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Unemployment and alcohol-related health in Sweden

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Abstract

A large number of studies have explored the relations between unemployment and alcohol-related health, but so far there is no consensus among the results. This paper contributes to the literature by exploring how unemployment is related to overall alcohol consumption as well as to the rates of alcohol poisoning, alcohol addiction and alcohol-related liver disease. A fixed effects model is used on Swedish county-level data from 2000 to 2012. The results indicate that patterns in aggregate alcohol consumption might not reveal the actual health effects. Overall consumption was found not to be linked with unemployment, but a consistent positive relationship was found with the instance of alcohol poisoning, indicating that unemployment increases binge drinking. No significant relationship was found between unemployment and alcohol addiction or alcohol-related liver disease, suggesting that unemployment does not induce alcohol abuse that is long-term enough to develop those conditions. Additionally, this paper implies it is desirable to use morbidity rates instead of mortality rates as health proxies, and that models with lags should be explored to allow for time until the alcohol-related health effects are revealed.

Keywords: unemployment, alcohol consumption, alcohol poisoning, alcohol addiction, alcohol-related liver disease

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1. Introduction

In the long run, economic conditions are positively related with health outcomes, and historically short-term economic downturns have also been associated with increased mortality (Tapia Granados, 2005b). However, several recent studies suggest that mortality increases during economic upturns in industrial countries. One explanation is that in the short run the economy expands on the account of more intensive use of labour and health inputs with the existing technology. But the long run economic growth is supported by innovations or expansions of the capital stock so human capital is not exploited at a higher rate (Ruhm, 2005; Svensson, 2010). Alternatively, the effect can be attributed to a reduction in "over-nutrition" and the consumption of goods that are harmful to health (like alcohol) in high-income countries during downturns. At the same time, people in low-income countries often suffer from under-nutrition and the lack of health care, and the situation worsens in economically hard times (Tapia Granados, 2005b; Suhrcke & Stuckler, 2010).

By now there exists a considerable body of literature on the relations between economic conditions and health in the short run, i.e. between business cycles and health. Most of these use age- or cause-specific mortality rates as health proxies, and unemployment as a business cycle indicator. It has been argued that unemployment is not the best measure of business cycles – it lags behind actual economic decline, it does not consider cyclical movements into and out of the labour force, etc. But as Stuckler *et al.* (2009) put it, it is a measure that is closer to the everyday experience of people than e.g. GDP measures. Unemployment becomes especially relevant in one subfield of the research on health and business cycles – that related to alcohol. This is because unlike other business cycle measures, unemployment has not only an economical but also a social and a psychological dimension. At the same time, although alcohol is considered to be a normal good, it has social and psychological dimensions as well.

There is a multitude of mechanisms through which unemployment can be linked to alcohol consumption and the resulting problems. On the one hand, there is a simple income effect – unemployment decreases incomes and consumption, including alcohol consumption. On the other hand, if drinking is assumed to be stress-related, it raises the question if it is work-related or unemployment-related stress that increases alcohol consumption the most. Lastly,

alcohol has been suggested to be a complement to both leisure time and social events. As Freeman (1999) notes, an employment-related variable might be a broader measure of a person's well-being than a purely income-related measure because it is capturing also the social aspects of work (e.g. being useful to the society, belonging to a group etc.) and the social role of alcohol. In that sense it is not even important if it is the best measure of a business cycle; it is definitely worth exploring the health effects related to unemployment specifically.

However, there is no consensus among previous studies on unemployment and alcohol-related health outcomes. Even though overall alcohol consumption has most often been found to be decreasing as unemployment increases, the results are mixed with regard to problem drinking and alcohol abuse. Some studies report a procyclical and others a contracyclical pattern. Similarly, studies on unemployment and alcohol-related mortality have provided contradicting results, and in some cases no link has been found. This indicates that alcohol consumption patterns might not always reveal the actual health effects. Therefore, more research is needed before drawing any final conclusions or designing policies to mitigate the health effects of unemployment that work through alcohol consumption.

This paper contributes to the literature by exploring the links between the unemployment rate and alcohol consumption as well as the rates of three different alcohol-related diseases: alcohol poisoning, alcohol addiction and alcohol-related liver disease. To that end, a fixed effects model is used on Swedish county-level data from 2000 to 2012. It appears that unemployment is not significantly related to overall alcohol consumption, alcohol addiction or alcohol-related liver disease, but there is a significant positive link with alcohol poisoning, suggesting that binge drinking increases when unemployment increases.

The paper is structured as follows. Section 2 gives an overview of the previous literature on unemployment and alcohol-related health outcomes. That includes explaining the possible mechanisms in action as well as summarizing empirical results. Section 3 describes the model and data used in this paper. The regression results are presented and discussed in section 4. Lastly, section 5 concludes.

2. Literature review

Suhrcke and Stuckler (2010) have reviewed a great number of articles dealing with the impact of recessions on health, concluding that there is no consensus and many factors play a part in the relations between business cycles and health outcomes. The results can differ depending on whether the data is on aggregate or individual level, from rich or poor countries, covering only periods of regular economic fluctuations or also severe crises. Considering those factors, even results that at first seem contradictory might fit into the puzzle eventually. For instance, most individual-level studies report that being unemployed has adverse health effects, while aggregate-level studies often show that unemployment and health are positively related in a business cycle context. But this can be explained with the fact that even though unemployed people do have a worse health status, they are still a minority compared to the "non-unemployed" population, whose health on average improves during a recession due to e.g. decreased work-related stress or decreased consumption of harmful goods (Suhrcke & Stuckler, 2010).

One of the most researched subfield of this topic is the relations between alcohol-related health and business cycles. Davalos *et al.* (2011) note that alcohol is interesting because on the one hand, it is a normal good, but on the other hand, it has mood-altering, medicinal and addictive qualities. Another reason why alcohol use is of interest is that it is hard to predict the effect of business cycle on alcohol consumption, based on just theory. In addition, the effect of alcohol on health is not unanimous, with light to moderate consumption sometimes even considered to be beneficial to health (Ruhm & Black, 2002). However, excess consumption can have negative outcomes such as alcohol-related diseases and increased rates of accidents.

When discussing how alcohol consumption might change with business cycles, most authors attribute the effects to changes in income, leisure time and stress. Drinking may decrease during recessions simply because it is a normal good and people have less money to spend on consumption (Davalos *et al.*, 2011; Johansson *et al.*, 2006; Ruhm & Black, 2002). At the same time, during a recession there might be more time to engage in recreational activities to which alcohol consumption is often a complement (Davalos *et al.*, 2011; Dee, 2001).

Considering stress, recessions may reduce work-related stress, leading to a decrease in drinking among those who work – provided that alcohol is sometimes used as a sort of self-medication. At the same time recessions are likely to increase stress levels among those who are unemployed, and thus increase stress-related drinking (Johansson *et al.*, 2006; Ruhm & Black, 2002; Svensson, 2010). As noted by Ruhm and Black (2002), the stress-induced increase in drinking might be partially or fully offset by the decrease in earnings during a recession. And again, as the unemployed are a considerably smaller group than the employed, the effect of stress on the unemployed can be offset by the effect of stress on the employed, resulting in procyclical drinking patterns. All in all, if the stress effect can work in opposite directions, it is particularly interesting to see what the net outcome turns out to be empirically.

The effect of alcohol on health can work through different channels. Firstly, excessive alcohol consumption might lead to illnesses like liver disease, alcohol poisoning, alcohol-related mental conditions and addiction, to name a few. Secondly, under the influence of alcohol or its residuals, people are more prone to get into accidents such as car crashes or work-related accidents. Tapia Granados and Ionides (2011) report that an increase in traffic deaths during economic upturns is a robust finding across countries (see e.g. Tapia Granados, 2005b). It can partly be explained by the general increase in commuting, commercial and recreational traffic, but also to the increased alcohol consumption that occur during booms (Liu *et al.*, 2002, cited in Tapia Granados and Ionides, 2011). However, Ruhm (1995) notes that if the increase in alcohol consumption is concentrated among light drinkers, then it might not have notable health effects. Davalos *et al.* (2011) suggest that the consumption of abusive or dependent drinkers might not change much because alcohol has an addictive effect.

There is also a possibility that the link between unemployment and alcohol consumption goes the opposite direction. E.g. Mullahy and Sindelar (1996) point out that employment would decrease and unemployment increase with the occurrence of problem drinking. Although it has been documented that moderate alcohol consumption might be beneficial to health and productivity, drinking in larger amounts is linked to lower earnings and other indicators of productivity. As the authors note, simultaneity is likely to exist and there is probably at least some reverse causality. They try an IV approach to establish causality but the significance of the results is not high enough to make confident conclusions. Overall, the authors consider it reasonable to believe that short-term (cyclical) unemployment might have an effect on drinking, but not that it would actually induce alcoholism. All in all, Mullahy and Sindelar

(1996) find it plausible that the effect goes from alcohol abuse and dependence to (long-term) unemployment.

One substantial empirical study on unemployment and mortality is that of Ruhm (2000). He uses both micro and macro level data for the U.S. during 1972–1991. With aggregate data he finds that many cause-specific mortality rates are procyclical – for instance, mortality from motor vehicle accidents, which is largely associated with drunk driving. With micro data it appears that smoking and obesity increase during economic upturns, while physical activity and the healthiness of diet decrease. For alcohol consumption there is a positive relation to unemployment, but it is not statistically significant. One of the potential explanations to this controversy is that recreational drinking might increase in economic downturns, while problem drinking (e.g. binge drinking or drunk driving) decreases (Ruhm, 2000).

The suggestion that problem drinking decreases in downturns partly relies on one of Ruhm's earlier papers (1995) where he investigates the link between economic conditions and two alcohol-related health outcomes – liquor consumption and highway traffic deaths (a lot of which involve alcohol). The data he uses is from the U.S., covering 48 states during 1975–1988. Liquor consumption and alcohol-involved driving appear to vary procyclically, and a large part of the effect can be attributed to the changes in income, demonstrating that drinking and driving are normal goods. Ruhm (1995) is convinced that any stress-induced drinking in a recession is more than offset by the income effect which makes alcohol relatively more expensive to consume in economically bad times. This is in line with the findings of Krüger and Svensson (2010), whose wavelet analysis for a long period of 1861–2000 shows that alcohol sales and thus consumption[1] in Sweden increase in short-term economic expansions.

Freeman (1999) uses the same data as Ruhm (1995) but a slightly different econometrical approach (using first differences instead of levels of mortality rates) and confirms the results with greater robustness to the sample period. But it is highlighted in Freeman's paper that aggregate-level studies are not able to examine how the cyclical changes in drinking are distributed. For example, even though the overall alcohol consumption declines during a recession, it is possible that quantities increase among those who are prone to alcohol abuse, while decreasing for the part of population who consumes moderately – which is the majority (Freeman, 1999).

[1] They make the assumption of a correlation close to 1 between alcohol sales and consumption.

Ruhm and Black (2002), using U.S. individual-level data from 1987 to 1999, confirm the procyclical variation of alcohol consumption, but they also investigate the distributive effects. They find that most of the change can be attributed to the behaviour of existing drinkers, while drinking participation is insensitive to business cycles. Furthermore, they discover that a decrease in heavy drinking accounts for the overall decrease, while light drinking actually increases. At the same time, drunk driving appears to become less common in a downturn. Lastly, they find no evidence of increased drinking among people who have become newly unemployed in economically bad times. Ruhm and Black (2002) confirm Ruhm's earlier conclusion that possible stress-induced increases in drinking during economic downturns are more than compensated by declines due to changes in incomes.

Dee (2001) uses individual-level data for the U.S. 1984–1995, and also finds a procyclical movement in alcohol consumption. But especially noteworthy is the finding that binge drinking[2] is countercyclical, and the effect is quite large. This might be due to the increased economic stress during downturns, or due to the increased availability of leisure time, which may encourage binge drinking. The author suggests that the leisure time hypothesis would hold if it turned out that the increase in binge drinking is lesser among the people who retain their employment during the recession. But this is not the case and thus Dee (2001) attributes most of the effect to the overall increase in economic stress. However, the model and data, and thus the results, of this paper are actually questioned by Ruhm and Black (2002), who themselves find procyclicality of problem drinking.

There is another study that confirms the increase in problem drinking during recessions. Davalos, Fang and French (2011) use individual level panel data from the U.S. 2001–2005. They find countercyclical patterns in heavy drinking, alcohol abuse and alcohol dependence, as well as in drunk driving. The results are qualitatively robust to different demographic groups and differ somewhat only in magnitude. Thus, Davalos *et al.* (2011) are of the opinion that the stress-reducing and leisure time effects must dominate the income effect on alcohol consumption during recessions.

Johansson *et al.* (2006) examine the connection between drinking, alcohol-related mortality and business cycles using both micro and macro (county level) data for Finland 1975–2001. With macro data they find a negative relation between alcohol-related mortality and employment. The severe recession of the 1990s is, however, an exception to this general

[2] Binge drinking means that a lot of alcohol (more than five drinks) is consumed on one occasion.

trend, and there was a decrease in alcohol-related mortality at that time. The authors suggest that during a major collapse of the economy, even a Nordic welfare state is not able to shield people from the income effect that induces significant changes in health outcomes (Johansson *et al.*, 2006).

At the same time the micro data for Finland suggests that alcohol consumption actually increases during economic expansions (Johansson *et al.*, 2006). But like in the study by Ruhm and Black (2002), it seems that the probability of being an alcohol consumer does not significantly change with cycles. As a final conclusion, Johansson *et al.* (2006) suggest that alcohol-related mortality and (self-reported) alcohol consumption may not be linked in the short term. It might be possible that binge drinking, which is most strongly associated with mortality, is not captured in the survey data that was used (*Ibid.*).

Suhrcke and Stuckler (2010) point out that there might be a difference between health responses to normal business cycles and to more severe recessions. They explore several mortality measures in 26 EU countries during 1972–2006, looking at the effects of a 1% increase in unemployment compared to the effects of an increase larger than 3%. The increase in death rates from alcohol poisoning and from liver cirrhosis seems to be larger (and significant) in a recession context, i.e. when unemployment rises sharply. Suhrcke and Stuckler (2010) relate this to increased psychological problems that concur with recessions. It is noteworthy that this result is the opposite of what emerged from Finnish data, which suggested a decrease in alcohol-related mortality in a recession context.

Gerdtham and Ruhm (2006), using aggregate data from 26 OECD countries over the time period 1960–1997, find that mortality from liver disease increases when unemployment decreases; and that the effect is stronger in countries with weaker social insurance systems. Higher mortality from liver cirrhosis, as well as from traffic accidents, in economically good times are also documented by Tapia Granados (2005a) for a long time span (1920–1999) in the U.S. However, Neumayer (2004) does not find a statistically significant link between unemployment and mortality from liver cirrhosis using German state-level data between 1980 and 2000. Lastly, based on Swedish county-level data from 1976–2005, there seems to be no link between unemployment and mortality from alcohol poisoning or alcohol psychosis and addiction (Svensson, 2010).

As can be concluded from above, the most often documented pattern for total alcohol consumption is procyclicality. This has been shown in numerous studies with U.S. data, but

also Finnish and Swedish data. An implication would be that for total consumption the income effect dominates any stress effects during a recession. But different results have been obtained with regard to heavy or abusive alcohol consumption – e.g. Ruhm and Black (2002) find that it is also procyclical, while Dee (2001) and Davalos *et al.* (2011) suggest that binge and problem drinking are contracyclical, i.e. increase during recessions. That would give more support to the dominance of stress effects. All three studies use U.S. data, so it is hard to explain the results with different institutional contexts, for example.

The results from studies on alcohol-related mortality are not unanimous either. U.S. data mostly indicates procyclical alcohol-related mortality, and so does a cross-country study on OECD members. In studies using German or Swedish data no significant links have been established. But two data sets, one from Finland and one covering the EU, indicate that alcohol-related mortality might actually be contracyclical. A curious thing is that among those two studies, the one on EU data suggests that a severe recession context induces a larger increase alcohol-related mortality than a regular contraction of the economy. But the Finnish study on the contrary shows that the general contracyclical relation was reversed during an exceptional recession and alcohol-related mortality decreased during that period.

All in all, in the multitude of different datasets and methodologies there are rather few clear answers about the links between unemployment, alcohol and health. Therefore, additional contributions to the literature seem necessary to be able to draw final conclusions and to use the results in designing effective policies to increase public health.

3. Method

3.1. Model and data

The empirical part of this paper uses aggregate data in a model with fixed effects to explore the relations between unemployment and four different alcohol-related measures. The data covers all 21 counties (*län*) of Sweden from 2000–2012. Even though this is a relatively short period, a lot of research has used similarly short time spans and still found statistically significant results. The time span from 2000[3] to 2012 covers both economically better and worse times and thus creates variation in the unemployment rate which is needed to get good coefficient estimates.

Fixed effects (FE) models have frequently been applied in studies on business cycles and health that use aggregate data, including several of the studies discussed in the literature review (e.g. Ruhm (1995) and (2000), Neumayer (2004), Tapia Granados (2005), Gerdtham and Ruhm (2006), Johansson *et al.* (2006), Svensson (2010)). The advantage of this method is that it eliminates the effect of potential time-invariant idiosyncratic characteristics of each county that are assumed to be related with the outcome, such as the geographical location or general lifestyle. This reduces omitted variable bias compared to using regular OLS. The inclusion of year effects further improves the precision of the estimates by accounting for factors that might change in time and affect all counties in a similar manner, such as alcohol prices in the state monopoly of alcohol retail (*Systembolaget*) or the economic crisis in 2008.

As noted by Tapia Granados (2005a), there are some problems with panel data models with a rate as the dependent variable. Namely, rates in levels usually have strong first order positive autocorrelation as well as heteroskedasticity issues (the variance of a rate is inversely related to its denominator, i.e. the population size in each county) (*Ibid.*). To account for this, clustered standard errors have been used instead of regular ones.

[3] The share of foreign-origin population is only available since 2002.

The econometrical model takes the following form.

$$y_{it} = a_0 + a_1 u_{it} + a_2 X_{it} + \eta_i + \gamma_t + \varepsilon_{it}$$

where i and t refer to county and year, respectively;

y_{it} is (the log of) the alcohol-related variable;

u_{it} is (the log of) the unemployment rate;

X_{it} represents a vector of control variables (in logs);

η_i represents individual county effects;

γ_t represents year effects;

ε_{it} is the error term.

Alcohol-related data has been obtained from the database of the Public Health Agency of Sweden (*Folkhälsomyndigheten*). Four different dependent variables have been explored:

- alcohol sales from the state monopoly (*Systembolaget*) in litres of pure alcohol per inhabitant (for those 15 years and older);
- cases of alcohol poisoning treated in a year per 10,000 inhabitants;
- cases of alcohol addiction treated in a year per 10,000 inhabitants;
- cases of alcohol-related liver disease treated in a year per 10,000 inhabitants.

It is worth to note an upside of mortality data compared to morbidity data – virtually all death cases are registered, while not all disease cases get reported. That could be a problem if for some reason the registration rate of disease cases (as opposed to the rate of disease) depended on unemployment as well, because that effect would be included in the unemployment coefficient estimate (there would be omitted variable bias). Another notion is that the sales from the state monopoly do not capture all alcohol consumption, like drinking at bars and restaurants or alcohol bought from outside Sweden. In fact, buying alcohol from *Systembolaget* and buying it from bars/restaurants (where alcohol is more expensive) or from abroad (where it is often cheaper) might be substitutes, depending on the current economic situation. Therefore, the estimates using the sales variable may be biased but the direction of the bias is unclear.

Lastly, as discussed in the literature overview, a great limitation of studies using aggregate data is that the changes in alcohol consumption might not be unanimous. While one group of people, e.g. recreational consumers, might decrease their alcohol consumption, another group, e.g. people who are prone to abuse alcohol for some sort of stress-relief, might increase it.

Then the two effects cancel each other out to some extent. This is why it is useful to look at morbidity variables – even if assuming that the aggregate consumption changes have been pinned down precisely, higher disease rates indicate increases in problem drinking.

The unemployment rates used in this study have been obtained from the Swedish Unemployment Office (*Arbetsförmedlingen*). The variable includes the unemployed who are participating in labour market programmes as well as the idle unemployed.

The data used as controls have been obtained from Statistics Sweden. It includes the share of male population and the share of foreign-origin population[4], the age and educational structures of the population, and the mean income[5] level. The International Standard Classification of Education (ISCED97) is used to calculate the shares of people with primary[6], secondary[7] and tertiary[8] level education. As for age, the population is divided in four groups: 0–14 years (children), 15–24 years (young people, who tend to have an above-average unemployment rate), 25–64 years (the main working age) and 65+ years (the elderly, most of whom have left the labour market). The precise origin of the data can be seen in the appendix.

The reason for choosing these controls is that both unemployment and drinking behaviour are assumedly related with the gender, age, education and cultural background of people, as well as their income level. Income is especially interesting as a control (and therefore receives more attention than other control variables) because it is theoretically one of the main channels through which health outcomes could be related to unemployment. Therefore, including income in the model is expected to shift the coefficient of unemployment towards zero. At the same time income alone is probably not able to capture the entire effect of unemployment if stress and leisure time mechanisms are involved as well (Ruhm, 1995). For each alcohol-related variable, the model is estimated for six specifications – using no controls, using all of the controls, and four specifications which exclude the age structure, the education structure, the share of foreign-origin population or the mean income, respectively.

[4] Persons of foreign origin are defined by Statistics Sweden as persons who have been born outside Sweden or who have been born in Sweden but neither of their parents have been born in Sweden.
[5] This includes all income (from e.g. wages, pensions, benefits, entrepreneurship etc.) except income from capital. The variable has been deflated using CPI.
[6] ISCED97 level 1: primary and secondary education less than 9 years.
[7] ISCED97 levels 2–3: primary and secondary education 9–10 years, upper secondary education 2 years or less, and upper secondary education 3 years.
[8] ISCED97 levels 4–6: post-secondary education less than 3 years, post-secondary education 3 years or more, and post-graduate education.

For alcohol sales and alcohol poisoning the effects may be expected to appear in the same period, but this is not the case for alcohol addiction. Namely, the time to develop addiction to alcohol is very individual and depends on many factors, e.g. the quantities consumed or genetic factors. It might happen within a year of starting drinking for some people, whereas others never develop addiction even though they consume alcohol all their life (Cauldwell, 1995). Therefore, with addiction as a dependent variable, the model is estimated both when using the contemporaneous as well as some lagged values of unemployment (lags up to three years, each in a separate model).

Similarly to alcohol addiction, alcohol-related liver disease might take years to develop, depending on the individual case. There are three stages of alcohol-related liver disease (see e.g. NHS, 2014). These are alcoholic fatty liver disease, alcoholic hepatitis and liver cirrhosis. The first occurs already after a few days of heavy drinking but can be reversed in a few weeks of abstinence. Alcoholic hepatitis is the next stage which develops when alcohol is misused for a longer period. Sometimes this can be reversed as well if alcohol is given up permanently. Lastly, cirrhosis can take many years to develop, but cannot be reversed (*Ibid.*). Therefore, models with lags of unemployment are used with this dependent variable as well in order to allow for some time until the effects of the changes in alcohol consumption appear.

3.2. Descriptive statistics

This subsection provides some summary statistics of the variables used in the regressions. In addition to the mean, standard deviation, minimum and maximum, the "between" and "within" statistics are reported as well. The between standard deviation refers to variation in the county means (mean value of observations across time in the same county, $\bar{x}_i$), while the within standard deviation refers to variation in the deviations from each county's mean ($x_{it} - \bar{x}_i + \bar{x}$, where the overall mean $\bar{x}$ has been added back in order to make the results comparable). The between and within minimum (maximum) refer to the smallest (largest) county mean ($\bar{x}_i$) and deviation from county mean ($x_{it} - \bar{x}_i + \bar{x}$), respectively.

The data presented in Table 1 has not been weighed by population sizes in each county, so the means over counties will not be exactly equal to the country-level mean values of the variables. However, the actual differences in the means of weighted and unweighted data are very small. There are 273 observations for each variable (21 counties over 13 years), except

for the share of foreign-origin population, for which there are 231 observations (21 counties over 11 years).

Table 1. Descriptive statistics

Variable		Mean	Std. Dev.	Min	Max
Alcohol sales (litres per person for population over 15)	overall	5.3	1.3	2.9	9.8
	between		1.2	3.5	8.0
	within		0.6	3.1	7.1
Alcohol poisoning (cases per 10,000 inhabitants)	overall	14.9	4.8	6.7	37.0
	between		3.8	8.5	24.3
	within		3.0	6.0	27.7
Alcohol addiction (cases per 10,000 inhabitants)	overall	20.4	7.5	5.6	40.8
	between		6.4	10.9	37.9
	within		4.2	7.9	40.8
Alcohol-related liver disease (cases per 10,000 inhabitants)	overall	5.4	1.5	2.3	9.5
	between		1.2	3.5	9.0
	within		1.0	2.8	8.4
Unemployment rate (%)	overall	6.0	1.6	2.7	10.1
	between		1.2	3.8	8.1
	within		1.1	3.2	8.5
Share of male population (%)	overall	49.8	0.4	48.9	50.8
	between		0.4	49.2	50.7
	within		0.1	49.5	50.2
Share of foreign-origin population (%)	overall	13.2	5.4	4.8	29.5
	between		5.4	5.4	26.4
	within		1.4	10.0	16.8
Share of 15–24-year-old population (%)	overall	12.7	0.9	10.8	15.1
	between		0.7	11.8	14.3
	within		0.7	11.2	13.7
Share of 25–64-year-old population (%)	overall	51.5	1.4	48.7	56.5
	between		1.1	50.3	55.6
	within		0.8	49.4	52.5
Share of over 64-year-old population (%)	overall	19.0	2.0	14.0	23.5
	between		1.7	14.4	21.2
	within		0.9	17.2	22.2
Mean income (thousand SEK in year 2000 value)	overall	186.8	15.5	151.2	248.5
	between		11.9	168.1	231.1
	within		10.3	164.4	206.4
Share of population with primary level education (%)	overall	27.3	4.9	19.2	43.3
	between		4.4	22.5	39.0
	within		2.2	22.5	31.7
Share of population with tertiary level education (%)	overall	10.1	3.0	4.0	17.5
	between		1.8	5.4	12.6
	within		2.4	5.8	15.3

The mean value for alcohol sales is 5.3 litres per person (for population over 16). There is considerable variation between counties, but notably less within counties. This can be seen from comparing both the standard deviations and the difference between min and max values. The mean number of cases of alcohol poisoning is nearly 15 per year per 10 000 inhabitants. The between-county values are somewhat more dispersed around the mean as can be seen from the standard deviation, but the within-variation has more extreme values. The average number of cases of alcohol addiction is about 20 per year per 10 000 inhabitants. The between-county values are notably more dispersed than the within-county ones, although the latter has more extreme values. Lastly, there are on average 5 cases of alcohol-related liver diseases per year per 10 000 inhabitants, and here the between and within variations do not differ that much.

The mean unemployment rate is 6% with a standard deviation of 1.6. It can be seen that there is almost as much variation within counties as between counties (standard deviations 1.1 and 1.2, respectively), and the difference between the min and max is actually larger within counties than between. For the fixed effects model to work there has to be enough within-variation in the explanatory variable to be able to identify a relationship. This criterion seems to be fulfilled for the main independent variable, unemployment.

Among control variables, the mean income level is the most interesting, considering that it is expected to be one of the mechanisms through which unemployment and alcohol consumption are related. Its mean value is 186.7 thousand Swedish kronas (in year 2000 value, deflated with the CPI) with a standard deviation of 15.5. It appears the between-variation is somewhat larger than the within-variation with standard deviations of 11.9 and 10.3, respectively. Yet, the latter seems sufficient to obtain reasonably good coefficient estimates and draw conclusions on the possible income effects.

4. Results

Alcohol sales

As can be seen from column (1) in Table 2, there is a negative relationship between unemployment and alcohol sales if no controls (except county and time fixed effects) are included in the model. If unemployment increases 1% then alcohol sales decreases 0.12%. The result is statistically significant on a 10% level. However, this relationship probably includes the effects of several confounders.

Table 2. Links between unemployment and alcohol sales

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment	-0.122*	-0.037	0.004	-0.058	-0.056	-0.033
	(0.098)	(0.363)	(0.917)	(0.244)	(0.170)	(0.394)
Share of males		-0.337	0.323	-2.822	-1.883	-0.301
		(0.867)	(0.886)	(0.459)	(0.485)	(0.879)
Share of foreigners		-0.167	0.056	0.211		-0.162
		(0.176)	(0.678)	(0.236)		(0.186)
Share of young		-0.764*		-0.331	-0.122	-0.746*
		(0.096)		(0.426)	(0.649)	(0.077)
Share of adults		-1.978*		0.175	-1.132	-2.006*
		(0.057)		(0.873)	(0.295)	(0.059)
Share of elderly		-0.999***		-0.458	-0.639**	-1.003***
		(0.003)		(0.361)	(0.016)	(0.003)
Mean income		-0.092	0.088	0.384	0.291	
		(0.821)	(0.823)	(0.579)	(0.483)	
Share of primary educ.		1.406***	1.213***		0.888**	1.395***
		(0.002)	(0.003)		(0.013)	(0.001)
Share of tertiary educ.		-0.625***	-0.488***		-0.589***	-0.625***
		(0.000)	(0.003)		(0.001)	(0.000)
Constant	1.796***	12.446	-3.943	11.596	12.100	11.893
	(0.000)	(0.236)	(0.690)	(0.422)	(0.307)	(0.226)
Observations	273	231	231	231	273	231
Adjusted R^2	0.981	0.990	0.988	0.985	0.987	0.990

All variables are in log form. All specifications include both county and year fixed effects (not reported here).
*, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.
P-values are provided in parentheses.

The next column (2) includes a number of controls that are potentially linked with both unemployment and alcohol-related behaviour. Now the coefficient of unemployment becomes insignificant, as well as considerably smaller in value, so it is easy to conclude that unemployment in itself has no relation to alcohol sales. The coefficients for education variables are highly significant and indicate that an increase in the share of people with just

primary education is associated with larger alcohol sales, whereas an increase in the share of people with tertiary education results in lower sales on average.

The coefficients for all age structure variables in specification (2) are negative and significant. At first it might not seem logical that alcohol sales decreases as the share of any of the older age groups increases (compared to the share of children under 15), but this can be explained by how the dependent variable is constructed. As the sales value is given in litres per inhabitants aged 15 and above, it might happen that if there are actually no substantial differences in consumption by age then the denominator of that measure would increase, from which results a decrease in the measure itself.

In columns (3)–(6), each of the specifications excludes one variable or group of variables – age structure, educational structure, foreign origin and mean income level, respectively. The coefficient of unemployment is insignificant in all specifications. It can also be seen that the coefficient results are quite robust for the education variables, and to some extent for the age variables. Interestingly, the coefficient for mean income is never even close to being significant, so similarly to unemployment it appears not to be linked with alcohol sales.

It was discussed previously that the finding of no link between alcohol consumption (proxied by sales) and unemployment does not necessarily mean that alcohol-related behaviour does not change when the unemployment level does. The effect could be zero in sum if, for instance, heavy drinking decreases, but light drinking increases, or vice versa. However, the "crude" relationship (without controls) is in accord with the negative relationship between unemployment and alcohol consumption documented by Krüger and Svensson (2010) for Sweden, as well as Ruhm (1995), Freeman (1999) and Dee (2001) for the U.S, and Johansson *et al.* (2006) for Finland.

Alcohol poisoning

As can be seen from Table 3, there is a significant positive relationship between unemployment and the instance of alcohol poisoning and the coefficient is remarkably stable across the different model specifications. A 1% increase in the unemployment rate is associated with a 0.6–0.7% increase in alcohol poisoning. Even though different sets of controls alter the coefficient of unemployment a little bit, the controls themselves are almost

never significant (except for the share of elderly people in specifications (2) and (6), which is negatively associated with alcohol poisoning).

Table 3. Links between unemployment and alcohol poisoning

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment	0.615**	0.747**	0.760**	0.610*	0.755**	0.635**
	(0.012)	(0.031)	(0.012)	(0.090)	(0.018)	(0.040)
Share of males		12.801	8.545	10.116	18.281	11.560
		(0.316)	(0.485)	(0.408)	(0.248)	(0.403)
Share of foreigners		-0.912	-0.428	-0.902		-1.099
		(0.322)	(0.643)	(0.140)		(0.220)
Share of young		0.923		0.203	2.985	0.332
		(0.697)		(0.941)	(0.171)	(0.901)
Share of adults		-10.148		-8.846	-9.177	-9.184
		(0.275)		(0.355)	(0.269)	(0.321)
Share of elderly		-4.141*		-3.589	-2.578	-4.005*
		(0.083)		(0.145)	(0.187)	(0.099)
Mean income		3.100	0.868	2.150	5.350	
		(0.520)	(0.871)	(0.630)	(0.280)	
Share of primary educ.		-1.823	-1.831		-0.910	-1.470
		(0.380)	(0.476)		(0.457)	(0.468)
Share of tertiary educ.		-0.709	0.122		-0.381	-0.714
		(0.598)	(0.918)		(0.724)	(0.573)
Constant	2.140***	-4.332	-27.723	-1.179	-57.210	14.344
	(0.000)	(0.955)	(0.559)	(0.988)	(0.478)	(0.862)
Observations	273	231	231	231	273	231
Adjusted R^2	0.719	0.763	0.751	0.760	0.732	0.762

All variables are in log form. All specifications include both county and year fixed effects (not reported here).
*, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.
P-values are provided in parentheses.

This positive relationship between unemployment and alcohol poisoning complies with the findings of Dee (2001) and Davalos *et al*. (2011) who document increased binge drinking and heavy drinking, respectively, in the U.S. when unemployment increased. In addition, it is interesting to note that Svensson (2010) did not find evidence of any significant link between unemployment and mortality from alcohol poisoning in Sweden. This illustrates the advantage of using a morbidity variable instead of a mortality variable – disease does not necessarily end with death but still means a considerable decrease in people's quality of life so it is important to explore these effects.

Alcohol addiction

With addiction as a dependent variable, the regressions are estimated both when using the contemporaneous as well as some lagged values of unemployment (lags up to three years, one

at a time) to allow time for the alcohol addiction to develop after the changes in alcohol-related behaviour. None of those estimations, regardless of what lag of unemployment to use, yields a significant coefficient for the unemployment variable (results not shown, except for unemployment lagged three years – see Table 4). But a consistent result is that regardless of the lag period, the share of tertiary education has a significant negative association with alcohol addiction.

Table 4. Links between the 3-year lag of unemployment and alcohol addiction

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Unemployment	-0.288	0.216	0.218	-0.054	0.212	0.205
	(0.429)	(0.466)	(0.493)	(0.880)	(0.483)	(0.505)
Share of males		-15.774	-14.421	-26.635***	-16.090	-14.309
		(0.206)	(0.283)	(0.005)	(0.213)	(0.237)
Share of foreigners		-0.459	0.083	0.801		0.353
		(0.584)	(0.923)	(0.396)		(0.716)
Share of young		-2.374		-1.699	-1.663	-0.491
		(0.530)		(0.693)	(0.653)	(0.903)
Share of adults		-4.095		5.377	-2.492	-5.312
		(0.608)		(0.560)	(0.722)	(0.561)
Share of elderly		-1.913		1.518	-1.299	-2.278
		(0.192)		(0.475)	(0.431)	(0.137)
Mean income		-8.766*	-8.121*	-6.929	-8.030*	
		(0.066)	(0.078)	(0.171)	(0.099)	
Share of primary educ.		0.212	-0.021		-0.156	-0.045
		(0.932)	(0.994)		(0.946)	(0.984)
Share of tertiary educ.		-3.473***	-3.217***		-3.240***	-3.142**
		(0.004)	(0.008)		(0.007)	(0.028)
Constant	4.175***	146.281**	108.633**	121.943*	133.283**	91.160
	(0.000)	(0.044)	(0.038)	(0.078)	(0.050)	(0.208)
Observations	210	210	210	210	210	210
Adjusted R^2	0.763	0.810	0.810	0.780	0.810	0.798

All variables are in log form. All specifications include both county and year fixed effects (not reported here).
*, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.
P-values are provided in parentheses.

Notably, the coefficient of income becomes significant (on a 10% level) when using the three-year lag of unemployment. As can be seen from Table 4, a 1% increase in income is linked to an 8% decrease in alcohol addiction, when holding constant the unemployment rate three years ago. An additional set of regressions (not presented) excluding the unemployment variable altogether yields insignificant income coefficients as well. If the unemployment variable is not controlled for, it masks the effect of income, suggesting that the effects of the two variables go opposite directions. This gives some support to the assumptions that unemployment-related stress or increased leisure time induces drinking. Indeed, the

coefficients are positive for most specifications, although it must be pointed out again that they are not nearly statistically significant.

It is interesting to note that Svensson (2010) did not find any links between mortality from alcohol addiction and unemployment in Sweden. He did not control for income level, though, which means there is a chance that the income effect and the stress effect working in opposite directions could have cancelled each other out in those results.

Alcohol-related liver disease

With alcohol-related liver disease as the dependent variable, the six model specifications are estimated when using unemployment as well as its lags up to three years as the main independent variable (each in its own regressions). The respective coefficients never appear statistically significant. It can be noticed, though, that when using any of the lags, the coefficients appear rather robust around –0.2 to –0.3. An example can be seen in Table 5 which presents the results for using unemployment lagged three years (regressions with other lags are not presented). When using contemporaneous unemployment, the coefficients are not only insignificant but also very close to zero (results not presented).

In a few cases (both when using contemporaneous unemployment or lags), educational structure appears significant. But regardless of significance it always indicates a positive link between alcohol-related liver disease and the share of population with primary education; and a negative link between liver disease and the share of population with tertiary education. In most specifications, an increase in the share of the adult population is significantly related to a decrease in alcohol-related liver disease with relatively stable coefficients regardless of which lag of unemployment was used.

Another rather robust finding across different lags of unemployment is the negative (and in about half of the specifications significant or very close to it) link between alcohol-related liver disease and income. The coefficient suggests a 3–4% decrease in alcohol-related liver disease if the mean income increases 1% (in Table 5 this can be seen for the specifications using the 3-year lag of unemployment). Estimating additional regressions with unemployment not included results in insignificant coefficients for income. The pattern of higher income and lower liver disease only becomes visible when we account for unemployment.

Table 5. Links between the 3-year lag of unemployment and alcohol-related liver disease

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment	-0.217	-0.205	-0.259	-0.348	-0.211	-0.210
	(0.229)	(0.320)	(0.215)	(0.117)	(0.296)	(0.308)
Share of males		25.752*	28.491*	22.568	25.315*	26.465*
		(0.056)	(0.073)	(0.128)	(0.053)	(0.051)
Share of foreigners		-0.637	-0.236	-0.041		-0.241
		(0.332)	(0.602)	(0.947)		(0.717)
Share of young		-3.276		-2.603	-2.291	-2.360
		(0.138)		(0.273)	(0.189)	(0.237)
Share of adults		-10.299**		-6.833**	-8.077**	-10.892**
		(0.013)		(0.043)	(0.036)	(0.012)
Share of elderly		-0.557		0.366	0.294	-0.735
		(0.736)		(0.806)	(0.812)	(0.650)
Mean income		-4.267*	-3.503*	-3.646	-3.247	
		(0.092)	(0.096)	(0.190)	(0.173)	
Share of primary educ.		2.415**	1.513		1.905*	2.290**
		(0.047)	(0.286)		(0.084)	(0.042)
Share of tertiary educ.		-1.149*	-0.920		-0.826	-0.988
		(0.056)	(0.144)		(0.148)	(0.169)
Constant	2.537***	-28.977	-92.796	-32.233	-47.236	-55.810
	(0.000)	(0.629)	(0.135)	(0.583)	(0.436)	(0.345)
Observations	210	210	210	210	210	210
Adjusted R^2	0.681	0.713	0.700	0.706	0.712	0.707

All variables are in log form. All specifications include both county and year fixed effects (not reported here).
*, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.
P-values are provided in parentheses.

The situation is similar to what was apparent with alcohol addiction and one possible explanation could be the opposite effects of income and unemployment. But with liver disease the unemployment coefficients are robustly negative across specifications, even though they are not statistically significant, and that indicates that the effects go in a similar direction. That would make it much harder to explain the results. However, the reason for these odd results might simply be the relatively short time span of the data, and especially the fact that liver disease is the variable that has somewhat less within-variation compared to alcohol poisoning or addiction so it can be harder to obtain good coefficient estimates for it. Additionally, three years might not be enough of a lag length because liver disease is probably not diagnosed in the earlier stages, while the late stages can take much more time to develop.

It is difficult to compare the above results for alcohol-related liver disease to those of earlier studies. Not only that previous studies have been looking at mortality not morbidity, but the category of ailments is also not directly comparable as previous studies have often used general alcohol-related mortality or general liver disease mortality. Perhaps the closest would

be Neumayer (2004) who found no link between unemployment and death from liver cirrhosis in Germany.

Death from liver disease and cirrhosis is also examined by Gerdtham and Ruhm (2006), who find a negative relationship with unemployment in OECD countries. However, the relationship is positive with income, which is exactly the opposite of what the regressions in this paper suggest. Additionally, Gerdtham and Ruhm (2006) find that mortality from liver disease grows over time, which the authors explain with the cumulative impact of a sustained increase in alcohol consumption. That at least gives support to the need to explore lagged independent variables, as seems to be the implication of the results of this paper as well.

5. Conclusions

This study contributes to the literature on unemployment and alcohol-related health outcomes, using Swedish county-level data from 2000 to 2012. The outcome variables include alcohol sales from the state monopoly (as a proxy for consumption), incidence of alcohol poisoning, incidence of alcohol addiction, and incidence of alcohol-related liver disease. Most previous literature has used mortality as a health variable instead of morbidity, but the latter gives a more accurate picture of the public health situation.

Out of the alcohol-related variables used in earlier studies, alcohol consumption is the one that has provided the most consistent results in different settings. Several studies using U.S. data as well as those using Swedish or Finnish data have found that alcohol consumption decreases when unemployment increases. This paper shows that the crude relationship between unemployment and alcohol sales from the state monopoly is indeed negative, but when different sets of controls are included, then the result becomes statistically insignificant. Similarly, the coefficient for income level is not significant in any specification. Theoretically, alcohol sales is expected to decrease when income decreases, but the lack of a significant link might also be the result of using aggregate data which does not enable to see the distributive effects in alcohol consumption – a part of the population might decrease consumption while another part increases it, so the net effect sums up to zero. Alternatively, buying alcohol from the state monopoly might be substituted for buying it in bars/restaurants or abroad depending on the economic conditions.

When using aggregate data, disease rates might help discover the distributive effects in alcohol consumption. If there is a significant link between unemployment and alcohol-related morbidity, it implies that problem drinking changes differently from recreational drinking. This paper finds a significant positive relationship between unemployment and the instance of alcohol poisoning. The elasticity is consistently estimated between 0.6–0.7, regardless of whether different control variables are used or not. Interestingly, a study using Swedish county-level data found no significant link between unemployment and mortality from alcohol poisoning. This illustrates how morbidity rates can reveal more than mortality rates.

Alcohol addiction and alcohol-related liver disease take some time to develop, which is why regressions using lags of unemployment were also explored. The unemployment effects (either contemporaneous or lagged) were not significant for either one of those outcomes. However, experimenting with lags of unemployment up to three years yielded some interesting results with regard to the mean income level – but only when the unemployment variable was included as well.

In specifications using the three-year lag of unemployment, there was a negative link between income and alcohol addiction. This has two implications. Firstly, the effect is lagged because addiction takes time to develop. Secondly, if unemployment is not controlled for, it confounds the effect of income, indicating that the effects of the two variables go opposite ways. That would be consistent with the theory that unemployment-related stress or the increased leisure time (due to unemployment) induces alcohol consumption.

For alcohol-related liver disease, a negative relationship with income was found when using any of the lagged unemployment variables (but not the contemporaneous one), although it was significant in about half of the specifications. The explanation could again lie in confounding effects of opposite directions, but the short time span of the data must be acknowledged as well. When using lags, the period under observation becomes even shorter. Furthermore, it includes the Great Recession, and some previous research has indicated that severe changes in unemployment might have different effects than regular fluctuations within the business cycle. Nevertheless, it is quite apparent that specifications using lags should be explored in future studies to allow for time to develop certain alcohol-related diseases such as addiction or liver problems.

All in all, this paper shows that patterns in aggregate alcohol consumption might not reveal the actual health effects. Overall consumption was found not to be linked with unemployment, but a very clear positive relationship was found with the instance of alcohol poisoning, indicating that unemployment increases binge drinking. No significant relationship was found between unemployment and alcohol addiction or alcohol-related liver disease, suggesting that unemployment does not induce alcohol abuse that is long-term enough to develop those conditions. With regard to future research in the field, this paper indicates the usefulness of using morbidity rates instead of mortality rates, as well as the need to allow the effects of unemployment to be lagged.

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Appendix. Data sources

- Alcohol-related variables – *Folkhälsodata* database of the Public Health Agency of Sweden (*Folkhälsomyndigheten*)
    - Alkohol: Konsumtion: Alkoholförsäljning från Systembolag efter region och år. Antal liter per invånare 15-w år: Total försäljning omräknat till 100% alcohol
    - Alkohol: Sjuklighet: Alkoholrelaterade sjukdomar efter region, kön och år. Antal vårdade per 10 000 inv.: Alkoholberoende, Alkoholrelaterade leversjukdomer, Alkoholförgiftning

- Unemployment rates – the Swedish Public Employment Service (*Arbetsförmedlingen*)
    - Statistik och Prognoser: Tidigare statistik: Öppet arbetslösa och sökande i program med aktivitetsstöd, andelar av befolkningen: Samtliga 16-64 år, totalt.

- Age and gender composition, educational structure and the shares of inhabitants of foreign origin – Statistics Sweden database (in English)
    - Education and research: Educational attainment of the population: Population 16-74 years of age by region, highest level of education, age and sex (excluding those whose educational attainment is unknown)
    - Population: Population statistics: Number of inhabitants: Population by region, marital status, age and sex
    - Population: Population statistics: Foreign/Swedish background: Number of persons with foreign or Swedish background (rough division)

- Mean income levels – Statistics Sweden database (in Swedish)
    - Hushållens ekonomi: Inkomster och skatter: Inkomster: Sammanräknad förvärvsinkomst för boende i Sverige hela året: Medelinkomst