Does unemployment cause long-term mortality? Selection and causation after the 1992–96 deep Swedish recession

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Background: Mass unemployment in Europe is endemic, especially among the young. Does it cause mortality?
Methods: We analyzed long-term effects of unemployment occurring during the deep Swedish recession 1992–96.
Mortality from all and selected causes was examined in the 6-year period after the recession among those
employed in 1990 (3.4 million). Direct health selection was analyzed as risk of unemployment by prior medical
history based on all hospitalizations 1981–91. Unemployment effects on mortality were estimated with and
without adjustment for prior social characteristics and for prior medical history. **Results**: A prior circulatory
disease history did not predict unemployment; a history of alcohol-related disease or suicide attempts did, in
men and women. Unemployment predicted excess male, but not female, mortality from circulatory disease,
both ischemic heart disease and stroke, and from all causes combined, after full adjustment. Adjustment for
prior social characteristics reduced estimates considerably; additional adjustment for prior medical history did
not. Mortality from external and alcohol-related causes was raised in men and women experiencing unemploy-
ment, after adjustment for social characteristics and medical history. For the youngest birth cohorts fully adjusted
alcohol mortality HRs were substantial (male HR = 4.44; female HR = 5.73). The effect of unemployment on
mortality was not uniform across the population; men, those with a low education, low income, unmarried or
in urban employment were more vulnerable. **Conclusions**: Direct selection by medical history explains a modest
fraction of any increased mortality risk following unemployment. Mass unemployment imposes long-term
mortality risk on a sizeable segment of the population.

Introduction

Mass unemployment in Europe is endemic, especially among the young.[1] Recurring economic crises in Europe and elsewhere call for an urgent answer to questions about immediate and long-term health effects of mass unemployment.[2,3] There is widespread consensus in an extensive literature spanning decades[4–17] that unemployment is related to poor health and early mortality, but substantial controversy exists over whether the causal direction is one leading from unemployment to health rather than the reverse.

We address this question by analyzing the deep Swedish recession of 1992–96, which saw mass unemployment on a scale not experienced since the 1930s. Unemployment rose from 1.6% in 1990 to 8.2% in 1993. In the youngest age group, 16–24, unemploy-ment was 18.4% in 1993.[18] Our data suggest that 23% of Swedish men and 20% of women of working age were unemployed at least 30 days during the recession. Often all of, or large parts of a workplace was closed. The economic sectors most affected included construc-tion, finance, telecommunications and public employment. In two previous papers,[19,20] we demonstrated that becoming unemployed during this recession was associated with mortality risk during the 6-year period immediately following the recession.

In this article, we delve deeper into issues of selection and causality. It is well established that unhealthy people are less likely to be employed and if employed more likely to lose their job, the 'healthy worker effect'.[21,22] We assume that this applies both at the peak and at the bottom of a business cycle, something we refer to as direct health selection.

Direct health selection into unemployment is assumed to be stronger when unemployment is low and weaker when unemploy-ment is high, or when entire workplaces close down.[9] Martikainen and Valkonen[9,10] suggested that it is impossible to deduce the true public health effects of unemployment when unemployment is very low. In their study of mortality during the deep Finnish recession of 1991–93, they showed that the association of mortality with un-employment weakened as unemployment increased; they suggested a reduced role of health selection during mass unemployment.

However, this finding is also consistent with the 'true' effect of un-employment being modified by contextual factors, such as a country's level of unemployment and its ability and willingness to offer social protection for those unemployed. For instance, stigmatization of the unemployed may be less when unemployment is widespread. On the other hand, unemployment compensation schemes may become less generous, or less affordable, when unemployment grows. Thus, psycho-logical effects on health might be reduced but economic effects on health more severe during mass layoffs. On the other hand, after the recession, those unemployed individuals who fail to regain entrance to the labour market may suffer stigma and be disregarded as welfare dependent.[23] We also suggest that the effects of unemployment on mortality are not uniform across the labour market. Economic loss may be more hazardous for people with low rather than high income, for instance.[24]

Thus, vulnerability to the health consequences of unemployment may vary by social characteristics and by position in the business cycle. In economic depressions, when a much larger pool of people become unemployed, the ratio of the proportion of those vulnerable to those less vulnerable may fall. A low average effect of

Table 1 Relative risk of unemployment 1992–96 by medical history

Medical history 1981–91	No. of persons with diagnosis	Unemployment risk (OR, 95% CL)	Adjusted estimate (OR, 95% CL)
Men			
Any diagnosis	557 722	1.29 (1.28–1.30)	1.16 (1.15–1.17)
Cancer	20 266	1.02 (0.98–1.06)	0.96 (0.92–0.99)
Circulatory	74 024	1.13 (1.11–1.15)	0.97 (0.95–0.99)
IHD	19 559	0.99 (0.96–1.03)	0.77 (0.74–0.80)
Stroke	5912	0.96 (0.89–1.02)	0.72 (0.67–0.77)
External	153 101	1.46 (1.44–1.48)	1.26 (1.24–1.27)
Suicide attempt	7394	2.93 (2.80–3.07)	1.90 (1.81–1.99)
Transport accidents	28 775	1.61 (1.57–1.65)	1.36 (1.33–1.40)
Alcohol related	68 183	1.99 (1.96–2.02)	1.40 (1.38–1.43)
Women			
Any diagnosis	938 339	1.09 (1.08–1.10)	1.05 (1.04–1.05)
Cancer	108 284	1.08 (1.06–1.10)	1.04 (1.02–1.06)
CVD	56 592	1.04 (1.02–1.07)	0.93 (0.90–0.95)
IHD	4806	0.81 (0.74–0.89)	0.62 (0.57–0.69)
Stroke	4288	1.02 (0.94–1.11)	0.83 (0.76–0.91)
External	91 236	1.36 (1.34–1.38)	1.21 (1.19–1.23)
Suicide attempt	11 092	2.39 (2.30–2.49)	1.74 (1.67–1.82)
Transport accidents	15 016	1.32 (1.27–1.37)	1.19 (1.14–1.24)
Alcohol related	31 798	1.61 (1.57–1.65)	1.24 (1.21–1.28)

Number of persons with a specific medical history 1981–1991 (col 2). Age-adjusted odds ratios and 95% confidence limits (column 3) comparing those with a diagnosis and those without (reference group). Estimates adjusted for social, family and employer characteristics (column 4).
CL = confidence limits.

unemployment on mortality, observed during a recession, does not invalidate conclusions about causality.

Persons who become unemployed during mass unemployment may have a different risk profile from those who retain their jobs. For instance, unmarried men and women were more likely than those married to become unemployed during the Swedish 1992–96 recession.[25] They also have a higher mortality risk than those married. Therefore, we expect them to have a higher mortality post-recession, even in the absence of any effect of unemployment on mortality, a classic example of confounding.

This is different from a situation where certain groups are more likely to become both unemployed and to suffer health consequences conditional on such an event. This could be seen as a form of indirect health selection, or 'vulnerability selection'. Social, family and employer characteristics may either modify or confound the effect of unemployment on health. In fact, they could confound and modify at the same time.

Thus, we try to address the causality issue and minimize the selection problem by (i) studying a period of mass unemployment when direct health selection is less likely; (ii) examining mortality post-recession, thereby creating a distinct time lag between exposure and outcome; (iii) accounting for medical history prior to unemployment; (iv) adjusting for a number of social, family and employer characteristics known to be linked both to unemployment and mortality risk; (v) and finally considering the possibility of effect modification and confounding by these characteristics.

Methods

We estimated unemployment risk by previous medical history in the adult Swedish working population. We were then able to follow mortality in this population for 6 years immediately after the 1992–96 recession, from 1 January 1997 to 31 December 2002. We estimated excess mortality risks for those who experienced unemployment during the recession, controlling for prior health

status and a number of factors that could either be confounders or effect modifiers, such as social, family and employer characteristics.

Study population

All men and women in the Swedish population born 1931–65 and employed in 1990 were eligible for study. Those employed in 1990 would be a healthy subset of the total population. We only included those who were still alive on 31 December 1996 which is the day before the mortality follow-up starts. Thus 3 392 169 individuals were identified in the Swedish Work and Mortality Database, an anonymous and temporary database held at the Centre for Health Equity Studies (CHESS), constructed by linking, through the unique Swedish personal identification number, several registries (see below) held by Swedish authorities. Ethical permission was given by the Stockholm Regional Ethics Board (no 02-481, 04-628T, 2008/1991-32).

Information about a person's gender, birth year and month, education and income, number of children, marital status, immigrant status and his/her employer's geographical location in Sweden was retrieved from the 1990 Census and/or the Swedish Longitudinal Integrated Database for Sickness Insurance and Labour Market Studies (LISA-registry).[26] The latter six variables are referred to as 'social, family and employer characteristics' below. Education was classified in seven categories: marital status as unmarried, married (including cohabitation), divorced or widowed; immigrant status as born in Sweden or not; income and number of children were logged in analyses; employer's county location was grouped in nine categories, but as urban, rural or unknown in analyses of effect modification (Supplementary Table S1 describes variables).

The LISA-registry allowed identification of all persons who experienced unemployment during the recession, here defined as at least 30 days of unemployment in any 1 year 1992–96. Unemployment information was collected at the end of a year, and only for those alive then. Thus, we could not study mortality outcomes in the same year a person lost their job.

Prior medical history

Information about medical history prior to unemployment was based on diagnoses at discharge from hospital, using all in-patient visits between 1 January 1981 and 31 Dec 1991, retrieved from the virtually complete Swedish In-patient Registry. The distribution of hospital visits was skewed and in the final mortality analyses, we used the logged number of hospitalizations. This produced HRs that consistently were between those estimated from models that used the raw number of hospitalizations and those using a binary measure (none vs. any).

In analysis of specific mortality outcomes, we took into account previous medical history of relevance for that cause-of-death. This includes prior cancer-related diagnosis (models with cancer mortality as the outcome); prior circulatory disease (CD) diagnoses including ischemic heart disease (IHD) models and stroke (CD and stroke models); prior self-injury attempts (all-external-causes model and suicide model) and prior injuries related to transport or other accidents (all-external-causes model and transport deaths model). Finally, we took prior alcohol-related diagnoses into account in analyses of deaths from any external cause, from suicide and from alcohol-related deaths. For all-cause mortality analyses, any kind of hospitalization was taken into account.

Mortality outcomes

Data on mortality diagnoses and date of death were retrieved from the Swedish Cause-of-Death Registry. Any death that occurred between 1 January 1997 and 31 December 2002 was included in

Table 2 Men: mortality during the 1997–2002 post-recession period

Cause-of-death	No of deaths	HR (95% CI) Model 1	HR (95% CI) Model 2	HR (95% CI) Model 3
All causes	45 081	1.46 (1.43–1.49)	1.26 (1.23–1.29)	1.26 (1.23–1.28)
All cancer	15 923	1.21 (1.16–1.25)	1.13 (1.09–1.18)	1.14 (1.09–1.18)
Circulatory	15 639	1.31 (1.26–1.36)	1.11 (1.07–1.15)	1.13 (1.09–1.18)
IHD	9954	1.28 (1.22–1.34)	1.08 (1.03–1.13)	1.11 (1.06–1.17)
Stroke	2393	1.50 (1.37–1.65)	1.29 (1.17–1.42)	1.32 (1.20–1.46)
External	5664	2.05 (1.94–2.17)	1.67 (1.58–1.77)	1.59 (1.50–1.69)
Suicide	2419	1.74 (1.60–1.90)	1.48 (1.36–1.62)	1.43 (1.31–1.56)
Transport	953	1.50 (1.30–1.72)	1.33 (1.15–1.53)	1.30 (1.13–1.50)
Alcohol related	960	3.22 (2.83–3.66)	2.33 (2.04–2.66)	2.16 (1.89–2.47)

HRs and 95% CI for those exposed to unemployment during the 1992–96 recession compared with those not exposed. All men in Sweden born 1931–65, employed in 1990 and alive on 31 December 1996 (n = 1 747 167). Model 1: adjusted for birth year; Model 2: Model 1 + adjustment for social, family and employer characteristics. Model 3: Model 2 + adjustment for prior health status.

Table 3 Women: mortality during the 1997–2002 post-recession

Cause-of-death	No of deaths	HR (95% CI) Model 1	HR (95% CI) Model 2	HR (95% CI) Model 3
All causes	26 183	1.12 (1.09–1.16)	1.03 (0.99–1.06)	1.03 (1.00–1.07)
All cancer	15 292	1.05 (1.00–1.10)	1.00 (0.96–1.05)	1.01 (0.96–1.05)
Circulatory	4948	1.01 (0.94–1.10)	0.89 (0.82–0.96)	0.91 (0.84–0.99)
IHD	2287	1.04 (0.93–1.18)	0.90 (0.80–1.02)	0.94 (0.83–1.06)
Stroke	1432	1.05 (0.91–1.22)	0.93 (0.80–1.08)	0.94 (0.81–1.10)
External	1912	1.47 (1.33–1.64)	1.24 (1.11–1.39)	1.17 (1.05–1.31)
Suicide	914	1.39 (1.19–1.62)	1.16 (0.99–1.36)	1.08 (0.92–1.27)
Transport	260	0.94 (0.69–1.30)	0.90 (0.65–1.24)	0.89 (0.64–1.23)
Alcohol related	314	2.32 (1.80–3.20)	1.97 (1.53–2.53)	1.91 (1.48–2.46)

HRs and 95% CI for those exposed to unemployment during the 1992–96 recession compared with those not exposed. All women in Sweden born 1931–65, employed in 1990 and alive on 31 December 1996 (n = 1 645 002). Model 1: adjusted for birth year; Model 2: Model 1 + adjustment for social, family and employer characteristics. Model 3: Model 2 + adjustment for prior health status.

the mortality follow-up, and grouped as follows: all-cause mortality; all cancer mortality (ICD 10 codes C00–C97, D00–D48); all CD mortality (ICD codes I00–I99), with specification for IHD mortality (I20–I25) and stroke mortality (I60–I69); all external causes of death (X00–X85, V00–V97, W00–W99 and Y00–Y97), with specification for suicide mortality (X00–X85,Y87) and mortality from transport accidents (V02–V97) and finally mortality from alcohol-related causes combined. The latter category was based on recommendations from the Swedish National Board of Health and Welfare, described in Room et al.[27]

Statistical analyses

Age-adjusted risks of unemployment in 1992–96 by prior medical history 1981–91 were estimated by logistic regression, with and without adjusting for social, family and employer characteristics.

The effects of unemployment on mortality were estimated by using multivariate Cox proportional hazards regression models, using attained age as underlying time scale.[28,29] Estimates were first adjusted for baseline social, family and employer characteristics, and then for prior medical history 1981–91. Males and females were analyzed separately. Additional analyses were undertaken by birth cohort.

Further, we examined whether the effect of unemployment on mortality was uniform across social, family and employer characteristics.

Results

At least one episode of hospitalization (excluding childbirths) during the 11-year period before the recession was experienced by 38% of women and 32% of men. Another 19% of women had been hospitalized only to give birth.

Risk of unemployment was in general modestly linked to prior history of hospitalization, somewhat more so for men than for women. A history of alcohol-related disease or of suicide attempts did predict unemployment in men and women. In contrast, prior CD history did not (model 2). However, comparing the unadjusted and adjusted effect for CD, we note a change of sign, possibly indicating over-adjustment. Direct selection by previous medical history into unemployment appear to vary strongly by disease category.

Mortality events were studied in the post-recession period only. The median number of years from an unemployment episode to a death was 6 or 7 years, depending on cause-of-death.

Post-recession, all-cause mortality was slightly raised among men (HR = 1.46; CI, 1.43–1.49) and women (HR = 1.12; CI, 1.09–1.16) who suffered unemployment during the recession (tables 2 and 3). Adjusting for social, family and employer characteristics in 1991 reduced these estimates considerably (by 43% for men and 75% for women), but additional adjustment for prior health status hardly affected the estimate. Consistent with the latter observation, we found no difference in the mortality effect of unemployment between men with prior hospitalization (all-cause mortality HR = 1.41; CI, 1.37–1.45) and men without (HR = 1.45; CI, 1.41–1.50). For women, the corresponding estimates were 1.10 (CI, 1.05–1.16) and 1.14 (CI = 1.09–1.19) (data not shown in table).

We found excess mortality from CD among men who had experienced unemployment, both from IHD and stroke, after full adjustment. Estimates were modest: stroke mortality HR = 1.32 (CI, 1.20-1.46) and IHD mortality HR= 1.11 (CI, 1.06-1.17). However, the stroke estimate was considerably higher among younger men (HR = 2.53; CI, 1.13-5.67 for those born 1961–65). Among women, in contrast, there was no evidence of elevated circulatory mortality following unemployment.

Alcohol-related mortality was significantly raised among both men and women who had experienced unemployment, even after full adjustment, with HRs of similar size for men (HR = 2.16; CI, 1.89–2.47) and women (HR = 1.91; CI, 1.48–2.46). For the two youngest age groups, born 1956–65, these ratios were very high:

Table 4 All-cause mortality during the 1997–2002 post-recession period

	Men		Women	
Unem/employment HR	HR (95% CI) Model 1[a]	HR (95% CI) Model 2[b]	HR (95% CI) Model 1[a]	HR (95% CI) Model 2[b]
Education				
High	1.54 (1.44–1.64)	1.28 (1.20–1.37)	1.16 (1.06–1.27)	1.07 (0.98–1.17)
Low	2.08 (2.02–2.15)	1.57 (1.52–1.62)	1.51 (1.44–1.58)	1.39 (1.33–1.46)
Income				
High	1.37 (1.32–1.43)	1.24 (1.20–1.29)	1.16 (1.10–1.22)	1.05 (0.99–1.12)
Low	2.04 (1.98–2.10)	1.61 (1.57–1.66)	1.19 (1.14–1.24)	1.12 (1.08–1.18)
Married				
Yes	1.28 (1.24–1.32)	1.19 (1.16–1.23)	1.06 (1.02–1.11)	1.01 (0.97–1.06)
No	2.53 (2.45–2.60)	1.91 (1.85–1.97)	1.63 (1.55–1.71)	1.44 (1.37–1.51)
Immigrant				
Yes	1.42 (1.35–1.49)	1.22 (1.17–1.29)	0.95 (0.87–1.03)	0.88 (0.81–0.95)
No	1.44 (1.40–1.47)	1.24 (1.21–1.27)	1.14 (1.00–1.18)	1.06 (1.02–1.09)
Urban employment				
Yes	1.56 (1.51–1.62)	1.40 (1.35–1.44)	1.21 (1.15–1.28)	1.16 (1.09–1.22)
No	1.37 (1.34–1.41)	1.20 (1.17–1.24)	1.12 (1.07–1.17)	1.05 (1.01–1.10)

HRs and 95% CI for those exposed to unemployment during the 1992–96 recession compared with those not exposed, within dichotomized categories of education, family income, marital status, immigrant status and employer localization at baseline. All men and women in Sweden born 1931–65, employed in 1990 and alive on 31 December 1996.

a: Age adjusted model.

b: Model 1 + adjustment for education, income, marital status, immigrant status, urban/rural employer in 1990.

for men (HR = 4.44; CI, 2.03–9.74) and for women HR = 5.73; (CI, 1.06–30.9) (data not shown).

For men, but not for women, suicide and cancer mortality were also raised among those who had suffered unemployment (suicide HR = 1.43; CI, 1.31–1.56; cancer HR = 1.14; CI 1.09–1.18 after full adjustments). Mortality from transport accidents was somewhat elevated among men (HR = 1.30; CI, 1.13–1.50), particularly the youngest (born 1961–65: HR = 1.72; CI, 1.22–2.43); ambiguity around this cause-of-death could include suicides misclassified as accidents.

Table 4 looks at interactions. It demonstrates, for men, heterogeneity of effect by marital status, education and employer localization. Low-educated men, men on low income and single men were more prone to suffer mortality consequences after unemployment than were other men. Among women those with low education or not married were more likely than other women to suffer mortality after unemployment.

Discussion

Exposure to unemployment during a deep recession predicts excessive all-cause and cause-specific mortality post recession. This is most noticeable not only for external and alcohol-related causes but also for male CD, in particular stroke. Attempts to disentangle the effect of direct health selection into unemployment from the causal effect of unemployment on health by controlling for prior health status typically find the effect of unemployment on mortality to be only marginally reduced when accounting for prior health status.[30] This is true both in periods of low unemployment, such as in Sweden 1981–96[6,13] and in periods of high unemployment, such as in Finland 1991–93[9,10] or Sweden 1992–96.[19,20]

We found direct selection by medical history to be of marginal importance in this representative Swedish population and only important for certain disease categories, notably alcohol-related disease and previously attempted suicide. Even for the latter two categories, adjustment for prior medical history only modestly affected estimates of the effect of unemployment on suicide or alcohol-related mortality. For the most common causes of death including cancer and CD, prior medical history did not influence estimates of unemployment effects at all. Therefore, our first conclusion is that direct selection by medical history (hospitalizations) does not explain much of the observed association between recession unemployment experience and post-recession mortality risk. However, prior health in the form of conditions

that do not always lead to hospitalizations, such as anxiety or depression, could have triggered both recession unemployment episodes and post-recession mortality. This could then be seen as another source of selection bias, with unclear importance in this study.

Above all, it seems to be confounding from social, family and employer characteristics that we should worry about. Persons recruited into unemployment differ by such characteristics, which in turn may be linked to their post-recession excess mortality (confounding). Indeed, for all outcomes, the adjustments for social, family and employer characteristics prior to recession have considerable impact on estimates in tables 2 and 3. As most of the effect remains this suggests, in any case, a partial causal effect of unemployment on mortality. Further, if persons recruited into unemployment are on average more vulnerable than others (vulnerability selection), we should not just routinely adjust for their characteristics but explore their potential effect modifications.

Social, family and employer characteristics before recession appear to modify the effect of recession unemployment on post-recession all-cause mortality. The effect of unemployment is not uniform across the exposed population. It varies not only by age-group and gender, being higher among men and the young, but also by education, income and family status. Therefore, accounting for the social composition of the unemployed is important in any causality analysis.

To adjust across factors that are at the same time confounders and modifiers, on the assumption that they are merely confounders, would conceal heterogeneity of effect. This may be a common problem in studies of unemployment and mortality. Our study suggests that observed mortality effects of unemployment are not due to confounding from social, family or employer characteristics, at least not entirely. At the very least, unemployment has taken its mortality toll among a vulnerable segment of the population, particularly among young men, unmarried men and men of low education or income.

The risk of becoming unemployed is higher among people who have previous experience of unemployment. This has been referred to as 'scarring', 'path dependency' or 'state dependency'.[31] Vulnerability to the health effects of unemployment may also be influenced by previous unemployment history and subsequent 'scarring'[32] especially by repeated spells of unemployment when young.[33] Scarring might be linked to conditions such as anxiety and depression, which may in turn influence unemployment risk in a vicious circle. A previous analysis of our study population

showed a nearly continuous increase in post-recession mortality risk with accumulated unemployment experience during the recession, among both men and women.[19] This dose–response relation, based either on long-term unemployment or repeated spells or both, adds further credibility to a causal interpretation, possibly implicating 'scarring'.

Our study includes neither hospitalizations nor deaths during the recession. The former limitation could conceal health selection and the latter is likely to give a conservative bias to estimates of unemployment effects on mortality. All things considered we conclude that neither direct selection by medical history nor confounding can fully explain the observed excess risk among those with unemployment experience. The differential vulnerability to this experience means that mortality risk may be substantial in vulnerable segments of the population. We conclude that mass unemployment does indeed impose long-term mortality risk on a sizeable segment of the population.

Policy implications

Economist Paul Krugman has repeatedly maintained that policies of fiscal contraction have contributed to very high levels of unemployment in much of Europe. The one-sided focus on state budget deficits has triggered programmes of austerity and thereby allowed unemployment to rise and the social protection of the unemployed to be weakened.[2,3,17] Learning from the Swedish 1992–96 recession, it would appear that such austerity will eventually take a toll in mortality, such as suicide, alcohol-related and traffic deaths (overlapping due to classification ambiguity) and circulatory deaths.

The Sarkozy Commission, in 2008, called on governments to '…shift emphasis from measuring economic production to measuring people's well-being'.[34] A focus on well-being is hardly consistent with mass unemployment. If economic policy makers, like doctors, were committed to an ethical principle 'to do no harm', mass unemployment would have to go.[35] Its abolishment, surely, would improve people's well-being and health.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Key points

- Unemployment risk, during the deep 1992–96 Swedish recession, was higher among those with a prior medical history of alcohol or suicide attempts; but not at all elevated among those with a prior history of circulatory disease or cancer.
- In the period after the recession, circulatory disease mortality, in particular from stroke, was elevated among men, but not among women, who suffered unemployment during the recession, even when all confounders have been accounted for.
- In the period after the recession, alcohol-related and external mortality was elevated among men and women suffering unemployment during the recession, even when their prior medical history has been taken into account.
- The effect of unemployment on all-cause mortality is not uniform across the population. Mortality consequences are larger among the young, among unmarried men and women and among men and women of low education or income.
- We conclude that mass unemployment imposes mortality risk on a sizeable segment of the population and caution against economic policies that allow mass unemployment.

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Patterns of life expectancy before and during economic recession, 2003–12: a European regions panel approach

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Background: Previous research has reported a decrease in all-cause mortality during times of economic recession. Our objective was to identify the short-term effects of the current Great Recession on life expectancy at birth in Europe, and the role of social protection typology, income and gender. **Methods:** We used a pooled time series cross-sectional design, with 232 European regions (level 2 of the Nomenclature of Territorial Units for Statistics) as the unit of analysis over 10 years (2003–12). The dependent variable was life expectancy at birth, and the independent variable was unemployment rate. We fit a model in first differences for the periods before and during the Great Recession (2003–07 and 2008–12, respectively), and stratified by sex, social protection typology (Eastern, Mediterranean and Northern) and regional income *per capita*. **Results:** We observed a negative association during the Great Recession between life expectancy (in years) and in unit change in unemployment among men and women in low-income Mediterranean regions [−0.048(95%CI: −0.081,−0.014) and −0.050(95%CI:−0.091,−0.007), respectively] but no change in trend, and a change in trend to a non-significant negative association among men in high-income Mediterranean and Northern regions (*P* = 0.005 and *P* = 0.002, respectively). We also observed a positive association among men in middle-income Mediterranean regions [0.044 (95%CI:0.004,0.084)], with change in trend (*P* = 0.047), and Eastern regions [0.042 (95%CI:0.001,0.072)] without change in trend. **Conclusion:** Overall, our data do not support the notion that increased life expectancy is associated with unemployment during the Great Recession.

Introduction

The extent to which economic recession can affect population health is a topic that has recently been revisited, especially since the peripheral European countries have been hardest hit by rising unemployment and the debt crisis. Greece, Portugal and Cyprus' finances were directly bailed out, while Spain and Italy, to varying degrees, were forced to restructure public services to avoid

default. Recent research across European countries has found that increased unemployment is associated with a decrease in all- and selected-cause mortality, motor vehicle accidents, cardiovascular disease and chronic liver disease and an increase in suicides rates.[1,2] National studies have also reported an increase in suicide among working age men in Italy,[3] Greece[4] and Spain[5] associated with the financial crisis. These findings corroborate previous counterintuitive evidence of a overall positive effect of economic