The public health effect of economic crises and alternative policy responses in Europe: an empirical analysis

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Summary

Background There is widespread concern that the present economic crisis, particularly its effect on unemployment, will adversely affect population health. We investigated how economic changes have affected mortality rates over the past three decades and identified how governments might reduce adverse effects.

Methods We used multivariate regression, correcting for population ageing, past mortality and employment trends, and country-specific differences in health-care infrastructure, to examine associations between changes in employment and mortality, and how associations were modified by different types of government expenditure for 26 European Union (EU) countries between 1970 and 2007.

Findings We noted that every 1% increase in unemployment was associated with a 0·79% rise in suicides at ages younger than 65 years (95% CI 0·16–1·42; 60–550 potential excess deaths [mean 310] EU-wide), although the effect size was non-significant at all ages (0·49%, –0·04 to 1·02), and with a 0·79% rise in homicides (95% CI 0·06–1·52; 3–80 potential excess deaths [mean 40] EU-wide). By contrast, road-traffic deaths decreased by 1·39% (0·64–2·14; 290–980 potential fewer deaths [mean 630] EU-wide). A more than 3% increase in unemployment had a greater effect on suicides at ages younger than 65 years (4·45%, 95% CI 0·65–8·24; 250–3220 potential excess deaths [mean 1740] EU-wide) and deaths from alcohol abuse (28·0%, 12·30–43·70; 1550–5490 potential excess deaths [mean 3500] EU-wide). We noted no consistent evidence across the EU that all-cause mortality rates increased when unemployment rose, although populations varied substantially in how sensitive mortality was to economic crises, depending partly on differences in social protection. Every US$10 per person increased investment in active labour market programmes reduced the effect of unemployment on suicides by 0·038% (95% CI –0·004 to –0·071).

Interpretation Rises in unemployment are associated with significant short-term increases in premature deaths from intentional violence, while reducing traffic fatalities. Active labour market programmes that keep and reintegrate workers in jobs could mitigate some adverse health effects of economic downturns.

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Introduction

Many commentators have expressed concern that the present economic downturn will adversely affect public health as a result of job losses, contributing to mental health or addiction problems, the adoption of less healthy lifestyles (such as increased consumption of cheap food with little nutritional value, or smoking as a response to stress), and poor disease management resulting from overburdened health-care services or delays seeking care for patients who are concerned about additional costs. WHO has warned that "it should not come as a surprise that we continue to see more stresses, suicides and mental disorders"; "the poor and vulnerable will be the first to suffer"; and "defending health budgets" will become more difficult.[1,2]

Yet many analysts have argued that overall health might not be affected by economic downturns; indeed, some argue that a recession could lead to health gains. Studies undertaken in high-income countries have suggested that mortality has tended to fall when the economy slows down and conversely rise when the economy speeds up.[3–7] These effects vary substantially for different age groups,[8] sexes, and diseases,[9,10] and the results are somewhat sensitive to the indicators used to measure economic change.[11–14] Although Catalano and Bellows[15] have noted the counterintuitive nature of these findings, it has been postulated that recessions lead people to engage in fewer unhealthy, so-called affluent activities (overconsumption of food and alcohol) and spend more time in health-promoting activities (eg, walking instead of driving), which has led some to speculate that a recession might make you healthier.[16,17] Which view of the effect of economic downturns on public health is best supported by empirical data?

Existing published work on the relation between economic trends and public health offers only an incomplete understanding of the present economic situation. Most previous studies have not analysed the effects of recession per se on health, but instead have assessed the static effects of routine peaks and troughs in total economic output (gross domestic product [GDP]) or GDP per person. These measures can ascertain whether death rates are relatively high when GDP is relatively low, but do not assess whether death rates rise after GDP falls, as in a recession. Other studies have recorded trends in mortality during periods of recession,

Panel: **Definition of social protection**

Family
Expenditure that supports families (ie, excluding one-person households). This expenditure often relates to the costs associated with raising children or with the support of other dependants. Expenditure related to maternity and parental leave is grouped under the family cash benefits subcategory.

Housing
Rent subsidies and other cash benefits to the individual to help with housing costs.

Active labour market programmes
Active labour market programmes contain all social expenditure (other than education) aimed at improving beneficiaries' prospects of finding gainful employment or to otherwise increase their earnings capacity. This expenditure includes spending on public employment services and administration, labour market training, special programmes for youth when in transition from school to work, labour market programmes to provide or promote employment for unemployed and other people (excluding young and disabled people), and special programmes for disabled people.

Unemployment
Cash expenditures to people compensating for unemployment. This expenditure includes redundancy payments from public resources and pensions to beneficiaries before they reach so-called standard pensionable age if these payments are made because they are out of work or otherwise for reasons of labour market policy.

Health
Expenditure in this category encompasses expenditure on in-patient care, ambulatory medical services, and pharmaceutical goods. To account for long-term care double-counting, some spending on services for elderly and/or disabled people provided by institutions other than hospitals are excluded for Denmark, Germany, Iceland, Norway, and Switzerland. Cash benefits related to sickness are classified as sickness benefits.

All data are public expenditures in purchasing power parity US$ per head of population. Definitions from Organisation for Economic Co-operation and Development (OECD) Health Data 2008 edition.[29] Four other social expenditure categories covered by the OECD data include incapacity-related benefits, old-age benefits, survivors' benefits, and other social policy areas.

For the **OECD social expenditure database** see http://www.oecd.org/els/social/expenditure

but have not corrected for possible confounding variables.[18] One study has shown that a serious financial crisis, as opposed to common economic fluctuations during the business cycle, does adversely affect health generally, although the specifics are unclear.[13]

Furthermore, although GDP might be the most widely used measure of the state of the economy, it is distant from the everyday experience of individuals, especially since it relates to the average income of a country and does not comment on inequality within countries. Instead, examination of measures such as unemployment or consumer confidence could be more relevant to capture the economic turmoil and insecurity faced by the population during periods of economic uncertainty. Of all the possible economic measures, unemployment is the most widely available indicator of economic difficulty, and previous research has shown that fluctuations in employment are more closely associated with short-term changes in health than are other economic indicators.[5] Although decreases in GDP are generally connected with rises in unemployment, the strength of this association varies greatly across countries and over time, reflecting factors such as fiscal responses to recession and employment legislation. Poor and vulnerable members of the population are most sensitive to unemployment, and could be missed by GDP that measures a country's average income. To overcome these gaps in our knowledge, we assessed the effects of significant financial events on mortality with measures of employment, examining causes of death at different ages and in both men and women. We also checked the robustness of our findings to other economic indicators, such as GDP per person, hours worked, and alternative measures of unemployment.

A crucial question is how to respond to any recorded effect of economic change on public health.[15] Growing evidence suggests that countries have different health responses to exogenous shocks. For example, in countries emerging from communism in Europe in the early 1990s, the adverse consequences of rapid economic reforms were reduced in countries in which many people were members of social organisations, such as trade unions, religious groups, or sports clubs.[19] Similarly, the Asian economic crisis seemed to have few health consequences in Malaysia, but far more significant consequences in Indonesia and Thailand; Malaysia's rejection of World Bank advice to reduce health expenditures, as opposed to Thailand and Indonesia's adoption of this advice, probably contributed to the different outcomes in these countries.[20] Other research has suggested that the adverse health effects of economic fluctuations might be reduced when there are high levels of social protections.[7] Individual-level studies have shown that the health effect of social programmes varies greatly by the type of social programme and, in some cases (such as with youth opportunity schemes), could be adverse.[21,22] Although these individual-level studies provide a hypothesis that governments might be able to reduce any potential negative effects of economic downturns on population health, the specific scope and scale of social programmes need to be understood since they relate to protecting health during economic turmoil.

Much of the previous work assessing the association between countries' economic cycles and public health outcomes has been limited to individual countries, such as Finland,[23] Germany,[24] the USA,[5] Japan,[6] Spain,[25] and Denmark.[26] To understand whether, and under what circumstances, increased unemployment might be linked to worse health outcomes across populations, and what

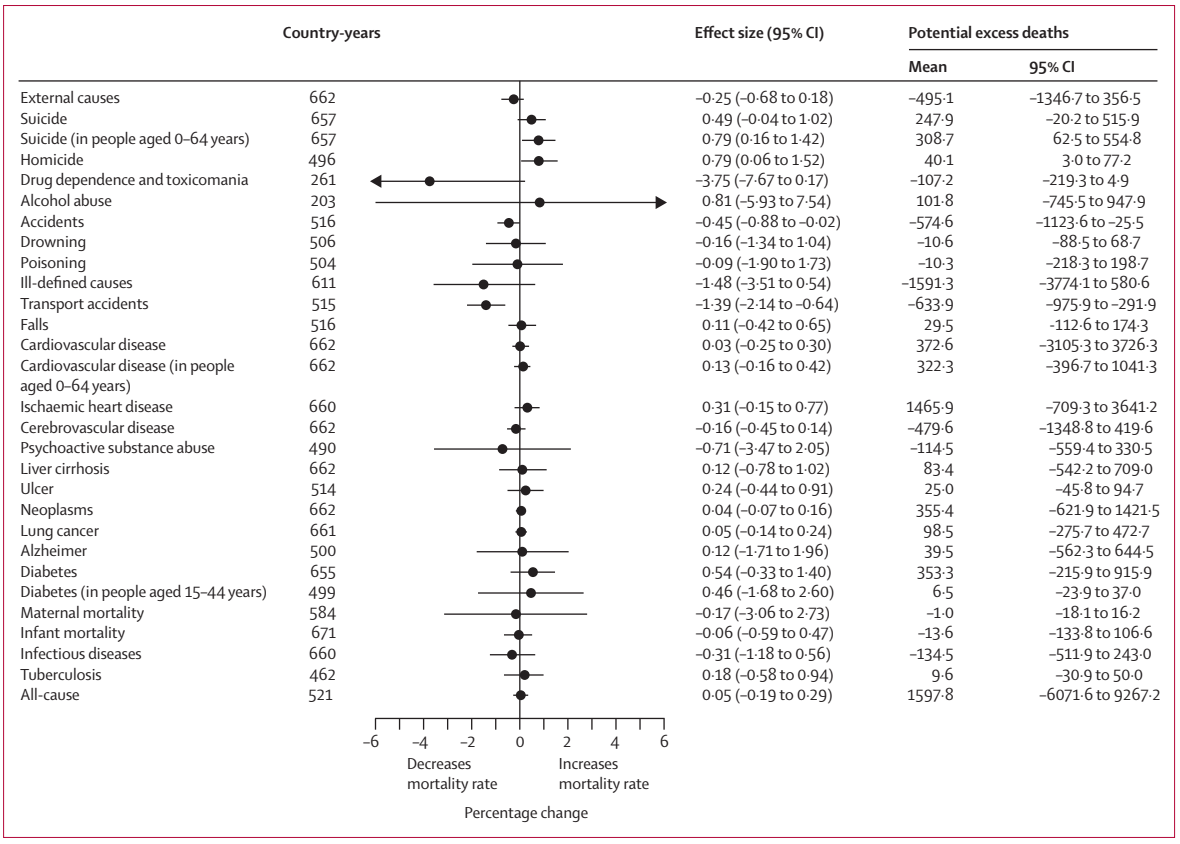

Figure 1: **Associations of a 1% rise in unemployment with age-standardised mortality rates, by cause of death, in European Union countries, 1970–2007**
Coefficients are presented from 29 separate regression models. Models estimated as mentioned in the Methods section, correcting for population ageing, past mortality trends, country-specific mortality trends, and country fixed effects (see webappendix pp 3–21 for representative models and more details). Error bars are 95% CIs based on robust standard errors clustered by country to reflect non-independence of sampling. Country-years are the sample size for every model. Some causes of death are overlapping (eg, poisoning and alcohol abuse). Potential excess deaths were estimated by applying the average effect size of a 1% rise in unemployment to the latest available EU-wide data for age-standardised death rates and population size. Data are from the WHO European Health for All database 2008 edition.

social programmes may mitigate these effects, we extended our analysis to a large international dataset for mortality and employment, encompassing 26 European Union (EU) countries from 1970 to 2007. To assess the plausibility of our statistical observations within populations, we calculated the expected effect of employment changes on mortality, on the basis of the effect sizes reported previously in studies of individual countries. We also examined trends in deaths from different causes to assess the biological plausibility of reported statistical trends—eg, changes in death rates from neoplasms are unlikely to be attributable to short-term events in view of the typically lengthy delay between exposure to carcinogens such as tobacco and death from lung cancer, whereas deaths from events such as suicide can occur rapidly after the onset of changed economic circumstances.

Methods

Data collection

Age-standardised and age-specific mortality data were taken from the WHO European Health for All database (basic and mortality database versions, respectively). Mortality rates were age-standardised by the direct method, according to the European Standard Population.[27] Official unemployment data were taken from the International Labour Organisation (ILO) Key Indicators of the Labour Market, which defines unemployment as all people who were without work yet available for or seeking employment. GDP data in current US$ were taken from the World Bank World Development Indicators 2008 edition.[28] Social expenditure data in the domains of health, unemployment, active labour market programmes, family and housing, as defined in the panel, were from the OECD Health Data 2008 edition,[29] expressed in US$ adjusted for purchasing power parity. The webappendix p 2 describes the data used in the study.

See Online for webappendix

Statistical analysis

Measurement of when and for how long episodes of recession occur is typically done in two ways: either with a classic method, which involves dating recession on the basis of the peak and trough of output in the economy; or with a two-step method, which first assesses the time

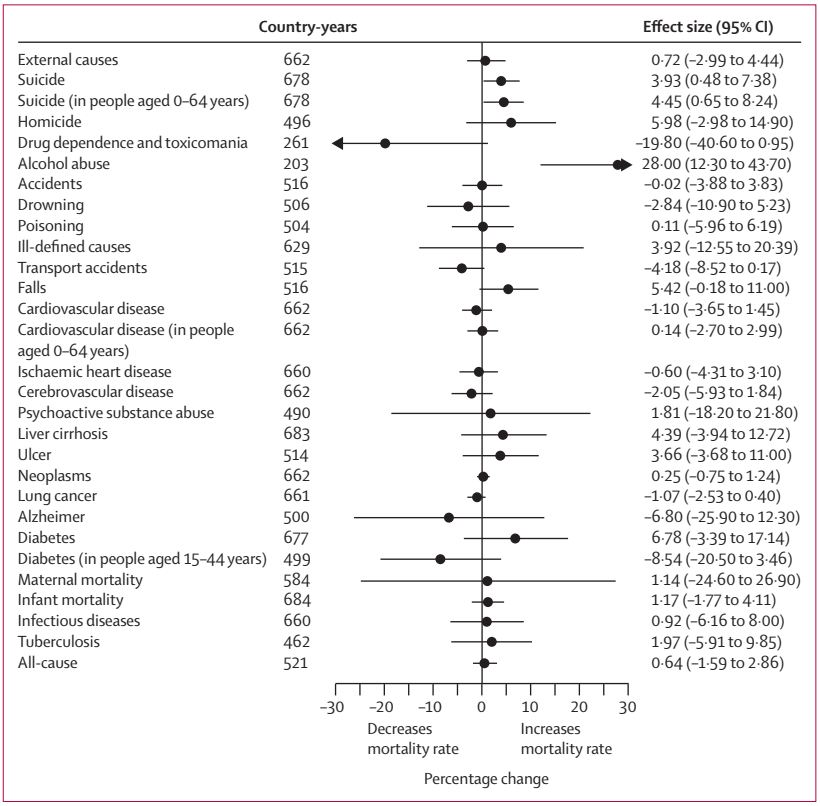

Figure 2: **Associations of a mass rise (>3%) in unemployment with age-standardised mortality rates, by cause of death, in European Union countries, 1970–2007**

Coefficients are presented from 29 separate regression models. Models estimated as mentioned in the Methods section, correcting for population ageing, past mortality trends, country-specific mortality trends, and country fixed effects (see webappendix pp 3–21 for representative models and more details). Error bars are 95% CIs based on robust standard errors clustered by country to reflect non-independence of sampling. Country-years are the sample size for every model. Some causes of death are overlapping (eg, poisoning and alcohol abuse). Data are from the WHO European Health for All database 2008 edition.

trends in the measure of the economy being assessed (usually GDP) and then defines recessionary episodes on the basis of downward fluctuations from these trends.[30] However, neither of these methods of dating business cycles is relevant to the present situation, which has involved rapid and significant increases in unemployment, which have been largely unanticipated by politicians and the general public. What could be more important for health is the pace of the social changes and how well prepared people are for dealing with them.[31] Hence, we used an approach comparing changes in unemployment to changes in mortality; however, to assess the robustness of our findings, we also used the traditional methods to examine the consistency of our results (webappendix pp 3–6).

To approximate the present situation, we identified significant financial events on the basis of unemployment fluctuations in two ways. First, we assessed deviations in unemployment rates from their average rate of change, as opposed to deviations from their average levels, to avoid spurious statistical findings. Second, we identified specific periods of mass job loss (when unemployment rises >3% in a fiscal year). This 3% cut-off corresponded to a change of two standard deviations, meaning an unemployment increase of this magnitude occurred in less than 5% of country-years and was a fairly rare event in EU countries.

Because the propensity to register for unemployment benefits varies across countries, indicating institutional differences,[32] we modelled out these differences with use of country-specific slopes (holding constant fixed effects, or a set of 26 country dummy variables).[33] Our statistical tests showed that we could not have assumed that the unobserved country fixed effects were not potential confounders of the association between unemployment and mortality (Hausman-Taylor $\chi^2(1)=4\cdot32$, $p=0\cdot038$)[34] (webappendix pp 20–21). Thus, we used the fixed effects approach to remove these potentially confounding between-country differences and to isolate the association between unemployment and mortality with use of within-country variations. The fixed effects approach is more conservative than alternatives are (random effects or pooled ordinary least squares) because it essentially includes an additional 26 control dummy variables, losing degrees of freedom, which might be appropiate in view of the need to protect the type-I error rate from the large number of statistical tests (and of the limitations associated with Bonferroni-style adjustments[35]). However, we felt the decision to use this conservative strategy was justified both theoretically and empirically. Furthermore, with use of deviations from every country's average rate of change in health and employment, we are able to note how a population's health changes with respect to its existing health and the ability to intervene.

Our basic linear fixed effects statistical model is thus:

$$\Delta H_{i,t}-\overline{\Delta H}_i=\alpha+\beta\times(\Delta U_{i,t}-\overline{\Delta U}_i)+\eta\times t+\gamma_i\times t+\varepsilon_{i,t}$$

where i is country and t year; H is the mortality rate; U is the measure of unemployment based on the standard ILO definition of people unemployed who are seeking jobs as a proportion of the total labour force; α represents the average background rate of change in mortality rates, η the average background rate of acceleration in mortality rates, and γ the country-specific rate of acceleration in the mortality rate from the health condition being analysed; and ε is the error term. We clustered our standard errors by country to reflect the fact that countries were not sampled independently and to calculate unbiased standard errors in the presence of serial correlation during years of mass rises in unemployment. We also removed observations when very large year-to-year changes occurred (>150%), which was noted only in the two smallest countries—Malta and Luxembourg—and reflected instability because of small numbers; none of the within-country results changed as a result of this step. Data were analysed with Stata (version 10.1). All data are available from the authors upon request.

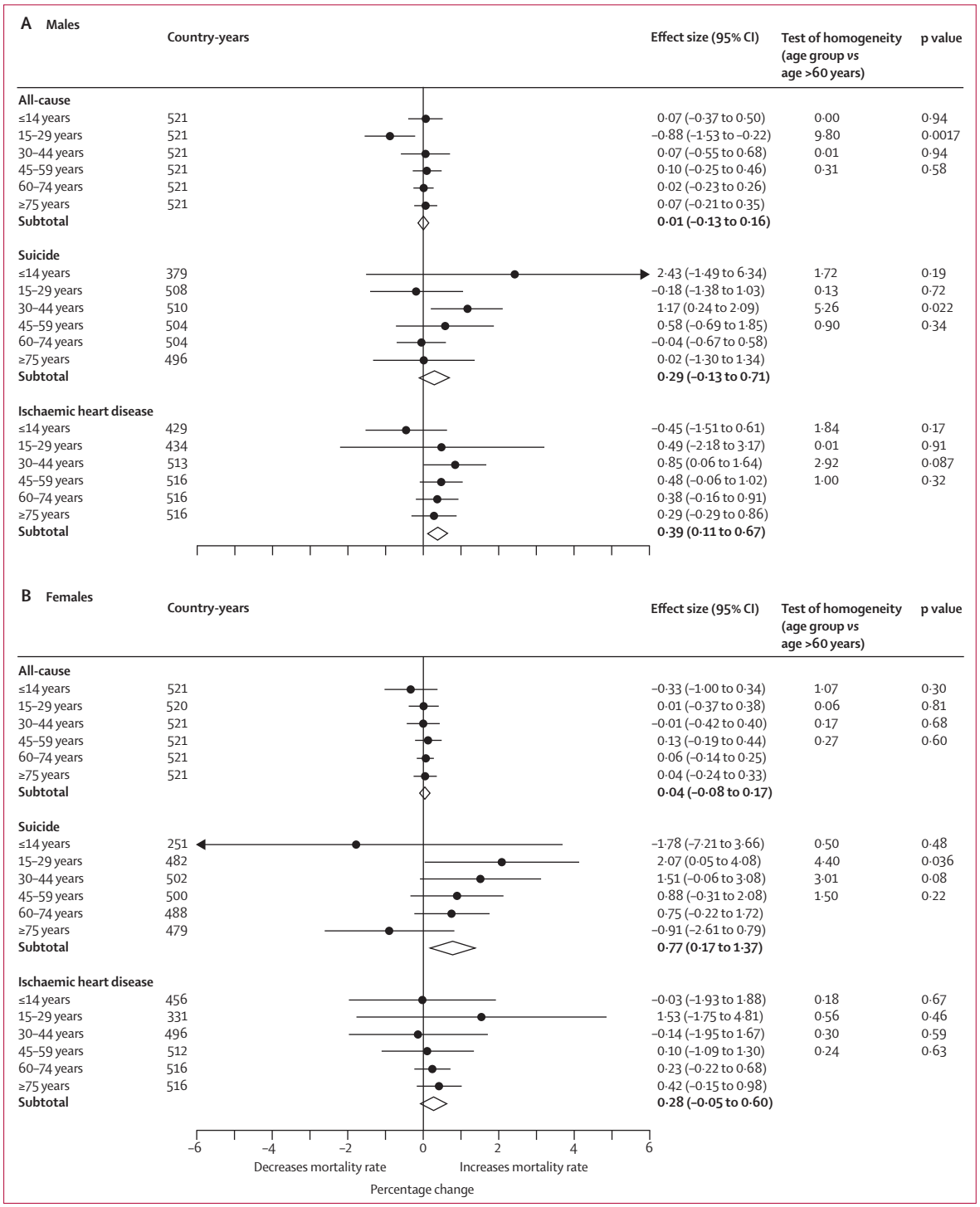

Figure 3: **Associations of a 1% rise in unemployment with age-specific mortality rates, by age group and sex, 1980–2007**
(A) Males. (B) Females. Coefficients are presented from 36 age-specific regression models estimated as mentioned in the Methods section, correcting for population ageing, past mortality trends, country-specific mortality trends, and country fixed effects (see webappendix pp 3–21 for representative models and more details). Error bars are 95% CIs based on robust standard errors clustered by country to reflect non-independence of sampling. Homogeneity of effect Wald test ~$\chi^2(1)$ and calculated based on robust standard errors clustered by country with Stata suest module; reference group is age greater than 60 years. A Bonferonni correction for k=4 populations sets the threshold for α=0·05 at p<0·004167; however, we undertook pairwise testing of a specific hypothesis that unemployment rates should most greatly affect people at risk of unemployment—ie, people of working age—instead of testing all age groups against each other, and hence the Bonferronni-type correction is not appropriate for the specific assessment. Country-years are the sample size for every model. Some causes of death are overlapping (eg, poisoning and alcohol abuse). Data are from the WHO European Health for All database 2008 edition. Subtotal was calculated with Stata's metan module.

	Effect size on suicide rates (95% CI)	p value
1% rise in unemployment rates	1·067% (0·1444 to 1·991)	0·026
US$10 higher social spending on active labour market programmes	–0·052% (–0·198 to 0·094)	0·460
1% rise in unemployment rate and US$10 higher spending on active labour market programmes (interaction)	–0·038% (–0·071 to –0·0046)	0·028

Effect sizes are based on modelling the interaction between changes in unemployment and the level of social protections: $\beta1\times\Delta Unemp+\beta2\Delta Unemp\times SP+\beta3\times SP$, where SP is social spending on active labour market programmes. Models also correct for both year and country-specific year trends. Number of countries=17, number of country-years=300; R^2=0·13 (see webappendix pp 28–32 for further interaction tests with family, housing, health care, and unemployment cash benefits. Active labour market programmes had the strongest and most significant protective effect). Countries included in the sample for which social protection data from the Organisation for Economic Co-operation and Development (OECD) Health Data 2008 edition are available include Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Slovakia, Spain, Sweden, and the UK. These data cover 1980–2003 for all countries apart from Slovakia (1995–2003), Poland (1990–2003), Czech Republic (1990–2003), and Austria (1980, 1985, 1990–2003). See webappendix p 2 for more details of data availability

Table 1: **Interaction of social labour market protections with the effect of unemployment on suicide rates (in people younger than 64 years), 1980–2003**

Role of the funding source

The sponsors of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Figure 1 shows the results of 29 regression models of different diseases for 26 EU countries between 1970 and 2007 (on average more than 550 country-years). After correcting for population ageing, past employment and mortality trends, and country-specific differences in surveillance, we noted that every 1% rise in unemployment rates was associated with a 0·79% rise in suicides at ages younger than 65 years (95% CI 0·16–1·42; 60–550 potential excess deaths [mean 310] EU-wide) and a 0·79% rise in homicides (0·06–1·52; 3–80 potential excess deaths [mean 40] EU-wide). By contrast, road-traffic deaths decreased by 1·39% (0·64–2·14; 290–980 potential fewer deaths [mean 630] EU-wide). Rising unemployment had no effect on other causes of death assessed (figure 1). As a result of these offsetting effects, combined with the absence of an effect on cardiovascular diseases, we recorded no significant net effect of unemployment on all-cause mortality rates (0·05%, 95% CI –0·19 to 0·29, p=0·68).

We tested whether especially large rises in unemployment (>3% in a year) had different effects on health outcomes (figure 2). The last time such an increase was noted in the UK was in 1981, when unemployment rose by 3·6% and suicides rates by 2·7%.[28] Consistent with these UK data, such an episode of mass unemployment was associated with a 4·45% (95% CI 0·65–8·24) rise in age-standardised suicide rates in 26 EU countries (250–3200 potential excess deaths [mean 1740] EU-wide). However, we also noted significant associations with deaths from alcohol abuse (figure 2), which lends support to the notion that short-term negative effects of unemployment mainly affect psychological distress.

We would expect that unemployment would affect people of working age, who are more directly affected by labour market stress, more than it would pensioners. Figure 3 shows the results of 36 statistical models of the effects of rises in unemployment on suicides, ischaemic heart disease, and all-cause mortality rates by age group and sex. Generally, we noted that younger populations were more sensitive to the negative health effects of rising unemployment than were those older than 60 years (on the basis of tests of effect homogeneity [webappendix pp 20–21 provides methodological details]; tests for multiple factors are not indicated here since comparisons are of two groups). For men, death rates from suicide and ischaemic heart disease at ages 30–44 years were positively related to unemployment (suicide: 1·17%, 95% CI 0·24–2·09; homicide: 0·85%, 0·06–1·64), although with ischaemic heart disease we detected no differential effect from that observed for ages greater than 60 years (suicide, test of effect homogeneity: χ^2=5·26, p=0·022; ischaemic heart disease, test of effect homogeneity: χ^2=2·92, p=0·087). For women, we noted significant associations with suicides at ages 15–29 years (2·07, 95% CI 0·05–4·08; test of effect homogeneity: χ^2=4·40, p=0·036), but no significant association with ischaemic heart disease (figure 3). Consistent with the aggregated models in figures 1 and 2, we did not record significant effects of rises in unemployment rates on all-cause mortality rates for any age group apart from a protective association in men aged 15–29 years (–0·88%, 95% CI –1·53 to –0·22; test of effect homogeneity χ^2=9·80, p=0·0017), which seems to accrue from reductions in traffic fatalities that account for roughly a third of all deaths in this age group.

The webappendix pp 22–23 separates figures 1 and 2 by sex for the major effects we recorded (54 models). We detected no evidence that men and women were differentially affected by rising unemployment in terms of transport-related deaths (test for effect homogeneity: χ^2=0·45, p=0·50), suicides (χ^2=2·06, p=0·15), or homicides (χ^2=2·11, p=0·15). However, we recorded a significant difference with deaths due to alcohol abuse (χ^2=5·41, p=0·0194), with unemployment associated with increased death rates in women but a negative association in men; but since we tested more than 30 potential differential associations we would have expected at least one significant association to have occurred by chance.

Two countries in western Europe stand out as de-coupling economic crises from the causes of mortality that in most cases do rise, especially in the case of suicides: Finland between 1990 and 1993, when unemployment rates rose from 3·2% to 16·6% while suicide rates dropped steadily, and Sweden between 1991 and 1992, when unemployment rates rose from 2·1% to 5·7% while suicide rates also dropped

	Suicide	CVD	Homicide	Road-traffic accidents	Life expectancy
Hours worked per week	–0·21% (0·34); p=0·55	–0·29% (0·11); p=0·016	–0·06% (0·99); p=0·95	0·57% (0·55); p=0·31	0·03% (0·02); p=0·13
Long-term unemployment	0·89% (0·76); p=0·25	–0·10% (0·21); p=0·63	2·28% (1·31); p=0·095	–2·26% (0·57); p=0·0006	0·04% (0·03); p=0·26
Underemployed percentage	–1·52% (1·86); p=0·42	–0·07% (0·35); p=0·85	–1·14% (2·93); p=0·70	–3·06% (1·43); p=0·053	0·04% (0·05); p=0·48
Unemployment rate (labour force surveys)	0·72% (0·44); p=0·11	0·02% (0·11); p=0·88	1·49% (0·64); p=0·028	–1·51% (0·57); p=0·013	0·02% (0·01); p=0·085
GDP per head	–0·05% (0·03); p=0·081	–0·01% (0·02); p=0·67	–0·04% (0·07); p=0·61	0·06% (0·05); p=0·21	–0·001% (0·003); p=0·61
Absolute change in unemployment rate	0·39% (0·33); p=0·20	0·08% (0·21); p=0·72	1·39% (0·88); p=0·13	–1·19% (0·45); p=0·015	–0·03% (0·03); p=0·40

Results presented from 29 regression models. Robust standard errors in parentheses clustered by country. Models estimated as mentioned in the Methods section. Underemployment is defined as people in employment whose hours of work were below a specific cut-off point, or the number of hours that a person seeking additional hours can work, and reported involuntary reasons for working fewer than full-time hours or wanting to or seeking to work additional hours. Long-term unemployment is people unemployed for 1 year or more as a percentage of the labour force. Countries include Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the UK. Suicide rates are in people younger than 65 years. CVD=cardiovascular disease. GDP=gross domestic product.

Table 2: **Associations of a 1% rise in alternative economic measures with percentage change in death rates in European Union countries, 1970–2007**

(webappendix pp 24–25). In both these countries, microdata showed no relation between economic downturns, unemployment, and poor health.[15,23] Across countries, the strength of the response of suicide rates to changes in unemployment varied substantially. Although, on average, the correlation between changes in unemployment and changes in the suicide rate was 0·12 (p=0·0018), the strength of this relation ranged from –0·13 (Sweden) to 0·59 (Spain) (webappendix pp 25–27).

The commitments of the governments of Sweden and Finland to social support during times of crises—eg, through the use of active labour market programmes—could have had a role.[36,37] One factor modifying the association between unemployment and mortality could be differences in social protection.

Table 1 shows the results of the addition of an interaction term between social labour market protections and unemployment to the basic model of the association between rising unemployment and suicide rates. For every US$10 higher investment in active labour market programmes there was a 0·038% lower effect of a 1% rise in unemployment on suicide rates in people younger than 65 years (95% CI 0·004–0·071, p=0·028). When this spending was greater than US$190 per head per year (adjusted for purchasing power parity), rises in unemployment would have no adverse effect on suicide rates (table 1). By comparison, roughly half of the countries studied spent $190 per person in 2003, and western European countries (EU members before 2004) spent six-fold more on these labour market protections per person than did eastern European countries ($261 *vs* $37 per person).

We undertook a series of further robustness checks on our model specification and estimation (webappendix pp 33–35). First, we included a set of additional economic and demographic controls in our model, including the rate of change in GDP per person, urbanisation, inflation, fertility rates, percentage of the population older than 65 years, and population size. None of our basic results was affected, although in some cases the findings were attenuated toward the null as a result of decreased power (smaller sample size, fewer degrees of freedom), also indicating the heterogeneity in the circumstances under which unemployment was associated with mortality. We used different measures of unemployment, such as data from labour force surveys rather than official reports, and recorded consistent results, although as before in some cases the coefficients were affected by the smaller sample size (table 2). Second, we replicated our models without using controls for time trends, and did not detect significant changes, although the associations tended to grow stronger, suggesting that the results of our analysis were conservative (webappendix pp 33–35). Third, we further tested the delayed effects of changes in unemployment rates. We noted that any significant negative associations appeared within the first 2 years of a market downturn (webappendix pp 36, 41–42). Fourth, we assessed 29 statistical models with alternative measures of the economy (table 2), and recorded consistent results (webappendix p 40).

Discussion

We have shown that rapid and large rises in unemployment were associated with short-term rises in suicides in working-age men and women and in homicides; adverse health effects on suicides were mitigated when investments in active labour market programmes were high (>$190 per head). Rapid increases in unemployment were also associated with short-term reductions in road-traffic fatalities. We noted no consistent evidence across the EU that all-cause mortality rates increased or decreased when unemployment rose, although populations varied substantially in how sensitive mortality was to economic crises, which we find depends partly on differences in social protection. Weaker labour market protections in the central and eastern European countries have made their populations very exposed to the potential for negative health effects when unemployment rates sharply rise.

Before we assess the importance of our study for policy, it is important to note its limitations. First, our analysis focused on the overall experience of populations. Although we detected evidence that inequalities between countries will rise as a result of differences in their level

of social protections, some groups are likely to be affected disproportionately within countries, particularly those who lose jobs, whereas the health of other groups might improve. These effects within populations could cancel each other out to yield no average overall population effect of recession on all-cause mortality rates. Research in the USA suggests that the least well educated workers are at greatest risk of ill health when jobs are lost during times of economic hardship.[38] Furthermore, in the USA the mental health situation of people with inferior employment prospects worsened substantially during phases of tightening labour market conditions.[39] People with low social support might also be at increased risk, as was seen in the communist countries of central Europe in the 1980s, when the rise in mortality was greatest in unmarried men.[40] Research in Japan has shown that, although self-reported health improved overall during a recession, social inequalities widened.[41]

Second, we investigated only mortality rates, which is clearly an incomplete measure of population health. Our models almost certainly understate the full effects of recession on health and, if comparable data had been available, we could have examined the consequences for risk factors and disease incidence.

Third, data were missing for many countries for social protections, mostly for central and eastern European countries, which had high unemployment rates and weak social protections (webappendix pp 2, 43–44). This finding further suggests that the effect modification we recorded was not simply arising from an unemployment non-linearity or east–west EU institutional difference. We were also unable to measure job insecurity for EU countries over the full study period. However, our measures of rises in unemployment are a broad indicator of the economic stress and uncertainty faced by the population, and not only by people who lose their jobs. Because individual studies have in some cases identified worse effects of job insecurity on health than has actual unemployment, to the extent job insecurity is not captured by our models, our findings probably understate the full effect of downturns on mortality rates.

We investigated only the short-term consequences of economic turmoil (ie, <3 years). Some effects of the Great Depression seem to have been manifest only 5–7 years after the bank crises of the late 1920s and early 1930s. A related concern is that fear and anxiety in the present crisis could be particularly longlasting; even when the market recovers, people's worries and associated behaviours (such as health-care seeking or alterations to health-system budgets) might not. Recent reports by non-governmental organisations working on nutrition have shown that UK diets are becoming less healthy, and so-called fast-food companies have reported profits during the present financial crisis.[42] Furthermore, we have investigated only the consequences for high-income countries with well developed social safety systems. The consequences for poor countries are likely to differ in both nature and scale.

Finally, we should note that several features of the present crisis, such as its rapid spread and depth, restrict our ability to infer lessons from the past to manage the present situation. However, there are some similarities with events in the 1930s, arguing for similar analyses of events then to those undertaken here.

Notwithstanding these limitations, our research does have important advantages. Specifically, it focuses on the pace of change in unemployment (what might be regarded as the magnitude of the crisis). It also draws on a larger range of countries than do most previous studies, making it possible to explore potential protective factors. The effects detected are plausible, both in terms of the scale of the recorded changes and in the causes of death.

The findings might have important implications for policy. Economic downturns are associated with substantial short-term rises in premature deaths associated with intentional violence. Fairly large and unexpected rises in unemployment might have a significantly worse effect on suicides and alcohol-related deaths than might slow rises in unemployment, especially in people of working age. Hence, there are reports of an increase in suicides in Japan[43] and mental distress in the UK[44] during the present crisis. However, the overall magnitude of immediate changes in mortality in Europe might be less than has been predicted by some commentators (our estimate is an additional 25–290 suicides in Britain attributable to unemployment rises, webappendix p 37). Nevertheless, although the financial sector of an economy may be principally responsible for risk-taking related to the present economic crisis, the true costs of this risk-taking behaviour are to society as a whole.

The analysis also suggests that governments might be able to protect their populations, specifically by budgeting for measures that keep people employed, helping those who lose their jobs cope with the negative effects of unemployment, and enabling unemployed people to regain work quickly. We observed that social spending on active labour market programmes greater than $190 per head purchasing power parity mitigated the effect of unemployment on death rates from suicides, creating a specific opportunity for stimulus packages to align labour market investments with health promotion.

Contributors

DS compiled the data, designed and did the empirical analysis, and drafted the report. SB, MS, and MM oversaw the design of the study, facilitated the interpretation of the findings, and helped to draft the report. AC provided background information and reviewed literature. All authors have seen and approved the final version of the report.

Conflicts of interest

We declare that we have no conflicts of interest.

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