemployment to drinking. We employ fixed-effects models to address the main problem encountered in this type of analysis—unobserved individual heterogeneity. This allows us to control for any time-invariant, unobserved individual characteristics that could be related to both alcohol use and unemployment.

Our results indicate that individual unemployment is a risk factor for unhealthy behavior (i.e., alcohol misuse). Specifically, we show a positive and significant association between job loss during the past year and average daily ethanol consumption, number of binge drinking days, and the probability of an alcohol abuse and/or dependence diagnosis. The fixed-effects estimates are smaller in magnitude than the benchmark pooled data estimates (with the exception of alcohol abuse and/or dependence models), suggesting the presence of endogeneity bias in the pooled data estimates. It is important to note, however, that results from the fixed-effects models may still contain residual bias if individual unobservable factors that vary over time affect alcohol use and employment status. The results of the core

models are highly robust to the use of different measures of alcohol use and are consistent in direction and significance across different empirical specifications.

This research is not without limitations and simplifying assumptions. First, our key regressor, unemployment, includes any type of job loss (e.g., voluntary, laid off, fired) and all respondents who happened to be jobless at least one month during the past year. Thus, some individuals were unemployed longer than others and for different reasons. While any type of job loss could lead to an increase in alcohol use, the length of an unemployment spell is probably an important factor. Unfortunately, the NESARC dataset does not provide information on unemployment type or duration. Future research could make significant contributions in this area if the requisite data become available.

Second, this study analyzes the effect of unemployment on alcohol use. Based on the results of our sensitivity analyses, the core results do not change when part-time workers are excluded from the sample, but it would be interesting to incorporate a more descriptive labor market variable such as the number of hours worked per week or the number of weeks worked per year. Unfortunately, detailed information on labor supply is not available in the dataset.

Third, our estimates identify the effect of unemployment on overall drinking but cannot isolate the brand substitution that could result from a change in income. For some individuals, a decrease in income could affect the quality of alcohol purchased (e.g., cheap wine or malt liquor beer) rather than the volume of ethanol. Although our ethanol volume measure is based on the beverage brand usually consumed, perhaps a better measure would be actual expenditures on alcohol, which is not available in the NESARC.

In summary, our findings suggest that job loss during the past year leads to a corresponding increase in average daily ethanol consumption, binge drinking days, and alcohol abuse/dependence diagnoses, possibly due to factors such as mental strain, financial pressure, and shame. It also appears that these psychological and emotional effects dominate any decrease in alcohol use due to reduced income caused by unemployment. Although we cannot conclusively claim that the results are causal, widespread unemployment during the current worldwide recession may be generating an ancillary public health crisis that will become more transparent during the coming years.

Acknowledgments

Financial assistance for this study was provided by the National Institute on Alcohol Abuse and Alcoholism (R01 AA015695). Thanks are due to Carmen Martinez, Christina Gonzalez, Allison Johnson, and William Russell for editorial assistance. We gratefully acknowledge Hai Fang for help with data analysis. We also thank Thomas McGuire and participants at the 2010 American Society of Health Economists conference for helpful suggestions on an earlier version of the paper. The data used to generate the results presented in the paper comes from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) which are available from the National Institute on Alcohol Abuse and Alcoholism of the National Institutes of Health.

References

American Chamber of Commerce Researchers Association (ACCRA). ACCRA Cost of Living Index. The Council for Community and Economic Research. 2007 http://www.coli.org/.

American Psychiatric Association (APA). DSM-IV, Diagnostic and Statistical Manual of Mental Disorders. ed. 4. Washington DC: American Psychiatric Association; 1994.

Angrist, Joshua D.; Pischke, Jörn-Steffen. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton, NJ: Princeton University Press; 2009.

Arkes, Jeremy. Does the economy affect teenage substance use? Health Economics. 2007; Vol. 16(No. 1):19–36. [PubMed: 16960850]

Brenner, M Harvey. Mortality and the national economy. Lancet. 1979; Vol. 314(No. 8142):568–573. [PubMed: 89569]

Bruckner, Tim A. Economic antecedents of prone infant sleep placement among black mothers. Ann.Epidemiol. 2008; 18:678–681. [PubMed: 18794008]

Caetano, Raul. Drinking and alcohol related problems among minority women. Alcohol Health and Research World. 1994; Vol. 18:233–242.

Catalano, Ralph; Dooley, David; Novaco, Raymond W.; Wilson, Georjeanna; Hough, Richard. Using ECA Survey Data to Examine the Effect of Job Layoffs on Violent Behavior. Hospital & Community Psychiatry. 1993b; 44:874–879. [PubMed: 8225302]

Catalano, Ralph; Dooley, David; Wilson, Georjeanna; Hough, Richard. Job Loss and Alcohol Abuse: A Test Using Data from the Epidemiological Catchment Area Project. Journal of Health and Social Behavior. 1993a; 34(3):215–225. [PubMed: 7989666]

Catalano, Ralph; Novaco, Raymond W.; McConnell, William. A Model of the Net Effect of Job Loss on Violence. Journal of Personality and Social Psychology. 1997; 72:1440–1447.

Catalano, Ralph; Novaco, Raymond W.; McConnell, William. Layoffs and Violence Revisited. Aggressive Behavior. 2002; 28:233–247.

Catalano, Ralph A.; Lind, Samuel L.; Rosenblatt, Abram B.; Attkisson, C Clifford. Unemployment and Foster Home Placements: Estimating the Net Effect of Provocation and Inhibition. American Journal of Public Health. 1999; 89:851–855. [PubMed: 10358674]

Catalano, Ralph A.; Goldman-Mellor, Sidra J.; Saxton, Katherine; Margerison-Zilko, Claire E.; Subbaraman, Meenakshi; LeWinn, Kaja; Anderson, Elizabeth. The Health Effects of Economic Decline. Annual Review of Public Health. 2011; 32:431–450.

Cutler, David M.; Felicia, Knaul; Rafael, Lozano; Oscar, Mendez; Beatriz, Zurita. Financial crisis, health outcomes and ageing: Mexico in the 1980s and 1990s. J. Public Econ. 2002; 84:279–303.

Dávalos, Maria E.; French, Michael T. This Recession is Wearing Me Out! Health-Related Quality of Life and Economic Downturns. Journal of Mental Health Policy and Economics. 2011; 14:61–72. [PubMed: 21881162]

Dee, Thomas S. Alcohol abuse and economic conditions: Evidence from repeated cross-sections of individual level data. Health Economics. 2001; Vol. 10:257–270. [PubMed: 11288191]

DiCecio, Riccardo; Engemann, Kristie M.; Owyang, Michael T.; Wheeler, Christopher H. Changing trends in the labor force: A survey. Federal Reserve Bank of St. Louis Review. 2008; Vol. 90(No. 1):47–62.

Division of Health Interview Statistics, National Center for Health Statistics. Centers for Disease Control and Prevention. Hyattsville, MD: U.S. Department of Health and Human Services; 2004. 2003 National Health Interview Survey (NHIS) Public Use Data Release: NHIS Survey Description.

Dooley, David; Prause, Joann. Underemployment and alcohol misuse in the National Longitudinal Survey of Youth. Journal Stud Alcohol. 1998; 59(6):669–680.

Eliason, Marcus; Donald, Storrie. Does job loss shorten life? J. Hum. Resour. 2009; 44:277–302.

Ettner, Susan. Measuring the human cost of a weak economy: Does unemployment lead to alcohol abuse? Social Science and Medicine. 1997; Vol. 44(No. 2):251–260. [PubMed: 9015877]

Feng, Weiwei; Zhou, Wei; Butler, John S.; Booth, Brenda M.; French, Michael T. The impact of problem drinking on employment. Health Economics. 2001; 10:509–521. [PubMed: 11550292]

Fergusson, David M.; Boden, Joseph M.; John, Horwood L. Unemployment and suicidal behavior in a New Zealand birth cohort—a fixed effects regression analysis. Crisis. 2007; 28:95–101. [PubMed: 17722691]

Freeman, Donald G. A note on 'Economic conditions and alcohol problems.'. Journal of Health Economics. 1999; Vol. 18(No. 5):659–668.

French, Michael T.; Popovici, Ioana. That Instrument is Lousy! In Search of Agreement when Using Instrumental Variables Estimation in Substance Use Research. Health Economics. 2011; 20(2): 127–146. [PubMed: 20029936]

French, Michael T.; Zavala, Silvana. The Health Benefits of Moderate Drinking Revisited: Alcohol Use and Self-reported Health Status. American Journal of Health Promotion. 2007; 21:484–491. [PubMed: 17674634]

Friedman, Jed; Norbert, Schady. How many more infants are likely to die in Africa as a result of the global financial crisis? Work. Pap. 5023, World Bank Policy Res. 2009:1–15.

Gallo, William T.; Bradley, Elizabeth H.; Falba, Tracy A.; Dubin, Joel A.; Cramer, Laura D.; Bogardus, Sidney T., Jr; Kasl, Stanislav V. Involuntary job loss as a risk factor for subsequent myocardial infarction and stroke: findings from the Health and Retirement Survey. Am. J. Ind. Med. 2004; 45:408–416. [PubMed: 15095423]

Gallo, William T.; Bradley, Elizabeth H.; Siegel, Michele; Kasl, Stanislav V. The Impact of Involuntary Job Loss on Subsequent Alcohol Consumption by Older Workers: Findings from the Health and Retirement Survey. J. Gerontol. 2001; 56:S3–S9.

Gallo, William T.; Teng, Hsun-Mei; Falba, Tracy A.; Kasl, Stanislav Vojtech; Krumholz, Harlan; Bradley, Elizabeth H. The impact of late career job loss on myocardial infarction and stroke: a 10 year follow up using the Health and Retirement Survey. Occup. Environ. Med. 2006; 63:683–687. [PubMed: 16798871]

Gerdtham, Ulf-G.; Ruhm, Cristopher J. Deaths rise in good economic times: evidence from the OECD. Econ. Hum. Biol. 2006; 4:298–316. [PubMed: 16713407]

Grant, Bridget; Goldstein, Rise B.; Chou, S Patricia; Huang, Boji; Stinson, Frederick S.; Dawson, Deborah A.; Saha, Tulshi D.; Smith, Sharon M.; Pulay, Attila J.; Pickering, Roger P.; Ruan, W June; Compton, Wilson. Sociodemographic and psychopathologic predictors of first incidence of DSM-IV substance use, mood and anxiety disorders: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. Molecular Psychiatry. 2008; Vol. 14(No. 11):1051–1066. [PubMed: 18427559]

Grant, Bridget F.; Stinson, Frederick S.; Dawson, Deborah A.; Chou, S Patricia; Dufour, Mary C.; Compton, Wilson; Pickering, Roger P.; Kaplan, Kenneth. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. Archives of General Psychiatry. 2004; Vol. 61(No. 8):807–816. [PubMed: 15289279]

Hammer, Torild. Unemployment and Use of Drug and Alcohol among Young People: A Longitudinal Study in the General Population. Br J Addict. 1992; 87(11):1571–1581. [PubMed: 1458036]

Hotchkiss, Julie L. Changes in behavioral and characteristic determination of female labor force participation, 1975–2005. Economic Review - Federal Reserve Bank of Atlanta. 2006:1–20. (Second Quarter).

Hupkens, Christianne L.; Knibbe, Ronald A.; Drop, Maria J. Alcohol consumption in the European Community: Uniformity and diversity in drinking patterns. Addiction. 1993; Vol. 88:1391–1404. [PubMed: 8251877]

Janlert, Urban; Anne, Hammarström. Alcohol Consumption among Unemployed Youths: Results from a Prospective Study. Br J Addict. 1992; 87(5):703–714. [PubMed: 1591521]

Johansson, Edvard; Alho, Hannu; Kiiskinen, Urpo; Poikolainen, Kari. The association of alcohol dependency with employment probability: Evidence from the population survey ‘Health 2000 in Finland.’. Health Economics. 2007; Vol. 16:739–754. [PubMed: 17186570]

Juhn, Chinhui; Potter, Simon. Changes in labor force participation in the US. Journal of Economic Perspective. 2006; Vol. 20(No. 3):27–46.

Karasek, Robert A.; Töres, Theorell. Healthy Work: Stress, Productivity, and the Reconstruction of Working Life. New York: Basic Books; 1990. p. 400

Kenkel, Donald; Ribar, David C. Alcohol consumption and young adults’ socio-economic status. Brookings Paper on Economic Activity (Micro). 1994:119–161.

Kessell, Eric R.; Catalano, Ralph A.; Christy, Annette; Monahan, John. Rates of unemployment and incidence of police-initiated examinations for involuntary hospitalization in Florida. Psychiatr. Serv. 2006; 57:1435–1443. [PubMed: 17035561]

Khan, Murad M.; Sadia, Mahmud; Karim, Mehtab S.; Mohammad, Zaman; Martin, Prince. Case-control study of suicide in Karachi, Pakistan. Br. J. Psychiatry. 2008; 193:402–405. [PubMed: 18978322]

Khan, Shaila; Murray, Robert; Barnes, Gordon. A structural equation model of the effect of poverty and unemployment on alcohol abuse. Addict Behav. 2002; 27(3):405–423. [PubMed: 12118628]

Kposowa, Augustine J. Unemployment and suicide: a cohort analysis of social factors predicting suicide in the US National Longitudinal Mortality Study. Psychol. Med. 2001; 31:127–138. [PubMed: 11200951]

Kulik, Liat. The impact of gender and age on attitudes and reactions to unemployment: The Israeli case. Sex Roles. 2000; Vol. 43:85–104.

Lewis, Glyn; Sloggett, Andy. Suicide, deprivation, and unemployment: record linkage study. Br. Med. J. 1998; 317:1283–1286. [PubMed: 9804714]

Lundin, Andreas; Ingvar, Lundberg; Hallsten, Lennart; Ottosson, Jan; Hemmingsson, Tomas. Unemployment and mortality: a longitudinal prospective study on selection and causation in 49321 Swedish middle-aged men. J. Epidemiol. Community Health. 2010; 64:22–28. [PubMed: 19289388]

MacDonald, Ziggy; Shields, Michael. Does problem drinking affect employment? Evidence from England. Health Economics. 2004; Vol. 13:139–155. [PubMed: 14737752]

Martikainen, Pekka; Netta, Maki; Markus, Jäntti. The effects of workplace downsizing on cause-specific mortality: a register-based follow-up study of Finnish men and women remaining in employment. J. Epidemiol. Community Health. 2008; 62:1008–1013. [PubMed: 18413437]

McLellan, A Thomas; Lewis, David; O'Brien, Charles; Kleber, Hebert. Drug dependence, a chronic medical illness: Implications for treatment, insurance, and outcomes evaluation. JAMA: The Journal of the American Medical Association. 2000; Vol. 284:1689–1695. [PubMed: 11015800]

Mossakowski, Krysia. Is the duration of poverty and unemployment a risk factor for heavy drinking? Social Science & Medicine. 2008; 67(6):947–955. [PubMed: 18573582]

Mullahy, John; Sindelar, Jody L. Gender differences on labor market effects of alcoholism. American Economic Review. 1991; Vol. 81:161–165.

Mullahy, John; Sindelar, Jody L. Effects of alcohol on labor market success: income, earnings, labor supply, and occupation. Alcohol Health & Research World. 1992; Vol. 16(No. 2):134–139.

Mullahy, John; Sindelar, Jody L. Employment, unemployment, and problem drinking. Journal of Health Economics. 1996; Vol. 15:409–434. [PubMed: 10164037]

Osler, Merete; Christensen, Ulla; Lund, Rikke; Gamborg, Michael; Godtfredsen, Nina; Prescott, Eva. High local unemployment and increased mortality in Danish adults: results from a prospective multilevel study. Occup. Environ. Med. 2003; 60:e16. [PubMed: 14573727]

Paul, Karsten I.; Moser, Klaus. Unemployment impairs mental health: meta-analyses. J. Vocat. Behav. 2009; 74:264–282.

Paxson, Christina; Schady, Norbert. Child health and economic crisis in Peru. World Bank Econ. Rev. 2005; 19:203–223.

Peele, Stanton; Brodsky, Archie. Exploring psychological benefits associated with moderate alcohol use: A necessary corrective to assessments of drinking outcomes? Drug and Alcohol Dependence. 2000; Vol. 60:249–250.

Peirce, Robert S.; Frone, Michael R.; Marcia, Russell; Cooper, M Lynne. Relationship of financial strain and psychosocial resources to alcohol use and abuse: The mediating role of negative affect and drinking motives. Journal of Health and Social Behavior. 1994; Vol. 35:291–308. [PubMed: 7844327]

Qin, Ping; Agerbo, Esben; Mortensen, Preben Bo. Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: a national register-based study of all suicides in Denmark, 1981–1997. Am. J. Psychiatry. 2003; 160:765–772. [PubMed: 12668367]

Robbins, Cynthia A.; Martin, Steven S. Gender, styles of deviance, and drinking problems. Journal of Health and Social Behavior. 1993; Vol. 34:302–321. [PubMed: 8034948]

Ruan, W June; Goldstein, Risë B.; Chou, S Patricia; Smith, Sharon M.; Saha, Tulshi D.; Pickering, Roger P.; Dawson, Deborah A.; Huang, Boji; Stinson, Frederick S.; Grant, Bridget F. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): Reliability of new psychiatric diagnostic modules and risk factors in a general population sample. Drug and Alcohol Dependence. 2008; 92:27–36. [PubMed: 17706375]

Ruhm, Christopher J. Economic conditions and alcohol problems. Journal of Health Economics. 1995; Vol. 14(No. 5):583–603. [PubMed: 10156503]

Ruhm, Christopher J.; Black, William E. Does drinking really decrease in bad times? Journal of Health Economics. 2002; Vol. 21:659–678. [PubMed: 12146596]

Ruhm, Christopher J. A healthy economy can break your heart. Demography. 2007; 44:829–848. [PubMed: 18232214]

Gerald, Shaper A. Editorial: Alcohol, the heart, and health. American Journal of Public Health. 1993; Vol. 83:799–801.

Tapia Granados, Jose. Recessions and mortality in Spain, 1980–1997. Eur. J. Popul. 2005; 21:393–422.

Terza, Joseph V. Alcohol abuse and employment: A second look. Journal of Applied Econometrics. 2002; Vol. 17:393–404.

Wilsnack, Richard W.; Vogeltanz, Nancy D.; Wilsnack, Sharon C.; Robert Harris, T. Gender differences in alcohol consumption and adverse drinking consequences: Crosscultural patterns. Addiction. 2000; Vol. 95:251–265. [PubMed: 10723854]

Wilson, Sarah; Walker, GM. Unemployment and health: A review. Public Health. 1993; Vol. 107:153–162. [PubMed: 8511234]

Wooldridge, Jeffrey M. Econometric Analysis of Cross Section and Panel Data. Cambridge, MA: The MIT Press; 2002.

Yang, Bijou. The Economy and Suicide: A Time-series Study of the U.S.A. Am. J. Econ. Sociol. 1992; 51:87–99.

Young, Douglas J.; Bielinska-Kwapisz, Agnieszka. Alcohol consumption, beverage prices, and measurement error. Journal of Studies on Alcohol. 2003; Vol. 64(No. 2):235–238. [PubMed: 12713197]

Appendix

Appendix Table A

First-Difference Estimation Results for Average Daily Ethanol Consumption

	Men (7,775)	Women (6,631)
Baseline mean values	0.608	0.210
No unemployment in Wave 1 → no unemployment in Wave 2	0.188	0.119*
	(0.116)	(0.070)
No unemployment in Wave 1 → unemployment in Wave 2	0.317**	0.195**
	(0.133)	(0.077)
Unemployment in Wave 1 → no unemployed in Wave 2	−0.208	−0.017
	(0.136)	(0.079)
Currently widowed, separated, or divorced	0.130	0.001
	(0.082)	(0.038)
Never married	0.064	−0.179***
	(0.103)	(0.061)
Persons in household	−0.021	−0.009
	(0.015)	(0.008)
Years of schooling	−0.013	−0.004
	(0.052)	(0.026)
Annual household income	0.000	0.000
	(0.000)	(0.000)
Reside in urban area	−0.093***	−0.001
	(0.035)	(0.018)

	Men (7,775)	Women (6,631)
General health scale	−0.004**	0.000
	(0.001)	(0.001)
Mental health scale	−0.006***	−0.001
	(0.001)	(0.001)
Current smoker	0.087*	0.220***
	(0.052)	(0.035)
Used illicit drug(s) in the past year	0.586***	0.358***
	(0.075)	(0.052)
Cost-of-living-adjusted price of spirits	−0.013	0.002
	(0.012)	(0.006)
Cost-of-living-adjusted price of beer	0.031	−0.013
	(0.042)	(0.021)
Cost-of-living-adjusted price of wine	0.009	0.001
	(0.029)	(0.015)
Constant	−0.224	−0.077
	(0.165)	(0.092)

Notes: Estimated with Ordinary Least Squares. With the exception of employment status, all variables are entered as Wave 2 minus Wave 1 values. The reference transition for employment status is unemployment in Wave 1 and unemployment in Wave 2. Standard errors in parentheses.

*Statistically significant, $p \leq 0.10$;

**Statistically significant, $p \leq 0.05$;

***Statistically significant, $p \leq 0.01$.

Table 1

Descriptive Statistics

	Men (N=7,775)		Women (N=6,631)	
Variables (past year)	**Wave 1**	**Wave 2**	**Wave 1**	**Wave 2**
Alcohol consumption and unemployment				
Average daily ethanol consumption (ounces)	0.634 (1.611)	0.581 (1.408)	0.209 (0.746)	0.211 (0.640)
Days of binge drinking[1]	24.60 (66.34)	23.51 (63.86)	9.34 (39.66)	9.54 (38.76)
Alcohol abuse and/or dependence (%)	13.90	15.97	6.03	7.06
Unemployed (%)[2]	8.80	9.88	7.93	9.12
Demographics and other characteristics				
White (%)	60.69		56.69	
African American (%)	14.57		22.35	
American Indian/Alaska Native (%)	1.67		1.67	
Asian or Pacific Islander (%)	3.12		2.65	
Hispanic (%)	19.95		16.64	
Born outside U.S. (%)	17.39		14.04	
Age	40.49 (9.64)	43.56 (9.64)	41.83 (9.50)	44.94 (9.48)
Currently married (%)	64.00	66.16	51.38	52.10
Currently widowed, separated, or divorced (%)	15.49	16.17	27.07	28.34
Never married (%)	20.51	17.67	21.55	19.56
Persons in household	2.78 (1.54)	2.96 (1.56)	2.58 (1.38)	2.71 (1.41)
Years of schooling	13.52 (3.27)	13.53 (3.27)	13.67 (3.08)	13.68 (3.08)
Annual household income[3]	58,119 (46,977)	60,069 (48,667)	50,014 (41,697)	51,803 (43,105)
Reside in urban area (%)	81.20	84.18	82.39	84.07
General health scale (SF-12)[4]	52.85	51.48	51.78	50.48

Ind Relat (Berkeley). Author manuscript; available in PMC 2014 April 01.

	Men (N=7,775)		Women (N=6,631)	
Variables (past year)	**Wave 1**	**Wave 2**	**Wave 1**	**Wave 2**
	(10.19)	(10.61)	(10.81)	(11.08)
Mental health scale (SF-12)[4]	53.39	52.97	51.02	50.62
	(9.59)	(9.71)	(10.52)	(10.48)
Current smoker (%)	35.99	32.06	25.17	23.38
Used illicit drug(s) in the past year (%)	5.39	6.47	2.41	2.93
State-level variables				
Unemployment rate (%)[5]	4.46	5.62	4.43	5.59
Cost-of-living-adjusted price of spirits[6]	19.16	19.74	19.15	19.78
	(3.74)	(4.07)	(3.81)	(4.12)
Cost-of-living-adjusted price of beer[7]	6.63	6.90	6.63	6.90
	(1.19)	(1.28)	(1.22)	(1.29)
Cost-of-living-adjusted price of wine[8]	5.35	5.50	5.37	5.54
	(1.05)	(1.24)	(1.06)	(1.25)

Notes: The sample excludes respondents who are out of the labor force. Standard deviations are in parentheses.

[1] Days of drinking 5+ (4+) drinks per episode for men (women).

[2] Unemployed and looking for work for more than one month during the past 12 months.

[3] Adjusted for inflation and cost-of-living.

[4] Scores derived from the SF-12 health survey that measures physical and social functioning, role functioning, bodily pain, general health, vitality, and mental health; ranges from 0–100; a higher score reflects a better health/mental status.

[5] The state unemployment rate was calculated as an average of the rate over the past 12 months prior to interview date.

[6] The price of a 750 ml bottle of J&B Scotch adjusted for the cost of living in each state.

[7] The price of a six pack of Heineken beer adjusted for the cost of living in each state.

[6] The price of a 1.5 liter bottle of Gallo or Livingston Cellars Chablis adjusted for the cost of living in each state.

Table 2

Selected Estimation Results for the Effects of Past Year Unemployment[1] on Past Year Alcohol Consumption

	Average Daily Ethanol Consumption[2]	Binge Drinking Days[3]	Alcohol Abuse and/or Dependence[4]
Men (n=15,377)			
Baseline mean values	0.608	24.06	0.149
Models with pooled panel data	0.391***	1.191**	1.240***
	(0.075)	(0.093)	(0.096)
Fixed-effects models	0.261***	1.119**	1.316*
	(0.051)	(0.061)	(0.200)
Women (n=13,102)			
Baseline mean values	0.210	9.44	0.065
Models with pooled panel data	0.091**	1.541***	1.418***
	(0.036)	(0.197)	(0.168)
Fixed-effects models	0.107***	1.192**	1.674**
	(0.026)	(0.094)	(0.377)

Notes: Models with pooled panel data control for survey wave, age, race, ethnicity, marital status, number of persons in the household, years of schooling, annual household income, being born outside the U.S., urbanicity, general and mental health status, smoking status, past year illicit drug use, state-level cost-of-living adjusted prices of beer, wine, and liquor, and state dummies. Standard errors are clustered at the individual level and reported in parentheses.
Fixed-effects specifications control for the following time-varying variables: marital status, number of persons in the household, years of schooling, annual household income, urbanicity, general and mental health status, smoking status, past year illicit drug use, and state-level cost-of-living adjusted prices of beer, wine, and liquor.

[1] Unemployed and looking for work for more than one month in the past year.

[2] Both pooled and fixed-effects models are estimated with Ordinary Least Squares.

[3] Models with pooled panel data are estimated with negative binomial regression. Fixed-effects models are estimated with conditional fixed effects negative binomial regression. Incidence-rate ratios are reported. For men (women), 7,418 (4,006) observations were used, as those with no variation in the dependent variable over time are dropped from conditional fixed-effects models.

[4] Models with pooled panel data are estimated with logit. Fixed-effects models are estimated with conditional fixed effects logit. Odds ratios are reported. For men (women), 2,416 (1,006) observations were used, as those with no variation in the dependent variable over time are dropped from conditional fixed-effects models.

* Statistically significant, $p \leq 0.10$;

** Statistically significant, $p \leq 0.05$;

*** Statistically significant, $p \leq 0.01$.

Table 3

Full Estimation Results for the Effects of Past Year Unemployment on Past Year Average Daily Ethanol Consumption

	Men (15,377)		Women (13,102)	
	Pooled Panel	**Fixed effects**	**Pooled Panel**	**Fixed effects**
Baseline mean values	0.608		0.210	
Unemployed	0.391***	0.261***	0.091**	0.107***
	(0.075)	(0.051)	(0.036)	(0.026)
African American	0.130**	-	−0.010	-
	(0.051)		(0.018)	
American Indian/Alaska Native	−0.049	-	−0.092*	-
	(0.129)		(0.054)	
Asian or Pacific Islander	−0.131***	-	−0.011	-
	(0.048)		(0.046)	
Hispanic	−0.012	-	−0.018	-
	(0.041)		(0.024)	
Born outside U.S.	−0.131***	-	−0.074***	-
	(0.035)		(0.020)	
Wave 1	−0.051**	-	0.009	-
	(0.024)		(0.011)	
Age	−0.002	-	−0.003***	-
	(0.002)		(0.001)	
Currently widowed, separated, or divorced	0.227***	0.118	0.019	−0.000
	(0.047)	(0.083)	(0.017)	(0.039)
Never married	0.133***	0.101	0.029	−0.173***
	(0.047)	(0.103)	(0.021)	(0.062)
Persons in household	−0.026**	−0.028*	−0.028***	−0.010
	(0.010)	(0.015)	(0.005)	(0.009)
Years of schooling	−0.015***	−0.014	0.000	−0.004
	(0.004)	(0.053)	(0.002)	(0.026)

	Men (15,377)		Women (13,102)	
	Pooled Panel	**Fixed effects**	**Pooled Panel**	**Fixed effects**
Annual household income	0.000***	0.000	0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Reside in urban area	−0.074*	−0.098***	0.035**	−0.001
	(0.040)	(0.035)	(0.015)	(0.019)
General health scale	−0.002	−0.004*	0.003***	0.000
	(0.002)	(0.002)	(0.001)	(0.001)
Mental health scale	−0.008***	−0.007***	−0.003***	−0.001*
	(0.002)	(0.002)	(0.001)	(0.001)
Current smoker	0.429***	0.105**	0.195***	0.225***
	(0.033)	(0.053)	(0.019)	(0.036)
Used illicit drug(s) in the past year	0.901***	0.568***	0.601***	0.372***
	(0.098)	(0.076)	(0.117)	(0.054)
Cost-of-living-adjusted price of spirits	−0.007	−0.004	−0.007	−0.004
	(0.023)	(0.021)	(0.010)	(0.011)
Cost-of-living-adjusted price of beer	0.047	−0.013	0.060*	0.054*
	(0.063)	(0.059)	(0.034)	(0.030)
Cost-of-living-adjusted price of wine	0.002	0.001	−0.039*	−0.037
	(0.043)	(0.047)	(0.023)	(0.024)

Notes: Standard errors in parentheses. Standard errors are clustered at the individual level in the pooled panel specifications. Pooled panel regressions also include state dummies (results not reported).

*Statistically significant, $p \leq 0.10$;

**Statistically significant, $p \leq 0.05$;

***Statistically significant, $p \leq 0.01$.