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Alcohol-related morbidity and mortality following involuntary job loss

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Alcohol-related morbidity and mortality following involuntary job loss[a]

by

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Abstract

The purpose of this study was to assess the association between involuntary job loss and alcohol-attributable morbidity and mortality. Swedish-linked employee-employer data were used to identify all establishment closures during 1990–1999, as well as the employees who were laid off and a comparison group. These data were merged with information on alcohol-attributable deaths and hospital admissions from the Causes of Death Register and the National Patient Register. The associations between job loss and alcohol-attributable morbidity and mortality during a follow-up period of 12 years were estimated by propensity score weighting methods. An excess risk of both alcohol-related hospitalization and mortality was found among both displaced men and women. For women, the wholly alcohol-attributable health problems were mainly limited to alcohol dependence, whereas men also had an increased risk of hospitalization from poisoning and alcohol-induced liver disease and pancreatitis. The findings support previous evidence of increased risks of alcohol-related morbidity/mortality following involuntary job loss, although the estimates presented herein are more conservative. In addition, the findings suggest that alcohol-related problems manifest differently in men and women.

Keywords: Alcohol,drinking, job loss, morbidity, mortality, plant closures
JEL-codes: I10, I12, J63, J65

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1 Introduction

The relationship between job loss and alcohol use and misuse is complex. On one hand, alcohol misuse may increase the risk of being laid off (Baldwin et al., 2010) and reduce the chances of being employed (MacDonald and Shields, 2004; Terza, 2002), although some studies have reported non-significant effects or even the opposite relationships (Balsa and French, 2010; Feng et al., 2001; Mullahy and Sindelar, 1996). On the other hand, job loss is a stressful event that some individuals may respond to with increased alcohol consumption as a strategy of coping (Gallo et al., 2001; Keyes et al., 2011), especially if followed by long periods of unemployment (Mossakowski, 2008). In theories of drinking and dependence (e.g., the tension-reduction, stress-coping, and self-medication theory), stress is viewed as an important trigger of alcohol use. However, the empirical support for such a relationship is inconclusive, and its direction seems to vary both across studies and by sex and type of stressor (Ayer et al., 2011; San Jose et al., 2000). Moreover, alcohol has consistently been shown to have a positive income elasticity (Gallet, 2007), as well as a negative price elasticity (Wagenaar et al., 2009). Unlike some other stressful life events, job loss may also result in income losses in both the short and long terms (Schmieder et al., 2010) limiting the financial resources available for alcohol consumption, but on average these losses have been shown to be modest in Sweden (Eliason, 2011).

Hence, the theoretical prediction of the magnitude and direction of the relationship between job loss and alcohol consumption is ambiguous (Gallo et al., 2001), and the empirical literature has not yet reached a consensus either. Several studies have observed increased alcohol consumption following job loss (Deb et al., 2011; Gallo et al., 2001; Kriegbaum et al., 2011) and unemployment (Bolton and Rodriguez, 2009; Virtanen et al., 2008); however, other studies have reported reduced alcohol consumption after losing a job (Giesbrecht et al., 1982; Iversen and Klausen, 1986) or unemployment (Leino-Arjas et al., 1999). The fewer studies on alcohol disorders and alcohol-related morbidity and mortality have generally, but not consistently, demonstrated positive associations with job loss (Browning and Heinesen, 2012; Catalano et al., 1993; Eliason and Storrie, 2009a, 2009b, 2010; Keefe et al., 2002).

The literature on the effects of job loss and unemployment on health and health behavior also lacks consensus regarding the moderating effect of gender (Hammarström et al., 2011). This also applies to the specific relationships between job loss or unemployment and alcohol use/misuse and its associated health problems. Several studies have estimated the effects only in combined samples of men and women (Catalano et al., 1993; Gallo et al., 2001) or in samples containing only men (Browning and Heinesen, 2010; Iversen and Klausen, 1986; Leino-Arjas et al., 1999). The few studies that have stratified the estimations by gender have reported mixed results. For example, Eliason and Storrie (2009a) found an alcohol-related excess mortality following job loss only among men, whereas Eliason and Storrie (2009b) found that job loss increased the risk of alcohol-related morbidity similarly in men and women.

In Sweden, the first half of the 1990s was characterized by mass layoffs and an increasing unemployment rate. Hundreds of thousands of redundant employees also faced cutbacks in most government-provided, income-maintenance systems (see Bergmark and Palme, 2003). The aim of this study was to investigate the extent to which these job losses – among both men and women during the 1990s – increased the risk of the most serious outcomes of alcohol use and misuse: hospitalization or death with an alcohol-attributable diagnosis. Additionally, by distinguishing between certain groups of alcohol-related diseases/conditions and exploring the time pattern of the impact of job loss on each of these groups, this study also aimed to reveal more about the manifestation of alcohol problems following job loss.

Following several previous studies on the effects of job loss, this study exploited establishment closures (i.e., plant closures) as a strategy to deal with the problem of selection and to establish causality. An early example of alcohol outcomes in a plant closure study was provided by Iversen and Klausen (1986), with Browning and Heinesen (2012), Deb et al. (2011), and Eliason and Storrie (2009a, 2009b) as more recent examples. Establishment closures have also been used to estimate, arguably, causal effects of job loss on many other outcomes: children's school performance (Coelli, 2011; Oreopoulos et al., 2008; Rege et al., 2011), criminality (Rege et al., 2009), depression (Brand et al., 2008), divorce (Charles and Stephens, 2004; Eliason, 2012; Rege et al., 2007), earnings (Eliason

and Storrie, 2006; Hijzen et al., 2010), family income (Eliason, 2011), fertility (Del Bono et al., 2012; Huttunen and Kellokumpu 2010), morbidity (Browning and Heinesen, 2012; Eliason and Storrie, 2009b, 2010), mortality (Browning and Heinesen, 2012; Eliason and Storrie 2009a), and being overweight (Deb et al., 2011). The closing and non-closing establishments, as well as the employees who were laid off and a comparison group, could be identified using linked administrative employee-employer data. These data were merged with information on deaths and hospital inpatient admissions from the Causes of Death Register and the National Patient Register.

Although Bartley and Ferrie (2001) – in their glossary on unemployment, job insecurity, and health – described plant closures as "considered to provide good natural experiments for the study of unemployment and health because, in theory, there should be no selection," losing a job does not by necessity imply that one becomes unemployed. In fact, many workers actually gain new employment without an intervening period of unemployment. Thus, any estimated effect of job loss cannot be directly interpreted as an effect of unemployment but might be viewed as a lower boundary of such an effect. Earlier studies investigating the impact of unemployment on alcohol-related morbidity and mortality have generally observed rather large adverse effects (Catalano et al., 1993; Eliason et al., 2010; Garcy and Vågerö, 2012; Lundin et al., 2012; Zagozdzon et al., 2009). A larger estimated effect of unemployment, compared with job loss, might suggest that unemployment accounts for much of the relationship between job loss and alcohol-related outcomes. However, it could also be argued that such a difference may be related to selection. Lundin et al. (2012), for example, found that a substantial proportion of the differences in alcohol-related morbidity between unemployed and employed men were attributable to pre-existing differences in risk factors that are generally not observed by the researcher.

Before proceeding, some contextual information is required. At the beginning of the 1990s, Sweden could be described as having a restrictive alcohol policy (including a state alcohol monopoly), with high excise taxes and prices and low levels of per capita consumption. However, after Sweden became a European Union member state in 1995, the restrictive Swedish alcohol policy was liberalized. The state monopolies on the import,

export, production, and wholesale of alcoholic beverages were abolished, and only the off-premise alcohol retail monopoly remains. The excise duty rates for beer and wine decreased by 39 percent (in 1997) and 19 percent (in 2001), respectively. By joining the European Union, Sweden was also forced to increase travelers' alcohol import quotas, and these quotas were abolished altogether in 2004. The more liberal alcohol policies are likely to have increased the consumption of alcohol, especially the unrecorded consumption of privately imported alcoholic beverages. In 1990, the estimated annual per capita consumption was 7.8 L of pure alcohol, of which 18 percent was unrecorded (legal and illegal) consumption. In 2004, these figures had increased to 10.5 L and 38 percent, respectively (CAN, 2012).

2 Method and data

2.1 Identification of closing and non-closing establishments

Swedish-linked administrative employee-employer data allowed the closures of establishments to be identified by following the flows of their employees. An establishment was defined as closing if it reduced its workforce by more than 90 percent between November in year t and November in year $t+1$, and if this cutback was shown to be permanent. All establishment closures during 1991–1999 were identified, including cases where the establishment's identity number no longer existed in year $t+1$. Statistics Sweden conducts thorough examinations and corrections of the establishment number in cases where these disappeared because of mergers, dispersals, or misreporting (Statistics Sweden, 2005) (i.e., "false establishment deaths"; Kuhn, 2002). In addition, the worker flows from all these establishments were examined; if the majority of the workers were employed together at a single establishment in the following year, where they also constituted the majority of the work staff, the old establishment was assigned the new establishment's identity number. Consequently, these cases were not considered "true" closures.

2.2 Estimation sample

The estimation sample contained all employees ages 20–64 years and whose main employment (i.e., the employment from which they received the largest annual income) in

the month of November was in a closing or non-closing establishment with at least 10 employees. These restrictions resulted in nine cohorts (i.e., 1991, 1992, ..., 1999) of displaced workers (i.e., those in the closing establishments) and non-displaced workers (i.e., those in the non-closing establishments) comprising 13,000–33,000 displaced men, 11,000–22,000 displaced women, and approximately 1.4 million non-displaced men and women, respectively (*Table 1*). In any subsequent year, no additional restrictions were imposed on either the displaced or the non-displaced workers. Thus, the non-displaced workers may have been displaced in any later year, and, analogously, the displaced workers may have experienced multiple displacements.

Table 1: Number of displaced and non-displaced men and women in each year, 1991–1999

	Men		Women	
Cohort	Displaced	Non-Displaced	Displaced	Non-Displaced
1991	25,873	1,535,013	15,748	1,529,118
1992	32,720	1,487,518	21,550	1,511,382
1993	29,549	1,405,178	18,032	1,475,412
1994	18,865	1,354,336	16,718	1,426,782
1995	18,774	1,381,364	16,289	1,438,271
1996	15,202	1,417,312	12,560	1,449,647
1997	13,613	1,421,344	10,755	1,450,704
1998	15,041	1,425,415	13,514	1,445,980
1999	20,120	1,451,525	14,971	1,476,598

2.3 Outcome measures

Alcohol-related morbidity and mortality were measured as hospital admissions and deaths with any notation (i.e., either as a principal or contributory discharge diagnosis or cause of death) of a disease or condition wholly attributable to alcohol. Diseases or conditions included were the following (with the associated ICD-9/10 codes shown in parentheses): alcohol poisoning (980; T51, X45, X65, Y15), alcohol use disorder (291, 303, 305.0; F10), alcoholic liver disease or alcohol-induced pancreatitis (571.0–3, 577.0–1; K70, K85, K86.0–1), and other alcohol-related diseases or conditions (357.5, 425.5, 535.3, 760.71; E24.4, G31.2, G62.1, G72.1, I42.6, K29.2, 035.4). However, both hospitalization and death from the residual group of alcohol-related diseases and conditions were very uncommon. Therefore, no estimates on this outcome are reported.

2.4 Baseline measures

The set of baseline variables, or risk factors, included standard sociodemographic and socioeconomic characteristics measured in year $t-1$, that is, age, marital status (never married, married, divorced, widowed), number of children ages 0–6 years old and 7–17 years old, county of residence (24 county indicators), education (compulsory school at most, upper secondary school, university), tenure (5 categories), industry sector (10 categories), and workplace size. A number of variables were instead measured during year $t-3$ to $t-1$: incidence of hospital inpatient treatment for each group of outcome diagnoses or for any mental health condition unrelated to alcohol, average annual number and duration of hospital inpatient episodes (regardless of diagnosis), average annual number and duration of sick-leave episodes, and average annual earnings.

2.5 Statistical analysis

2.5.1 The estimator

In the empirical analysis, a propensity score weighted regression estimator was used to estimate both risk ratios (RRs) and risk differences (RDs). By propensity score weighting, one will ideally obtain a pseudo-sample, where the distribution of (observed) characteristics is the same in samples of exposed (i.e., displaced workers) and non-exposed (i.e., non-displaced workers). Propensity scores (p) were obtained by fitting a binomial generalized linear model and specifying the logit link. Each worker i was assigned a weight $w_i^D = D_i + (1-D_i)p_i/(1-p_i)$, where D_i takes the value of 1 if displaced and the value of 0 otherwise. Weights were normalized as suggested in Hirano and Imbens (2001). RRs and RDs were then estimated for the pooled samples of all cohorts but stratified by sex, using a weighted binomial generalized linear model with the log and identity link, respectively. Robust 95 percent confidence intervals were computed using the sandwich estimate of variance, which produces conservative estimates. The issue of right censoring was ignored. Because censoring occurs only in case of death and emigration, it was assumed to have no more than a minor impact on the estimates.

2.5.2 Estimation of propensity score weights

Estimation of the propensity scores was stratified by both sex and cohort. For brevity, no coefficient estimates are reported but only summary statistics of the propensity scores and corresponding weights. An assessment of these statistics, reported in *Table 2*, shows that the samples of displaced and non-displaced workers were not markedly different with respect to the estimated propensity scores. For all samples, the distribution was highly skewed to the right. Moreover, only a few displaced workers, but quite a few non-displaced workers, were discarded because they were found to lie outside the overlapping range of the propensity score distribution.

Table 2: Summary statistics of the estimated propensity scores and weights (and the number/share of observations being outside the overlapping range of the propensity score distribution) by gender and exposure group

	Propensity score			Propensity score weights			Discarded observations	
Sample	Mean	Min.	Max.	Mean	Min.	Max.	*n*	%
Men								
Displaced	0.031	0.000	0.355	1.000	1.000	1.000	6	0.00
Non-displaced	0.014	0.000	0.634	0.016	0.000	0.541	1,154,729	8.97
Women								
Displaced	0.024	0.000	0.420	1.000	1.000	1.000	9	0.01
Non-displaced	0.010	0.000	0.494	0.012	0.000	0.721	1,465,695	11.10

2.5.3 Descriptive statistics and assessment of covariate balance

This section includes descriptive statistics of the baseline covariates (the 24 county indicators are suppressed for brevity) used in estimation of the propensity score weights. Both means and standardized differences in means (i.e., the difference in covariate means between the samples of displaced and weighted non-displaced workers as a percentage of the pooled standard deviation [before weighting] of that covariate; Rosenbaum and Rubin, 1985), for both the unweighted and weighted samples, are displayed in *Table 3*. From these tables, it is clear that the most pronounced differences between the displaced and non-displaced workers refer to differences in establishment size, tenure, sector, age, and annual earnings. The measures of previous hospital admissions, especially those related to alcohol-attributable conditions, exhibited much lower disparity. Notably, the fractions

that had been hospitalized because of an alcohol-attributable discharge diagnosis during the 3-year baseline period were very small, less than 1 percent for men and less than 0.5 percent for women.

Re-weighting the samples using the derived propensity score weights eliminated much of the above differences. For both the male and female sample, the average of the absolute values of the standardized differences in means decreased from 8–9 to less than 0.1. Similarly, the maximum value for any single covariate decreased from about 43 to 0.28 and 0.77 for the sample of men and women, respectively. An absolute value of the standardized difference in the means of 20 has been considered as "substantial" (Rosenbaum and Rubin, 1985) and a value less than 10 as "small" (Normand et al., 2001). In that perspective, the differences between the samples of displaced and non-displaced workers were on average rather small already before the weighting, although some individual covariates exhibited substantial differences, while post-weighting differences were minimal.

Table 3: Sample fractions/means for each of the baseline variables for the samples of displaced ($D = 1$) and non-displaced ($D = 0$) men and women. The fractions/means are accompanied by the standardized differences in means (SDM) as a measure of the similarity of the samples of displaced and non-displaced workers. The variable fractions/means and the SDMs are displayed for the samples both before and after propensity score weighting. All fractions are expressed in percent

	Men						Women					
	Before weighting			After weighting			Before weighting			After weighting		
Baseline variables	D=1	D=0	SDM	D=1	D=0	SDM	D=1	D=0	SDM	D=1	D=0	SDM
Age	38.26	40.31	-17.34	38.26	38.26	0.00	37.71	40.71	-25.11	37.71	37.70	0.08
Foreign born	12.84	9.37	11.04	12.84	12.84	-0.01	12.56	9.60	9.44	12.55	12.57	-0.03
Marital status												
Never married	48.11	41.81	12.70	48.11	48.12	-0.01	43.88	34.00	20.37	43.88	43.91	-0.07
Married	42.81	49.64	-13.75	42.81	42.81	0.00	42.65	52.57	-19.96	42.65	42.61	0.08
Divorced	8.58	7.98	2.20	8.58	8.58	0.02	11.66	11.32	1.06	11.66	11.67	-0.02
Widowed	0.50	0.57	-1.02	0.50	0.50	-0.01	1.81	2.11	-2.19	1.81	1.81	0.00
No. of children												
<7 years of age	0.20	0.20	-1.56	0.20	0.20	0.00	0.22	0.21	1.34	0.22	0.22	0.02
7–17 years of age	0.24	0.27	-7.17	0.24	0.24	0.00	0.27	0.31	-9.04	0.27	0.27	0.02
Education												
Compulsory/unknown schooling	27.51	23.88	8.31	27.51	27.52	-0.01	24.57	19.56	12.08	24.57	24.57	0.00
Upper secondary schooling	52.36	48.01	8.69	52.36	52.37	-0.02	52.89	49.60	6.58	52.89	52.91	-0.04
University studies	20.13	28.10	-18.72	20.13	20.11	0.04	22.55	30.84	-18.82	22.55	22.53	0.04
Income												
Mean annual earnings (1,000 SEK)	199.21	233.38	-24.17	199.20	199.09	0.07	134.61	153.70	-22.43	134.61	134.54	0.07
Sector												
Non-specified activities	2.52	0.37	18.10	2.52	2.55	-0.25	2.72	0.38	19.02	2.71	2.81	-0.77
Agriculture, forestry, and fishing	1.35	0.82	5.09	1.35	1.34	0.02	0.92	0.35	7.18	0.92	0.91	0.02
Manufacturing and mining	25.45	34.78	-20.44	25.45	25.44	0.03	14.25	12.78	4.29	14.25	14.27	-0.08
Electricity, water supply, waste	0.78	1.89	-9.67	0.78	0.78	0.01	0.29	0.45	-2.66	0.29	0.29	0.00
Construction	15.78	7.88	24.67	15.78	15.82	-0.11	1.87	0.88	8.59	1.87	1.89	-0.10
Trade and communication	21.03	19.62	3.49	21.03	21.02	0.01	18.47	13.87	12.52	18.47	18.49	-0.05

	Men						Women					
	Before weighting			After weighting			Before weighting			After weighting		
Baseline variables	D=1	D=0	SDM	D=1	D=0	SDM	D=1	D=0	SDM	D=1	D=0	SDM
Sector												
Financial and business services	13.38	10.30	9.54	13.38	13.36	0.04	15.83	8.60	22.20	15.83	15.82	0.03
Education and research	1.95	6.72	-23.60	1.95	1.94	0.04	4.29	12.04	-28.59	4.29	4.27	0.07
Health and social work	3.99	5.93	-8.92	3.99	3.99	0.00	22.46	37.66	-33.63	22.46	22.33	0.29
Personal and cultural services	8.91	4.74	16.57	8.91	8.90	0.03	13.12	6.15	23.79	13.12	13.13	-0.03
Public administration, etc.	4.86	6.95	-8.88	4.86	4.85	0.07	5.80	6.85	-4.32	5.80	5.80	0.00
Tenure												
1 year	34.91	19.39	35.43	34.91	35.01	-0.25	37.97	20.80	38.38	37.97	38.10	-0.29
2 years	17.39	12.37	14.13	17.39	17.37	0.04	17.41	13.08	12.07	17.41	17.43	-0.06
3 years	10.14	9.35	2.67	10.14	10.13	0.02	9.90	9.84	0.20	9.90	9.89	0.04
4 years	7.24	7.58	-1.29	7.24	7.23	0.04	7.07	7.90	-3.14	7.07	7.06	0.04
5 years	5.38	6.43	-4.44	5.38	5.37	0.02	5.34	6.58	-5.24	5.34	5.33	0.03
6 years	24.95	44.89	-42.78	24.95	24.88	0.16	22.30	41.80	-42.71	22.30	22.18	0.26
No. of employees	126.28	469.87	-42.76	126.26	124.03	0.28	157.77	581.65	-42.49	157.76	152.80	0.50
Hospital discharge diagnoses												
Alcohol poisoning	0.04	0.03	0.40	0.04	0.04	0.00	0.03	0.02	0.59	0.03	0.03	-0.01
Alcohol use disorder	0.73	0.46	3.52	0.73	0.73	0.02	0.23	0.16	1.71	0.23	0.23	0.00
Alcoholic liver disease/pancreatitis	0.14	0.10	1.17	0.14	0.14	0.00	0.06	0.06	0.04	0.06	0.06	0.01
Other alcohol-related diseases/conditions	0.01	0.01	0.51	0.01	0.01	0.00	0.00	0.00	0.40	0.00	0.00	0.04
Non-alcoholic mental condition	0.94	0.72	2.38	0.94	0.94	-0.01	1.03	0.81	2.30	1.03	1.03	0.00
Hospital inpatient treatment												
No. of admissions	0.07	0.07	1.34	0.07	0.07	0.02	0.14	0.13	1.47	0.14	0.14	0.04
No. of days	0.48	0.43	1.17	0.48	0.48	0.00	0.82	0.78	1.07	0.82	0.81	0.04
Sickness absence												
No. of episodes	0.99	0.79	15.30	0.99	0.99	0.04	1.10	1.01	6.14	1.10	1.10	0.05
No. of days	13.70	10.93	8.32	13.70	13.70	0.01	18.34	17.10	2.97	18.34	18.33	0.03

3 Results

3.1 Alcohol-related morbidity

Table 4 presents the propensity score weighted RRs and RDs (with 95 percent robust confidence intervals) as measures of the impact of job loss on the risk of hospitalization with any alcohol-related diagnosis as well as each of the three specific groups of alcohol-related diagnoses (i.e., alcohol poisoning, alcohol use disorder, and alcoholic liver disease or pancreatitis); the follow-up periods were 1–4, 8, and 12 years. These estimates suggest that displaced men had an immediate excess risk of hospitalization with an alcohol-related diagnosis of 21 percent (RR=1.21, 95% CI [1.14, 1.27]). Twelve years after job loss, the RR had decreased marginally to 1.13 (95% CI [1.10, 1.16]). The long-term RR for women was of the same magnitude as for men, yet it was slightly lower in the short term. However, hospitalization is a rare event; consequently, RDs are small. The 12-year RD for men indicates that the increased risk of alcohol-related hospitalization among displaced men corresponded to 0.37 percentage points (95% CI [0.29, 0.45]). For displaced women, the increased risk was even lower than that for men, that is, 0.16 percentage points (95% CI [0.09, 0.22]).

Regarding estimates on the three subgroups of diagnoses, we first note that, for alcohol use disorder, the estimates are (as expected) similar to those reported above, because these conditions are the most common of the alcohol-attributable diagnoses and also most often accompany any other alcohol-related diagnosis. One exception, however, is alcohol poisoning, which does not necessarily imply dependence. Immediately after job loss, men seemed to have had a rather large relative excess risk, albeit diminishing over time, of hospitalization because of alcohol poisoning (RR = 1.51, 95% CI [1.15, 1.98]). However, the situation was quite different for displaced women for whom there were neither short- nor long-term excess risks. For the group of liver diseases and pancreatitis the excess risk among displaced men ranged between 7 percent (RR = 1.08, 95% CI [1.01, 1.16]) and 20 percent (RR = 1.22, 95% CI [1.06, 1.41]), depending on the length of the follow-up period. For displaced women, corresponding estimates were even smaller, and statistically non-significant, than those for displaced men.

Table 4: Propensity score weighted estimates from a binomial generalized linear model of the impact of job loss on hospitalization due to any alcohol-related condition, as well as three subgroups of alcohol-related conditions, expressed as both risk ratios (RRs) and risk differences (RDs) with 95% robust confidence intervals (CIs)

		Men			Women		
Diagnosis	Years	Hospitalized[a]	RR [95% CI]	RD[b] [95% CI]	Hospitalized[a]	RR [95% CI]	RD[b] [95% CI]
All alcohol-related conditions	1	1,523/1,264	1.21 [1.14, 1.27]	0.137 [0.095, 0.178]	369/333	1.11 [1.00, 1.23]	0.026 [-0.002, 0.054]
	2	2,043/1,724	1.19 [1.13, 1.24]	0.168 [0.120, 0.216]	545/471	1.16 [1.06, 1.26]	0.053 [0.019, 0.086]
	3	2,535/2,147	1.18 [1.13, 1.23]	0.204 [0.151, 0.258]	696/604	1.15 [1.07, 1.24]	0.065 [0.027, 0.103]
	4	2,998/2,548	1.18 [1.13, 1.22]	0.237 [0.179, 0.296]	856/737	1.16 [1.08, 1.24]	0.085 [0.043, 0.127]
	8	4,593/4,024	1.14 [1.11, 1.18]	0.300 [0.228, 0.372]	1,418/1,278	1.11 [1.05, 1.17]	0.100 [0.046, 0.154]
	12	6,239/5,537	1.13 [1.10, 1.16]	0.370 [0.287, 0.453]	2,082/1,860	1.12 [1.07, 1.17]	0.158 [0.093, 0.224]
Alcohol poisoning	1	58/38	1.51 [1.15, 1.98]	0.010 [0.002, 0.018]	22/27	0.82 [0.54, 1.26]	-0.003 [-0.010, 0.003]
	2	78/58	1.34 [1.07, 1.70]	0.011 [0.001, 0.020]	40/38	1.05 [0.76, 1.44]	0.001 [-0.008, 0.010]
	3	94/77	1.23 [0.99, 1.52]	0.009 [-0.001, 0.019]	55/49	1.12 [0.85, 1.48]	0.004 [-0.006, 0.015]
	4	119/94	1.26 [1.04, 1.52]	0.013 [0.001, 0.025]	66/59	1.11 [0.87, 1.43]	0.005 [-0.007, 0.017]
	8	181/153	1.18 [1.02, 1.38]	0.015 [0.000, 0.029]	103/98	1.05 [0.86, 1.28]	0.003 [-0.011, 0.018]
	12	269/232	1.16 [1.03, 1.32]	0.020 [0.002, 0.037]	151/152	0.99 [0.84, 1.17]	-0.001 [-0.019, 0.017]
Alcohol use disorder	1	1,257/1,061	1.18 [1.12, 1.26]	0.103 [0.065, 0.141]	277/241	1.15 [1.01, 1.30]	0.025 [0.001, 0.050]
	2	1,691/1,439	1.17 [1.12, 1.24]	0.133 [0.089, 0.177]	407/336	1.21 [1.09, 1.34]	0.051 [0.021, 0.080]
	3	2,115/1,780	1.19 [1.14, 1.24]	0.176 [0.127, 0.225]	513/426	1.20 [1.10, 1.32]	0.062 [0.029, 0.095]
	4	2,482/2,104	1.18 [1.13, 1.23]	0.199 [0.146, 0.253]	628/515	1.22 [1.12, 1.32]	0.081 [0.045, 0.117]
	8	3,748/3,267	1.15 [1.11, 1.19]	0.254 [0.189, 0.319]	1,004/864	1.16 [1.09, 1.24]	0.100 [0.055, 0.146]
	12	5,036/4,413	1.14 [1.11, 1.17]	0.328 [0.253, 0.403]	1,441/1,229	1.17 [1.11, 1.24]	0.151 [0.097, 0.206]
Alcoholic liver disease/ pancreatitis	1	241/200	1.20 [1.06, 1.37]	0.021 [0.005, 0.038]	79/73	1.08 [0.86, 1.36]	0.004 [-0.008, 0.017]
	2	333/293	1.14 [1.02, 1.27]	0.021 [0.002, 0.041]	121/112	1.08 [0.90, 1.30]	0.006 [-0.010, 0.022]
	3	425/388	1.10 [0.99, 1.21]	0.020 [-0.002, 0.042]	163/153	1.07 [0.91, 1.25]	0.007 [-0.011, 0.026]
	4	535/480	1.11 [1.02, 1.22]	0.029 [0.004, 0.054]	208/196	1.06 [0.92, 1.22]	0.008 [-0.012, 0.029]
	8	960/886	1.08 [1.01, 1.16]	0.039 [0.006, 0.072]	398/391	1.02 [0.92, 1.12]	0.005 [-0.024, 0.033]
	12	1,449/1,359	1.07 [1.01, 1.12]	0.047 [0.007, 0.088]	636/611	1.04 [0.96, 1.13]	0.018 [-0.019, 0.054]

[a] The two hospitalization figures refer to displaced and non-displaced workers, respectively, in the propensity score weighted samples.

[b] Risk differences are expressed in percentage points units (i.e., estimated coefficients from the binomial generalized linear model are multiplied by 100).

3.2 Alcohol-related mortality

Table 5 presents the propensity score weighted RRs and RDs (with 95% robust confidence intervals) as measures of the impact of job loss on the same alcohol-related diseases/conditions as in the previous section, but now as causes of death instead of as hospital discharge diagnoses. The small number of deaths during the first few years led to convergence difficulties. Therefore, estimates are presented only for follow-up periods of 4, 8, and 12 years.

For displaced men, the excess risk of alcohol-related mortality was 10 percent (RR = 1.10, 95% CI [0.96, 1.27]) during the first 4 years following job loss, which then increased marginally to 15 percent (RR = 1.15, 95% CI [1.07, 1.23]) when considering the entire 12-year period. The corresponding RDs showed an elevated risk of 0.010 percentage points (95% CI [-0.005, 0.026]) and 0.061 percentage points (95% CI [0.029, 0.093]), respectively. Among displaced women, the relative excess risk was larger than that for displaced men: The RR for women was 1.41 (95% CI [1.07, 1.88]) during the first 4 years and 1.24 (95% CI [1.08, 1.44]) for the entire 12-year follow-up period. However, in absolute terms, the excess risk for displaced women was only about half of that for displaced men. Despite a marked increase in the risk of hospitalization because of alcohol poisoning among displaced men, poisoning does not seem to have contributed significantly to the excess mortality among either displaced men or women. Moreover, although the mortality rate in general is high among individuals who develop alcohol-induced liver diseases or pancreatitis, only a small proportion of the excess alcohol-related mortality following job loss was associated with such diseases. Among men, the RRs for mortality from alcohol-induced liver diseases and pancreatitis were slightly larger than for overall alcohol-related mortality, albeit statistically significant only in the longer term. However, the corresponding RDs were much smaller. For women, the RRs were smaller and associated with much uncertainty because of the small number of deaths caused by these diseases, which is also reflected in the small RDs.

Table 5: Propensity score weighted estimates from a binomial generalized linear model of the impact of job loss on mortality due to any alcohol-related condition, as well as three subgroups of alcohol-related conditions, as cause of death, expressed as both risk ratios (RRs) and risk differences (RDs) with 95% robust confidence intervals (CIs)

		Men					Women				
Diagnosis	Years	Deaths[a]	RR	[95% CI]	RD[b]	[95% CI]	Deaths[a]	RR	[95% CI]	RD[b]	[95% CI]
All alcohol-	4	210/190	1.10	[0.96, 1.27]	0.010	[-0.005, 0.026]	54/38	1.41	[1.07, 1.88]	0.011	[0.001, 0.022]
related	8	515/456	1.13	[1.03, 1.24]	0.031	[0.007, 0.055]	121/94	1.28	[1.06, 1.54]	0.019	[0.003, 0.035]
conditions	12	901/785	1.15	[1.07, 1.23]	0.061	[0.029, 0.930]	202/162	1.24	[1.08, 1.44]	0.028	[0.008, 0.049]
Alcohol	4	45/48	0.94	[0.70, 1.28]	-0.001	[-0.009, 0.006]	20/16	1.24	[0.79, 1.95]	0.003	[-0.004, 0.009]
poisoning	8	107/95	1.12	[0.92, 1.37]	0.006	[-0.005, 0.017]	35/32	1.10	[0.78, 1.56]	0.002	[-0.006, 0.011]
	12	167/151	1.11	[0.94, 1.30]	0.008	[-0.006, 0.022]	53/47	1.13	[0.86, 1.50]	0.004	[-0.006, 0.015]
Alcohol use	4	168/153	1.10	[0.94, 1.29]	0.008	[-0.006, 0.022]	34/24	1.40	[0.98, 2.01]	0.007	[-0.002, 0.015]
disorder	8	419/371	1.13	[1.02, 1.25]	0.025	[0.003, 0.047]	81/64	1.28	[1.01, 1.60]	0.012	[-0.001, 0.025]
	12	723/635	1.14	[1.05, 1.23]	0.046	[0.017, 0.075]	137/112	1.22	[1.03, 1.46]	0.018	[0.001, 0.035]
Alcoholic	4	20/13	1.57	[0.99, 2.05]	0.004	[-0.001, 0.009]	4/4	1.13	[0.32, 4.07]	0.000	[-0.003, 0.004]
liver disease/	8	69/61	1.12	[0.88, 1.44]	0.004	[-0.005, 0.013]	18/17	1.05	[0.64, 1.71]	0.001	[-0.006, 0.007]
pancreatitis	12	164/138	1.19	[1.01, 1.39]	0.014	[0.000, 0.027]	40/39	1.03	[0.75, 1.42]	0.001	[-0.008, 0.010]

[a] The two mortality figures refer to displaced and non-displaced workers, respectively, in the propensity score weighted samples.

[b] Risk differences are expressed in percentage points units (i.e., estimated coefficients from the binomial generalized linear model are multiplied by 100).

Most excess alcohol-related mortality could be explained by an increased risk of alcohol use disorder as a contributory cause of death. Among men, the RR was 1.10 (95% CI [0.94, 1.29]) in the short term and increased marginally to 1.14 (95% CI [1.05, 1.23]) in the longer term, whereas the 4- and 12-year RRs for women were 1.40 (95% CI [0.98, 2.01]) and 1.22 (95% CI [1.03, 1.46]), respectively.

3.3 Sensitivity analysis

The absence of selection in plant closure studies has been questioned because workers may be aware of the impending closure long in advance. Workers with better job opportunities may then leave for a new job before the plant actually shuts down. The closure may also be preceded by a period of downsizing, during which it is possible that the least able workers are laid off. Hence, there are potentially two different selection mechanisms working in opposite directions. No matter which mechanism dominates, the existence of so-called early leavers is likely to imply that those still employed at the time of the closure are a non-random sample of the original workforce.

In this study, the samples of displaced workers comprised workers employed in November at establishments that shut down within the next 12 months. However, for some establishments, the period between November and the closure date might have been too short to capture all early leavers. Therefore, as a check of sensitivity to this issue, samples of displaced workers were redefined by prolonging the selection period by 1 year (i.e., a closure was then defined as a reduction in the workforce by more than 90 percent between November in year t and November in year $t+2$, and the new sample of displaced workers consisted of those employed in the closing establishments in November of year t). To not include the same closures twice in two subsequent years, it was also required that the reduction in the workforce from year $t-1$ to $t+1$ was no more than 90 percent. The results from this sensitivity analysis are presented in *Table 6* and *Table 7*. The estimated excess risks are generally, but not consistently, somewhat smaller than those of the main analysis. Some of the shorter term estimates also lost statistical significance, whereas a few gained statistical significance.

Table 6: Sensitivity analysis: Propensity score weighted estimates from a binomial generalized linear model of the impact of job loss, including early leavers, on hospitalization due to any alcohol-related condition, as well as three subgroups of alcohol-related conditions, expressed as both risk ratios (RRs) and risk differences (RDs) with 95% robust confidence intervals (CIs)

		Men					Women				
Diagnosis	Years	Hospitalized[a]	RR	[95% CI]	RD[b]	[95% CI]	Hospitalized[a]	RR	[95% CI]	RD[b]	[95% CI]
All alcohol-related conditions	1	2,002/1,729	1.16	[1.11, 1.21]	0.103	[0.068, 0.137]	544/466	1.17	[1.07, 1.28]	0.039	[0.016, 0.063]
	2	2,730/2,358	1.16	[1.11, 1.20]	0.140	[0.099, 0.180]	769/662	1.16	[1.08, 1.25]	0.054	[0.026, 0.082]
	3	3,399/2,944	1.15	[1.11, 1.20]	0.171	[0.126, 0.216]	970/850	1.14	[1.07, 1.22]	0.060	[0.029, 0.092]
	4	4,020/3,498	1.15	[1.11, 1.19]	0.196	[0.147, 0.245]	1,187/1,039	1.14	[1.08, 1.21]	0.074	[0.039, 0.109]
	8	6,260/5,548	1.13	[1.10, 1.16]	0.267	[0.207, 0.328]	2,035/1,806	1.13	[1.08, 1.18]	0.115	[0.069, 0.161]
	12	8,565/7,667	1.12	[1.09, 1.14]	0.337	[0.267, 0.408]	2,969/2,635	1.13	[1.09, 1.17]	0.168	[0.113, 0.223]
Alcohol poisoning	1	61/52	1.17	[0.90, 1.53]	0.003	[-0.003, 0.009]	39/37	1.06	[0.77, 1.47]	0.001	[-0.005, 0.007]
	2	93/79	1.18	[0.95, 1.46]	0.005	[-0.002, 0.013]	54/53	1.01	[0.77, 1.33]	0.000	[-0.007, 0.008]
	3	124/105	1.19	[0.98, 1.43]	0.007	[-0.001, 0.016]	69/68	1.01	[0.79, 1.29]	0.000	[-0.008, 0.009]
	4	155/129	1.20	[1.01, 1.42]	0.010	[0.000, 0.019]	83/83	1.00	[0.80, 1.25]	0.000	[-0.009, 0.009]
	8	240/210	1.14	[1.00, 1.31]	0.011	[0.000, 0.023]	142/138	1.03	[0.87, 1.22]	0.002	[-0.010, 0.014]
	12	365/322	1.13	[1.02, 1.26]	0.016	[0.002, 0.031]	216/215	1.01	[0.88, 1.15]	0.001	[-0.014, 0.016]
Alcohol use disorder	1	1,693/1,451	1.17	[1.11, 1.23]	0.091	[0.059, 0.123]	403/335	1.20	[1.09, 1.33]	0.034	[0.014, 0.055]
	2	2,293/1,967	1.17	[1.12, 1.22]	0.123	[0.086, 0.160]	569/469	1.21	[1.11, 1.32]	0.051	[0.026, 0.075]
	3	2,840/2,436	1.17	[1.12, 1.21]	0.152	[0.111, 0.193]	709/595	1.19	[1.10, 1.29]	0.057	[0.030, 0.085]
	4	3,325/2,880	1.15	[1.11, 1.20]	0.167	[0.123, 0.212]	862/720	1.20	[1.12, 1.28]	0.071	[0.042, 0.101]
	8	5,142/4,488	1.15	[1.11, 1.18]	0.246	[0.191, 0.301]	1,428/1,214	1.18	[1.11, 1.24]	0.108	[0.069, 0.146]
	12	6,944/6,089	1.14	[1.11, 1.17]	0.321	[0.258, 0.385]	2,061/1,734	1.19	[1.14, 1.24]	0.165	[0.119, 0.211]
Alcoholic liver disease/ pancreatitis	1	292/274	1.07	[0.94, 1.20]	0.007	[-0.006, 0.020]	117/105	1.11	[0.92, 1.34]	0.006	[-0.005, 0.017]
	2	434/401	1.08	[0.98, 1.20]	0.012	[-0.004, 0.028]	174/162	1.08	[0.92, 1.26]	0.006	[-0.007, 0.020]
	3	572/534	1.07	[0.98, 1.17]	0.014	[-0.004, 0.033]	230/221	1.04	[0.91, 1.19]	0.005	[-0.011, 0.020]
	4	732/665	1.10	[1.02, 1.19]	0.025	[0.004, 0.046]	291/282	1.03	[0.92, 1.16]	0.005	[-0.013, 0.022]
	8	1,288/1,233	1.04	[0.99, 1.11]	0.021	[-0.007, 0.048]	573/560	1.02	[0.94, 1.11]	0.007	[-0.018, 0.031]
	12	1,979/1,896	1.04	[1.00, 1.09]	0.031	[-0.003, 0.065]	905/874	1.04	[0.97, 1.11]	0.016	[-0.015, 0.046]

[a] The two hospitalization figures refer to displaced and non-displaced workers, respectively, in the propensity score weighted samples.

[b] Risk differences are expressed in percentage points units (i.e., estimated coefficients from the binomial generalized linear model are multiplied by 100).

Table 7: Sensitivity analysis: Propensity score weighted estimates from a binomial generalized linear model of the impact of job loss, including early leavers, on mortality due to any alcohol-related condition, as well as three subgroups of alcohol-related conditions, as cause of death, expressed as both risk ratios (RRs) and risk differences (RDs) with 95% robust confidence intervals (CIs)

		Men					Women				
Diagnosis	Years	Deaths[a]	RR	[95% CI]	RD[b]	[95% CI]	Deaths[a]	RR	[95% CI]	RD[b]	[95% CI]
All alcohol-	4	301/261	1.15	[1.02, 1.30]	0.015	[0.002, 0.028]	68/54	1.25	[0.98, 1.61]	0.007	[-0.001, 0.015]
related	8	743/629	1.18	[1.09, 1.27]	0.043	[0.022, 0.064]	158/135	1.17	[1.00, 1.38]	0.012	[-0.001, 0.024]
conditions	12	1,250/1,084	1.15	[1.09, 1.22]	0.062	[0.035, 0.090]	271/231	1.17	[1.04, 1.33]	0.020	[0.003, 0.037]
Alcohol	4	59/66	0.89	[0.68, 1.17]	-0.003	[-0.009, 0.003]	29/23	1.26	[0.86, 1.85]	0.003	[-0.002, 0.009]
poisoning	8	140/131	1.07	[0.90, 1.27]	0.003	[-0.006, 0.013]	48/46	1.05	[0.79, 1.41]	0.001	[-0.006, 0.008]
	12	227/208	1.09	[0.95, 1.25]	0.007	[-0.004, 0.019]	68/67	1.01	[0.79, 1.29]	0.000	[-0.008, 0.009]
Alcohol use	4	246/209	1.18	[1.03, 1.35]	0.014	[0.002, 0.026]	44/34	1.29	[0.94, 1.75]	0.005	[-0.002, 0.012]
disorder	8	600/511	1.17	[1.08, 1.28]	0.033	[0.014, 0.052]	107/90	1.19	[0.97, 1.45]	0.009	[-0.002, 0.019]
	12	1,003/875	1.15	[1.07, 1.22]	0.048	[0.024, 0.072]	191/158	1.21	[1.04, 1.40]	0.017	[0.003, 0.031]
Alcoholic	4	27/18	1.47	[0.98, 2.21]	0.003	[-0.001, 0.007]	4/5	0.79	[0.28, 2.20]	-0.001	[-0.003, 0.002]
liver disease/	8	114/87	1.32	[1.08, 1.60]	0.010	[0.002, 0.018]	30/25	1.22	[0.84, 1.77]	0.003	[-0.003, 0.008]
pancreatitis	12	235/196	1.20	[1.05, 1.38]	0.015	[0.003, 0.027]	62/56	1.11	[0.86, 1.43]	0.003	[-0.005, 0.011]

[a] The two mortality figures refer to displaced and non-displaced workers, respectively, in the propensity score weighted samples.

[b] Risk differences are expressed in percentage points units (i.e., estimated coefficients from the binomial generalized linear model are multiplied by 100).

Table 8: Sensitivity analysis: Propensity score weighted estimates from a binomial generalized linear model of the impact of job loss, excluding with less than 50 employees, on hospitalization due to any alcohol-related condition, as well as three subgroups of alcohol-related conditions, expressed as both risk ratios (RRs) and risk differences (RDs) with 95% robust confidence intervals (CIs)

		Men			Women		
Diagnosis	Years	Hospitalized[a]	RR [95% CI]	RD[b] [95% CI]	Hospitalized[a]	RR [95% CI]	RD[b] [95% CI]
All alcohol-related conditions	1	648/517	1.25 [1.15, 1.36]	0.179 [0.108, 0.250]	176/159	1.11 [0.95, 1.29]	0.028 [-0.017, 0.073]
	2	845/699	1.21 [1.13, 1.30]	0.201 [0.120, 0.282]	253/225	1.12 [0.99, 1.28]	0.047 [-0.007, 0.100]
	3	1,024/862	1.19 [1.11, 1.27]	0.222 [0.133, 0.312]	335/288	1.16 [1.04, 1.30]	0.079 [0.017, 0.140]
	4	1,200/1,018	1.18 [1.11, 1.25]	0.249 [0.153, 0.346]	405/351	1.15 [1.04, 1.28]	0.089 [0.022, 0.157]
	8	1,819/1,586	1.15 [1.09, 1.20]	0.320 [0.202, 0.438]	649/608	1.07 [0.98, 1.16]	0.068 [-0.018, 0.154]
	12	2,462/2,166	1.14 [1.09, 1.18]	0.406 [0.269, 0.543]	948/874	1.09 [1.02, 1.16]	0.123 [0.020, 0.227]
Alcohol poisoning	1	16/15	1.10 [0.66, 1.85]	0.002 [-0.009, 0.013]	12/11	1.07 [0.60, 1.93]	0.001 [-0.010, 0.013]
	2	24/21	1.13 [0.74, 1.72]	0.004 [-0.010, 0.018]	19/16	1.17 [0.73, 1.86]	0.004 [-0.010, 0.019]
	3	28/28	1.01 [0.69, 1.48]	0.000 [-0.015, 0.015]	27/21	1.28 [0.87, 1.90]	0.010 [-0.007, 0.027]
	4	32/34	0.95 [0.66, 1.36]	-0.003 [-0.018, 0.013]	31/26	1.21 [0.84, 1.75]	0.009 [-0.010, 0.028]
	8	53/55	0.96 [0.72, 1.27]	-0.003 [-0.024, 0.017]	44/44	1.00 [0.74, 1.36]	0.000 [-0.022, 0.022]
	12	85/84	1.01 [0.81, 1.27]	0.002 [-0.024, 0.027]	60/67	0.90 [0.69, 1.16]	-0.011 [-0.038, 0.015]
Alcohol use disorder	1	543/435	1.25 [1.14, 1.37]	0.148 [0.083, 0.213]	132/119	1.11 [0.93, 1.33]	0.022 [-0.017, 0.061]
	2	702/585	1.20 [1.11, 1.30]	0.160 [0.086, 0.235]	190/165	1.15 [0.99, 1.34]	0.042 [-0.005, 0.089]
	3	859/715	1.20 [1.12, 1.29]	0.197 [0.116, 0.279]	250/208	1.20 [1.05, 1.37]	0.070 [0.016, 0.123]
	4	995/841	1.18 [1.11, 1.26]	0.211 [0.123, 0.299]	300/251	1.20 [1.06, 1.35]	0.082 [0.023, 0.140]
	8	1,469/1,288	1.14 [1.08, 1.20]	0.249 [0.143, 0.356]	469/418	1.12 [1.02, 1.24]	0.085 [0.012, 0.158]
	12	1,972/1,725	1.14 [1.09, 1.20]	0.339 [0.216, 0.462]	661/587	1.13 [1.04, 1.22]	0.123 [0.036, 0.209]
Alcoholic liver disease/ pancreatitis	1	106/82	1.29 [1.05, 1.58]	0.033 [0.004, 0.061]	37/33	1.12 [0.79, 1.57]	0.006 [-0.014, 0.027]
	2	149/120	1.24 [1.04, 1.47]	0.039 [0.005, 0.073]	54/51	1.06 [0.80, 1.40]	0.005 [-0.020, 0.030]
	3	182/159	1.14 [0.98, 1.33]	0.031 [-0.006, 0.069]	72/70	1.03 [0.81, 1.31]	0.004 [-0.025, 0.033]
	4	226/197	1.15 [1.00, 1.32]	0.040 [-0.002, 0.082]	90/90	1.00 [0.78, 1.24]	-0.001 [-0.033, 0.032]
	8	410/358	1.15 [1.03, 1.27]	0.071 [-0.015, 0.128]	167/183	0.91 [0.78, 1.07]	-0.027 [-0.071, 0.017]
	12	622/544	1.14 [1.05, 1.24]	0.107 [0.038, 0.177]	281/283	0.99 [0.88, 1.12]	-0.004 [-0.060, 0.053]

[a] The two hospitalization figures refer to displaced and non-displaced workers, respectively, in the propensity score weighted samples.

[b] Risk differences are expressed in percentage points units (i.e., estimated coefficients from the binomial generalized linear model are multiplied by 100).

Table 9: Sensitivity analysis: Propensity score weighted estimates from a binomial generalized linear model of the impact of job loss, excluding establishments with less than 50 employees, on mortality due to any alcohol-related condition, as well as three subgroups of alcohol-related conditions, as cause of death, expressed as both risk ratios (RRs) and risk differences (RDs) with 95% robust confidence intervals (CIs)

		Men					Women				
Diagnosis	Years	Deaths[a]	RR	[95% CI]	RD[b]	[95% CI]	Deaths[a]	RR	[95% CI]	RD[b]	[95% CI]
All alcohol-	4	92/81	1.14	[0.92, 1.41]	0.015	[-0.011, 0.042]	28/21	1.35	[0.99, 1.99]	0.012	[-0.006, 0.030]
related	8	229/195	1.17	[1.02, 1.35]	0.047	[0.004, 0.089]	59/51	1.16	[0.89, 1.52]	0.014	[-0.012, 0.040]
conditions	12	397/332	1.20	[1.08, 1.33]	0.089	[0.034, 0.145]	101/84	1.20	[0.98, 1.47]	0.028	[-0.006, 0.061]
Alcohol	4	18/17	1.04	[0.64, 1.67]	0.001	[-0.011, 0.013]	10/8	1.22	[0.64, 2.32]	0.003	[-0.008, 0.014]
poisoning	8	44/36	1.21	[0.89, 1.65]	0.010	[-0.008, 0.029]	13/16	0.79	[0.45, 1.39]	-0.006	[-0.018, 0.007]
	12	73/59	1.23	[0.96, 1.57]	0.019	[-0.005, 0.043]	20/23	0.86	[0.55, 1.34]	-0.006	[-0.021, 0.010]
Alcohol use	4	73/66	1.10	[0.87, 1.40]	0.009	[-0.015, 0.033]	18/13	1.34	[0.81, 2.19]	0.007	[-0.007, 0.022]
disorder	8	191/161	1.19	[1.02, 1.38]	0.042	[0.003, 0.081]	43/35	1.24	[0.91, 1.71]	0.014	[-0.008, 0.036]
	12	324/269	1.21	[1.07, 1.35]	0.076	[0.025, 0.126]	73/59	1.24	[0.98, 1.58]	0.024	[-0.005, 0.052]
Alcoholic	4	9/6	1.55	[0.76, 3.17]	0.004	[-0.004, 0.013]	2/2	1.12	[0.26, 4.76]	0.000	[-0.004, 0.005]
liver disease/	8	26/26	0.98	[0.65, 1.49]	-0.001	[-0.015, 0.014]	8/10	0.83	[0.40, 1.72]	-0.003	[-0.013, 0.007]
pancreatitis	12	70/61	1.16	[0.90, 1.48]	0.013	[-0.011, 0.037]	23/20	1.13	[0.74, 1.74]	0.004	[-0.012, 0.021]

[a] The two mortality figures refer to displaced and non-displaced workers, respectively, in the propensity score weighted samples.

[b] Risk differences are expressed in percentage points units (i.e., estimated coefficients from the binomial generalized linear model are multiplied by 100).

The exogeneity argument might also be threatened by establishments small enough to introduce the possibility that the employees themselves might have influenced the risk of business failure. In the main analysis, establishments with less than 10 employees were excluded; however, this threshold might not have been high enough. Therefore, in an additional sensitivity analysis, the threshold was raised to 50 employees. The resulting estimates are presented in *Table 8* and *Table 9*. Increasing the threshold slightly affected the point estimates, but they are neither consistently larger nor smaller than those presented in the main analysis. However, because many establishments were small, more than half of the displaced workers were excluded, which resulted in less precise estimates. Consequently, several estimates lost statistical significance.

3.4 Discussion

This study showed that individuals experiencing job loss seem to suffer from increased alcohol-related morbidity and mortality. The positive income elasticity of alcohol consumption would predict that the consumption of alcohol would be reduced by the income losses associated with job loss. However, the average income losses have been shown to be modest in the Nordic countries (Eliason, 2011; Huttunen et al., 2011). Moreover, job loss cannot be viewed in monetary terms alone. For some, at least, job loss represents a stressful life event that may alter daily routines, relationships, social roles, and self-perception. It also implies more time available for drinking and loss of the external regulation and facilitation of self-regulation of alcohol intake that a job may provide.

The findings of this study are in concordance with those of Browning and Heinesen (2012) and Eliason and Storrie (2009a, 2009b), although the estimates presented herein are more conservative, at least in the shorter term, and are more precisely estimated. One potential explanation for the more modest effects observed in this study may be the unfavorable labor market conditions at the time of the job losses. During these years, Sweden experienced the most severe recession since the Great Depression. Although the recession worsened employment prospects for those being laid off, it is also likely that the stigma associated with unemployment was reduced and that the employees constituting the control group had a higher risk of future job loss during this period.

Many of the previous empirical studies on the effects of job loss or unemployment on health or health behavior have been silent regarding whether men and women are affected equally. Nonetheless, several reasons have been suggested to why women would be less likely to be affected by job losses and more likely to cope better with unemployment: Women have greater opportunities to switch between different rewarding social roles (i.e., from working woman to housewife; Hammarström et al., 2011), unemployment undermines the traditional family role of men but not that of women (Helgeson, 2010), and women have a weaker attachment to the labor force and less of their identity is tied to their work role (Brand et al., 2008). However, findings from some Swedish and U.S. studies (Brand et al., 2008; Eliason and Storrie, 2009b; Hammarström et al., 2011) may challenge this hypothesis, at least with respect to whether these explanations can be generalized to societies like Sweden and the United States with a high female labor force participation and where the traditional male-only breadwinner model is no longer preferred.

Even if men and women would react similarly to job loss, they may not necessarily experience the same levels of alcohol-related morbidity and mortality. In general, men consume more alcohol than women do, although this consumption gap has been closing over time (Holmila and Raitasalo, 2005). Men have also often been found to be more prone to using alcohol as a way to cope with distress (Nolen-Hoeksema and Harrell, 2002; Park and Levenson, 2002), although the situation seems to be the reverse among alcoholics (Olenick and Chalmers, 1991; Rubonis et al., 1994). However, the outcome measure in this study was not alcohol consumption per se but its adverse health consequences. Hence, it is necessary to acknowledge that women experience shorter periods between the onset of excessive alcohol use and the onset of alcohol-related health problems (Hernandez-Avila et al., 2004). Also, women have a lower threshold for alcohol toxicity than men (Müller, 2006). Nonetheless, because of the larger – at least perceived – social stigma associated with alcohol misuse among women, they are less likely to seek treatment than men (Greenfield et al., 2007). The findings of the present study suggest that the effects of job loss on overall alcohol-related morbidity and mortality were of similar relative sizes among both men and women; however, in absolute numbers, more men were affected.

Alcohol problems following job loss in women appear to manifest mostly as dependence, whereas the risks of alcohol poisoning and, to some extent, alcohol-induced liver disease and pancreatitis were also elevated in men. However, that displaced men had an immediate excess risk of hospitalization because of liver diseases and pancreatitis, despite the fact that these diseases only occur after many years of hazardous drinking, suggests that the groups of displaced and non-displaced men – even after controlling for baseline risk factors – had different existing drinking habits before job loss, or that job loss exacerbated existing conditions among those who already had drinking problems. The latter explanation is analogous to that of an observed immediate increase in cirrhosis-related mortality following increases in aggregate alcohol consumption (Norström and Skog, 2001).

The present study has several advantages over previous studies, mostly related to the comprehensive administrative data covering the whole population of Sweden; however, there are some limitations that should be acknowledged. First, administrative data also come with some notable drawbacks, such as a lack of pre-displacement information on drinking habits and co-morbidities not requiring inpatient treatment (e.g., mild depression). Second, by limiting the analysis to diseases and conditions wholly attributable to alcohol, the total impact on adverse alcohol outcomes cannot be covered. However, if one would have included also diseases that are only indirectly attributable to alcohol (e.g., stomach and liver cancer, hypertensive diseases, and stroke), then it could, instead, be questioned as to what extent alcohol was a causative agent in the specific cases studied. Third, it is commonly reported that death certificates underreport the involvement of alcohol (Ågren and Jakobsson, 1987). However, it seems that Northern European countries are much more prone to report wholly alcohol-attributable diseases and conditions than many other countries (Ramstedt, 2002), which suggests that underreporting may not be a major issue. Combining the principal and contributory discharge diagnoses or causes of death may also have provided a more comprehensive measure (Herttua et al., 2007; Mäkelä, 1999). Fourth, in observational studies, an inevitable question is the extent to which the estimated effects reflect a "causal effect" or a "selection effect." Given the sole focus on job losses as a result of establishment closures and pre-displacement information on various known risk factors, including prior hospital inpatient treatment related to

alcohol misuse, this study goes a long way toward establishing causality. Nevertheless, at the end of the day, the causal interpretation relies on the untestable "unconfoundedness assumption" – that is, that conditional on the observed pre-displacement characteristics, job losses (because of establishment closures) can be considered randomly distributed.

A final consideration concerns interpretation of the estimates. That job losses because of establishment closures (arguably) are not related to the employees' traits or behavior has an additional implication (besides providing the researcher with a "quasi-experiment"): Such job losses are less likely to signal low productivity than job losses in general that, potentially, are more selective (Gibbons and Katz, 1991). Those who are laid off may, therefore, be less prone to blame themselves (Brand et al., 2008). Hence, it is likely that job losses because of establishment closures have a lower psychological impact on employees than do individual layoffs (Brand et al., 2008; Eliason and Storrie, 2010). Therefore, any estimates of their impact should be regarded as conservative estimates of the impact of job losses in general. Moreover, in this study, losing a job (because of an establishment closure) was compared not with never losing a job but rather with not losing a job (because of an establishment closure) at that point in time, but possibly in the future.

To conclude, job loss and unemployment per se may be stigmatizing for those affected. Similarly, having an alcohol problem, depending on its extent and manifestation, may also be stigmatizing. Thus, the small proportion of individuals who misuse alcohol as a means of coping with their situation following job loss may suffer from a double stigma and, by extension, increase their risk of diseases and conditions requiring hospital inpatient treatment or increase their risk of death.

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