



Health outcomes during the 2008 financial crisis in Europe: systematic literature review

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ABSTRACT

OBJECTIVE

To systematically identify, critically appraise, and synthesise empirical studies about the impact of the 2008 financial crisis in Europe on health outcomes.

DESIGN

Systematic literature review.

DATA SOURCES

Structural searches of key databases, healthcare journals, and organisation based websites.

REVIEW METHODS

Empirical studies reporting on the impact of the financial crisis on health outcomes in Europe, published from January 2008 to December 2015, were included. All selected studies were assessed for risk of bias. Owing to the heterogeneity of studies in terms of study design and analysis and the use of overlapping datasets across studies, studies were analysed thematically per outcome, and the evidence was synthesised on different health outcomes without formal meta-analysis.

RESULTS

41 studies met the inclusion criteria, and focused on suicide, mental health, self rated health, mortality, and other health outcomes. Of those studies, 30 (73%) were deemed to be at high risk of bias, nine (22%) at moderate risk of bias, and only two (5%) at low risk of bias, limiting the conclusions that can be drawn. Although there were differences across countries and groups, there was some indication that suicides increased and mental health deteriorated during the crisis. The crisis did not seem to reverse the trend of decreasing overall mortality. Evidence on self rated health and other indicators was mixed.

CONCLUSIONS

Most published studies on the impact of financial crisis on health in Europe had a substantial risk of

bias; therefore, results need to be cautiously interpreted. Overall, the financial crisis in Europe seemed to have had heterogeneous effects on health outcomes, with the evidence being most consistent for suicides and mental health. There is a need for better empirical studies, especially those focused on identifying mechanisms that can mitigate the adverse effects of the crisis.

Introduction

In 2008, Europe entered a period of unprecedented financial crisis following a global economic downturn. Several countries in the European Union faced declining gross domestic product (GDP), increasing public debt, and rising borrowing costs, while individual households experienced financial insecurity created by job loss, reduced salaries, and plummeting house prices.¹ The situation worsened by early 2010, and Greece became the first EU country to receive a bailout package jointly from the International Monetary Fund, the EU, and the European Central Bank. Ireland, Portugal, and Cyprus followed a few months later.

The effect of the financial crisis on European health systems was inevitable. Different countries responded with different policies. Many countries reduced their health budgets, and some had to introduce structural changes and tough austerity measures.² Fears about the adverse impact of the financial crisis on health outcomes have been increasing, and consequently, the number of studies investigating this impact has grown in the past few years.^{3,4} It has been argued that the impact of a financial crisis is not always uniform across countries, but could depend on the duration and severity of the crisis, the type of austerity measures introduced by the government, and whether the populations are covered by social protection schemes.⁵

Evidence relating to previous crises is inconclusive and suggests that the impact on health outcomes can be context specific. Tapia Granados and Diez Roux⁶ studied the Great Depression in the USA (1929-39) and found that except for suicides, most other causes of mortality fell, but life expectancy rose during that period. By contrast, in Russia, following the breakup of the Soviet Union, life expectancy decreased by 6.6 years for men and 3.3 years for women between 1989 and 1994.⁷ The current financial crisis is arguably the most severe that Europe has experienced in the post-war era, threatening even the unity of the EU, with countries such as Greece facing exit in light of their debt crisis. In addition, the magnitude and geographical variation of the crisis makes it a unique context to analyse.

Yet—and despite growing interest in the impact of the financial crisis in Europe on health outcomes—the evidence so far has been fragmented. Studies focus on

WHAT IS ALREADY KNOWN ON THIS TOPIC

As a result of the financial crisis in Europe that intensified in 2008, several European Union countries reduced their health budget and introduced structural changes and austerity measures

At the same time individual households experienced financial insecurity created by job loss and reduced salaries

Despite immense interest in the impact of the financial crisis in Europe, evidence on its impact on health outcomes is still unclear and fragmented

WHAT THIS STUDY ADDS

Our systematic review shows that the financial crisis in Europe seems to have had heterogeneous effects on health outcomes, with the evidence being most consistent for suicides and mental health that show deterioration

Evidence also suggests that most of the studies reviewed had a substantial risk of bias; therefore, results need to be cautiously interpreted

particular countries (eg, Simou and Koutsogeorgou⁸ on Greece), particular health outcomes (eg, van Hal⁹ on psychological wellbeing), or particular groups (eg, Rajmil and colleagues¹⁰ on children). The aim of this paper was to systematically identify, critically appraise, and synthesise the empirical evidence on the impact of the financial crisis in Europe on health outcomes.

Methods

Search strategy and selection process

Our steps for identifying and reviewing the evidence were based on the recommendations of the Centre for Reviews and Dissemination.¹¹ Firstly, we conducted structured searches of online databases: PubMed, Web of Science, EBSCOhost, Scopus, and Google Scholar. Secondly, we hand searched key healthcare journals (*Lancet*, *European Journal of Public Health*, *Health Policy*, *Social Science and Medicine*, *The BMJ*, *PLoS One*, and *BMJ Open*). Finally, we searched the websites of relevant organisations that have published reports and data on population health and healthcare, including the World Health Organization, Organisation for Economic Co-operation and Development, European Observatory on Health Systems and Policies, and Unicef. The search terms we used included “financial crisis”; “economic crisis”; “recession”; “austerity”; in conjunction with “health”; “health outcomes”; “healthcare”; and “Europe.” Supplementary table A shows the search string as applied in PubMed.

We included studies published from January 2008, when the financial crisis in Europe intensified, to December 2015. Only studies published in English were included. The search was limited to empirical, quantitative papers and excluded qualitative studies, opinion papers, commentaries, and systematic literature reviews. We excluded the following groups of studies:

- Empirical cross sectional studies with no control group—that is, a country that was not hit by the crisis
- Longitudinal studies that did not follow the same group before and after the crisis
- Studies presenting only descriptive evidence
- Studies examining the impact of the crisis on health behaviours, such as smoking, exercising, and drinking
- Studies looking at the impact of macroeconomic indicators on health outcomes in general, unless researchers specifically investigated this in the context of the current crisis—that is, by clearly defining the period of crisis
- Studies looking at the impact of the financial crisis on health systems, such as changes in health workforce.

We also excluded conference proceedings and abstracts if the full text was not available. Multicountry studies were included if their results on European countries could be identified separately.

Our research assistant searched the above websites and, along with one of the authors, initially screened titles for relevance to the topic. The research assistant and one author then screened the abstracts of the selected papers independently, and when disagreements occurred, the second author became involved.

The two authors then read and discussed the full text of the papers and excluded those that did not meet the aims of the study. In this way, we decided on the final list of papers to be included for analysis. The research assistant searched the references and citations of the selected papers. Abstracts and the full text of additional papers identified were reviewed in the same manner. This review process followed the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines (the PRISMA checklist is available on request).¹²

Data extraction and analysis

We extracted data using a standardised data extraction form. These extracted data included: country, period examined, definition of the crisis period, crisis indicator, data and population, study design and methods, main findings, and health outcome examined. Owing to the heterogeneity of the studies in terms of study design and analysis, we decided to thematically analyse them per outcome. Formal quantitative synthesis (meta-analysis) was further impeded by the fact that some studies covered overlapping questions and settings or used different analyses on overlapping datasets; whenever such an overlap existed, we pointed this out. The data extraction table is provided in the supplementary appendix (table B).

Risk of bias assessment

After considering several assessment tools for observational studies, including the Newcastle-Ottawa scale¹³ and the RTI item bank,¹⁴ we decided that the nature of our review and of the reviewed studies was such that none of the existing tools was suitable. For example, the Newcastle-Ottawa scale items on comparability and RTI items on performance and detection bias were not easy to operationalise for our research question. Moreover, these common scales did not include items that captured important aspects that we wanted to consider in our review. Therefore, we decided to develop our own tool. We assessed the risk of bias of the included studies over seven key domains of bias: selection bias, ecological fallacy, confounding bias, reporting bias, time bias, measurement error in exposure indicator, and measurement error in health outcome.

Three of these domains (selection bias, confounding bias, and reporting bias) are commonly captured in several scales, including the RTI item bank and Newcastle-Ottawa scale. Measurement error in health outcomes, adapted from the Newcastle-Ottawa scale, captured the heterogeneity of indicators used, which varied in terms of potential for misreporting (eg, high potential for suicides, none for all cause mortality).

The remaining three domains were included to capture important characteristics of our studies. The ecological fallacy exists when inferences are made from group averages of potential risk factors about outcomes of single individuals. The average experience might not necessarily reflect the experience at the individual level. For example, suppose that an increase in unemployment across different countries is found to be

Table 1 | Assessment risk of bias tool

Risk of bias	Definition	Points to consider and scoring (1=low risk; 2=medium risk; 3=high risk)*
Selection bias	The sample is not representative of the population intended to be analysed	Are the individuals selected to participate in the study likely to be representative of the target population? For survey studies in particular, a response rate of >80% is low risk, 60-79% is moderate risk, and <60% or not reported response rate is high risk. 1=very likely; 2=somewhat likely; 3=not likely
Ecological fallacy	Logical fallacy inherent in making causal inferences from group data to individual behaviours	The study is: 1=non-ecological; 3=ecological
Confounding bias	The analysis does not account for those confounders that are expected to have an effect on the outcome and that have not been accounted for by the inclusion of other	Were analyses appropriately adjusted for confounders? 1=for most confounders; 2=for some confounders; 3=no or cannot tell
Reporting bias	Inappropriate or inaccurate reporting of aspects of the study	Are all aspects of the study (including aims, methods, and results) clearly described and reported? 1=all aspects of the study are clearly described and clear models are provided to support the findings; 2=some aspects of the study are not clear; 3=certain aspects of the study are missing and it is hard to interpret the results provided (full models are not provided)
Time bias	Bias introduced owing to the timeframe considered	Were analyses appropriately considering (a) more than 10 years of data, (b) at least three years of data post crisis, and (c) potential lag effects? 1=all three factors are considered; 2=two of the three factors are considered; 3=one or none of the three are considered
Measurement error in exposure variable	Errors related to the exposure variable	When considering the economic crisis, are analyses appropriately using: 1=more than one macroeconomic variable; 2=one macroeconomic variable; 3=no macroeconomic variable, just the year of the crisis
Measurement error in health outcome	Errors related to the health outcome measurement	The health outcome is: 1=a clinical indicator or officially recorded data that is not likely to be misreported or misstated; 2=self reported validated tool; 3=self reported tool but not clear if it was validated or official recorded data that are likely to be misstated (eg, suicide in death certificate)

*Overall rating for risk of bias: 1 (strong; no high risk score), 2 (moderate; up to two high risk scores), 3 (weak; two or more high risk score).

associated with increased death or suicide risk. Still, one cannot exclude the possibility that within one country, those people who committed suicide and died were actually those who were employed (but overworked and underpaid) rather than those who were unemployed. Under this scenario, if one intervened and employed the unemployed group in jobs where they are underpaid and overworked, suicides might actually increase. Time bias was considered important because previous empirical studies in the area have suggested that reliable estimates can be obtained only when long periods are considered.¹⁵ Measurement error in exposure indicator was included to account for different macroeconomic indicators, which have been used to capture the financial crisis, the main focus of our review. The tool is presented in table 1, along with the definition of each domain.

Studies were given a rating for each domain, with each scored as 1 (strong; low risk of bias), 2 (moderate; moderate risk of bias), or 3 (weak; high risk of bias). An overall rating for each study was based on the rating of each domain. A study was given an overall rating of 1 (strong) if none of its domains was rated as weak; 2 (moderate) if up to two domains were rated as weak; and 3 (weak) if three or more domains were rated as weak. Each study was assessed independently by two authors. We compared the rating for each domain, as well as the overall rating, and reached a consensus on the final rating for each included study. We calculated the weighted κ for each domain as well as for the overall rating.

Patient involvement

No patients were involved in setting the research question or the outcome measures, nor were they involved in developing plans for design, or implementation of the

study. No patients were asked to advise on interpretation or writing up of results. There are no plans to disseminate the results of the research to study participants or the relevant patient community.

Results

Figure 1 shows the results of the review process. We screened 4801 studies by title and abstract for possible inclusion. The full texts of 108 studies were assessed for eligibility. In total, 41 studies¹⁶⁻⁵⁶ met our selection criteria and were included in the systematic review.

Table B in the supplementary appendix presents the data extraction of the papers that were included in the review. The vast majority of the papers focused on

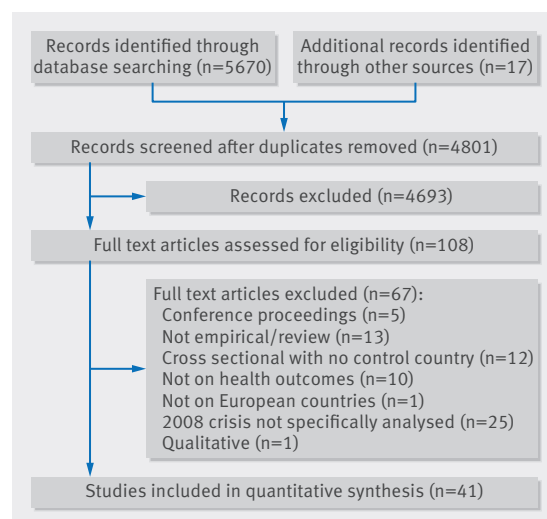


Fig 1 | PRISMA flow diagram of papers reporting on health outcomes during the financial crisis in Europe, published from January 2008 to December 2015

Spain (n=10) and Greece (n=9). Other countries included the UK and its four constituencies (n=7), Ireland (n=1), Italy (n=1), Iceland (n=2), and France (n=1). Ten papers used data from more than one country, either to collectively analyse the data or to compare outcomes across countries. The health outcomes that the papers studied included suicide (n=16), mental health (n=14), self rated health (n=12), mortality (n=2), and other health outcomes (n=9). Some papers studied more than one health outcome. The studies are summarised in table 2.

Risk of bias assessment

Of the 41 studies we reviewed, 30 (73%) were rated as weak, showing a high risk for bias in at least three domains. Nine studies (22%) were rated as moderate, showing a high risk for bias in up to two domains (table 3). Only two studies (5%) were rated strong in the overall risk assessment. The weighted κ for each domain and the overall rating are also presented in table 3. Nearly half (n=20) of the studies had a high risk of ecological fallacy, because they made inferences about individual characteristics based on aggregate level data. Time bias was also a common concern (none of the studies had a low risk of time bias). Most studies used data covering periods shorter than 10 years, considered fewer than three years of data after the crisis, and did not account for potential lag effects. Many studies were also at a high risk of reporting bias (54%), measurement bias in exposures (44%), and measurement bias in health outcome (56%). In particular, almost all studies on suicides (14 of 16 studies) and mortality (both), were rated as weak (that is, had a high risk of bias).

Suicides

Most of the 16 relevant studies reported a significant increase in suicides during the financial crisis and found that men—particularly those of working age and the unemployed—were more significantly affected, while suicide rates among women were largely unaffected.

Four Greek studies used data from the Hellenic Statistical Authority (ELSTAT) but applied different analyses. Using interrupted time series analysis from 1983 to 2012, Branas and colleagues²³ found that total and male suicides increased in June 2011 by 35.7% ($P<0.001$) and 18% ($P<0.01$), respectively, and female suicides increased by 35.8% ($P<0.05$) in May 2011. Kontaxakis and colleagues⁴¹ used data from 2001-11 and compared the specific suicide rate in 2008-11 with that in 2001-07. They found that overall specific suicide rate increased (from a negative rate of -3.9% to a positive rate of +27.2%), and the rate for men increased (from -8.4% to +26.9%, $P<0.05$), especially for men aged 30-54 years, and decreased for men aged 60-64 years. For women, no statistically significant change was observed. Madianos and colleagues⁴⁴ using 1990-2011 data, found that age adjusted suicide rates increased by 19% between 2005 and 2011. Rachiotis and colleagues⁴⁶ used ELSTAT data for 2003-12 and correlation and

regression analyses, and found that overall suicide rates increased 35% between 2010 and 2012; rates increased for both sexes. Comparing 2003-10 with 2011-12, the researchers found that suicides increased by 29% for men ($P<0.01$) and 33% for women ($P=0.03$). Unemployment in 2003-12 was associated with suicides for working aged men but not for working aged women.

A fifth study by Antonakakis and Collins¹⁷ used data on suicides from the WHO Mortality Database for the years 1968-2009, figures from a published paper for 2010, and figures from a Greek newspaper for 2011. They found a significant age and sex specificity. For men, austerity measures and negative economic growth significantly increased suicide rates. Unemployment increased suicide rates for men aged 25-44 years only, while for women no association was found with austerity measures and economic growth. Unlike men, unemployment was in fact associated with reducing suicide rates for all age groups in women.

In Spain, Cordoba-Dona and colleagues²⁷ found an increase in suicide attempt rates for both sexes during 2008-12 in Andalucía. They found a significant association between suicide attempts and unemployment for men but not for women. Another Spanish study,⁴³ using monthly suicide rates by region and age group and population data from Spain's National Statistics Institute for 2005-10, found an 8% increase in the suicide rate ($P=0.03$) during the crisis. Suicides increased by 9% in the Mediterranean region and by 19% among men. Results for women and for other regions were non-significant.

In Ireland, an interrupted series analysis using data from the Irish Central Statistics Office found that, by the end of 2012, the male suicide rate was 57% higher (that is, 476 more suicides) than if the pre-crisis trend had continued.²⁵ Those most affected were men aged 25-44 years. Female suicide rates were unchanged.

In England, Barr and colleagues²⁰ were first to show an increase of suicides after 2008. Between 2008 and 2010, they reported 846 more male suicides and 155 more female suicides than would have been expected based on previous trends. They also showed links between suicide trends and unemployment. By contrast, Coope and colleagues²⁶ found no change in overall male suicides in England and Wales. They documented a halt in the previous downward trend in suicide rates for men aged 16-34 years in 2006 and an upward trend in early 2010 for those aged 35-44 years. For women, there was no change in suicide rates. Another study found no change in suicides rates in England after 2008 for both men and women, with potential heterogeneity across regions.⁵²

Six studies provided comparative results across several countries. Laanani and colleagues⁴² used data for 2000-10 from eight countries and found a 3.3% increase in the overall suicide rate during the crisis. Associations between unemployment rate and suicide rate were significant in three countries: 0.7% (95% confidence interval 0.0% to 1.4%) in the Netherlands, 1.0% (0.2% to 1.8%) in the UK, and 1.9% (0.8% to 2.9%) in France. They estimated that unemployment accounted for 564

Table 2 | Summary characteristics of 41 eligible studies in systematic review

First author(s) and year of study	Country	Time period considered	Methods	Main outcome considered
Aguiar-Palacio, 2015	Spain	2006 and 2011-12	χ^2 square tests and multivariate logistic regressions	Self rated health, mental health
Antonakakis and Collins, 2014	Greece	1968-2011	Multivariate regressions	Suicide
Astell-Burt and Feng, 2013	UK	2006-10	Multivariate logistic regressions	Mental health
Barr, 2012	England	2000-10	Time trends analysis and multivariate regression models	Suicide
Barr, 2015	England	2004-13	Segmented linear regression	Mental health
Bartoll, 2014	Spain	2006 and 2011-12	Multivariate Poisson regressions	Mental health
Bartoll, 2015	Spain	2001-12	Multivariate linear regression	Self rated health
Branas, 2015	Greece	1983-2012	Interrupted time series analysis	Suicide
Chang, 2013	54 countries (27 European)	2000-09	Time trend analysis	Suicide
Corcoran, 2015	Ireland	1980-2012	Interrupted time series analyses	Suicide
Coope, 2014	UK (England & Wales)	2001-11	Joinpoint regression analysis	Suicide
Córdoba-Doña, 2014	Spain (Andalucía)	2003-12	Negative binomial and fixed effects linear regressions	Suicide
Curl and Kearns, 2015	Scotland (Glasgow)	2006, 2008, and 2011	Binary logistic regressions and correlation analysis	Mental health
De Vogli, 2014	Italy	2000-10	Fixed effects linear regressions	Mental health
Drydakis, 2015	Greece	2008-13	Fixed effects logit regressions	Self rated health, mental health
Economou, 2013	Greece	2008 and 2011	Correlation analysis and logistic regression	Mental health
Eiríksdóttir, 2013	Iceland	2006-09	Logistic regression analysis	Infant health
Eiríksdóttir, 2015	Iceland	2005-12	Logistic regression analysis	Maternal health
Ferrarini, 2014	23 European countries	2006 and 2009	Hierarchical logistic conditional change models	Self rated health
Fountoulakis, 2014	29 European countries	2000-11	Correlation analysis and random effects regressions	Suicide
Gili, 2013	Spain	2006-07 and 2010-11	Multivariate linear probability regressions and Levin's formula	Mental health
Gotsens, 2015	Spain	2006 and 2012	Poisson regressions were used to obtain prevalence ratios	Self rated health, mental health
Hessel, 2014	Greece and Ireland	2006-10	Logistic regressions with difference-in-difference, using Poland as control	Self rated health
Huijts, 2015	27 European countries	2007-09	Linear regression models	Self rated health
Katikireddi, 2012	UK (England)	1991-2010	Logistic regressions	Mental health
Kontaxakis, 2013	Greece	2001-11	Correlation analysis	Suicide
Laanani, 2015	8 west European countries	2000-10	Quasi-Poisson regression and sensitivity analysis	Suicide
Lopez Bernal, 2013	Spain	2005-10	Interrupted time series analysis	Suicide
Madianos, 2014	Greece	1990-2011	Correlation analysis	Suicide
Malard, 2015	France	2006 and 2010	Generalised estimating equations (GEE) for logistic regression	Mental health
Rachiotis, 2015	Greece	2003-12	Correlation and regression analysis	Suicide
Rajmil, 2013	Spain (Catalonia)	2006 and 2010-12	Before-after comparisons and multivariate regression analysis.	Mental health, self rated health
Reeves, 2014	20 EU countries	1981-2011	Multivariate regressions	Suicide
Reeves, 2014	21 EU countries	1991-2012	Multivariate regressions and simulations	Tuberculosis
Regidor, 2014	Spain	1995-2011	Joinpoint regression and average annual percent change analysis	Mortality, self rated health
Reile, 2014	Estonia, Lithuania, and Finland	2004-10	Logistic regressions using Finland as a control	Self rated health
Saurina, 2013	England	1993-2010	Hierarchical mixed models	Suicide
Tapia Granados and Rodriguez, 2015	Greece, Finland, and Iceland	1990-2012	Multivariate regressions	Mortality, suicide
Vandoros, 2013	Greece	2006-09	Difference-in-difference with Poland as control	Self rated health
Zapata Moya, 2015	Spain	2003-12	Logistic three level analyses	Mental health
Zavras, 2012	Greece	2006 and 2011	Correlation analysis and logistic regressions	Self rated health

Table 3 | Assessment of risk of bias for 41 eligible studies included in systematic review

Paper (first author(s), year)	Selection bias	Ecological fallacy	Confounding bias	Reporting bias	Time bias	Measurement error in exposure variable	Measurement error in health outcome	Overall rating
Aguilar-Palacio, 2015	3	1	2	3	3	2	3	3
Antonakakis and Collins, 2014	2	3	2	2	3	1	3	3
Astell-Burt and Feng, 2013	3	1	2	3	3	3	3	3
Barr, 2012	1	3	2	1	2	2	3	2
Barr, 2015	3	1	3	3	3	2	3	3
Bartoll, 2014	3	1	2	2	3	3	2	3
Bartoll, 2015	2	1	2	3	2	2	2	2
Branas, 2015	1	3	3	2	2	3	3	3
Chang, 2013	2	3	2	1	3	3	3	3
Coope, 2014	2	3	2	3	2	1	3	3
Corcoran, 2015	1	3	2	2	2	3	3	3
Córdoba-Doña, 2014	3	3	2	2	2	2	2	2
Curl and Kearns, 2015	3	1	3	3	2	2	2	3
De Vogli, 2014	1	3	3	3	2	1	3	3
Drydakakis 2015	2	1	2	2	2	2	2	1
Economou, 2013	2	1	1	3	3	3	2	3
Eiríksdóttir, 2013	1	1	2	3	3	3	1	3
Eiríksdóttir, 2015	1	1	2	2	2	2	2	1
Ferrarini, 2014	2	3	2	3	3	3	3	3
Fountoulakis, 2014	2	3	3	3	2	1	3	3
Gili, 2013	2	1	2	3	3	1	2	2
Gotsens, 2015	3	1	2	3	3	3	2	3
Hessel, 2014	3	1	1	2	3	3	2	3
Huijts, 2015	1	1	1	2	3	2	2	2
Katikireddi, 2012	2	1	1	2	2	2	2	2
Kontaxakis, 2013	1	3	3	3	2	3	3	3
Laanani, 2015	3	3	1	3	2	2	3	3
Lopez Bernal, 2013	2	3	2	2	3	3	3	3
Madianos, 2014	1	3	3	3	2	1	3	3
Malard, 2015	2	1	2	1	3	3	2	3
Rachiotis, 2015	2	3	2	3	2	2	3	3
Rajmil, 2013	3	1	2	3	3	2	2	3
Reeves (20 EU countries), 2014	2	3	2	3	2	2	3	3
Reeves (21 EU countries), 2014	2	3	2	2	2	1	3	2
Regidor, 2014	2	3	3	3	2	3	1	3
Reile, 2014	3	1	2	2	3	3	3	3
Saurina, 2013	1	3	3	3	2	2	3	3
Tapia Granados and Rodriguez, 2015	1	3	3	3	2	3	3	3
Vandoros, 2013	3	1	1	1	3	3	3	3
Zapata Moya, 2015	3	1	2	2	2	3	2	2
Zavras, 2012	3	1	1	2	3	2	2	2
Weighted κ	0.65	0.83	0.64	0.56	0.70	0.6059	0.75	0.76

additional suicides in France, 57 in the Netherlands, and 456 in the UK. They found no associations in Austria, Finland, Spain, and Sweden. Comparing suicide rates between 2003-07 and 2008-12 in Greece, Iceland, and Finland, Tapia Granados and Rodriguez⁵³ found an increase in suicides in 2008-12 for Greece only, although they reported that even at its peak in 2011, this rate remained low—a third of the mean suicide rate in the EU.

Using 2000-09 WHO mortality data for 27 European countries, Chang and colleagues²⁴ found 2937 additional male suicides in 2009 over the previous pre-crisis trend. The highest increase was among the male age group 15-24 years, while suicide rates for women remained stable. Another study on 29 European countries during 2000-11 found a strong correlation between male suicide rates and all economic indices except for

GDP per capita, and a correlation between female suicides and unemployment only.³⁵ The researchers found that the temporal relation did not support causality (suicide rates increased several months before the crisis emerged). Reeves and colleagues⁴⁸ used data on male suicides from 20 EU countries (1981-2011) and estimated 6998 excess suicides after 2008, based on pre-crisis suicide trends. Of these, 1077 (15%) were attributed to increased unemployment. Further, they estimated that spending on active labour market programmes prevented 540 (50%) suicides, and high levels of social capital prevented another 210 (19%).

Mental health

Most, but not all, of the 14 relevant studies found an association between deteriorating economic indicators and poor mental health, particularly among men.

In Italy, De Vogli and colleagues²⁹ found that the crisis resulted in an additional 548 deaths due to mental and behavioural disorders (that is, 0.303 per 100 000 deaths per year). Further, they estimated that 22.4% of these deaths could be attributed to income loss and 16.4% to unemployment.

In Greece, using longitudinal telephone surveys, Drydakis³⁰ found that unemployment was associated more with poor mental health in 2010-13 than in 2008-09. Among women, unemployment increased poor mental health from 4.3% to 7.3% and, among men, from 3% to 4.9% ($P<0.001$). Another Greek study that found the odds of a person having major depression was 2.6 times greater in 2011 than in 2008.³¹

In Spain, four studies used data from the Spanish National Health Surveys (2006 and 2011-12). Among young people (16-24 years), Aguilar-Palacio and colleagues¹⁶ found that the prevalence of poor mental health decreased for women in 2012 versus 2006, with no change for men. However, they identified unemployment (>1 year) as a risk factor for poor mental health in 2012 for men. Bartoll and colleagues²² also found reduced prevalence of poor mental health among young women (prevalence ratio 0.89, $P<0.001$), with no change for men. For the older population, they found that the prevalence of poor mental health increased among men with no change among women over age 25 years. Comparing immigrants with natives, Gotsens and colleagues³⁷ reported a new onset of inequalities in poor mental health between immigrants and native men and an equalisation of the previously lower use of psychotropic drugs by male immigrants, with no change for female immigrants. Finally, Zapata Moya and colleagues⁵⁵ reported that depression increased by 12% in 2009 ($P<0.05$) and by 23% in 2011 ($P<0.001$) among women, and by 13% in 2011 ($P<0.10$) among men compared with 2003. These effects disappeared after controlling for changes in GDP growth rate.

Of the two remaining studies on Spain, Gili and colleagues³⁶ found that unemployment was associated with major depressive disorders in both 2006 and 2010 (odds ratio 1.54 and 1.72, respectively; $P<0.001$) among primary healthcare attendees. In 2010, the association between unemployment and minor depressive disorders increased (1.20; $P<0.001$), while for dysthymia, there was no association. One third of major depression in 2012 was attributed to individual and family unemployment and mortgage payment difficulties. Lastly, Rajmil and colleagues⁴⁷ studied children in Catalonia, and reported no changes in 2010-12 versus 2006 and no association between children's mental health and parental employment status.

In France, using a prospective national survey, Malard and colleagues⁴⁵ found no change in the prevalence of major depressive episodes and generalised anxiety disorder for both sexes in the working population—except for an increase of 7.4% ($P=0.007$) in the disorder among women working in the public sector. Astell-Burt and Feng,¹⁸ using population data from the Quarterly Labour Force Survey in the UK, found a 0.2% increase in depression and 0.1% increase in mental ill-

ness during the crisis. Curl and Kearns²⁸ examined the effect of financial difficulties on mental health in deprived areas of Glasgow and found that decreased affordability was associated with declining mental health. Katikireddi and colleagues,⁴⁰ using repeated cross sectional surveys in England, found that prevalence of poor mental health in men increased after 2008 (by 5% in 2009 and by 3% in 2010), but the men's changing employment status did not explain this increase. The same study showed no change in poor mental health prevalence among women. Barr and colleagues¹⁹ found that, although mental health problems increased post-crisis (+0.08% prevalence per quarter), only 36% of the additional problems could be explained by rising unemployment and declining wages.

Self rated health

Twelve studies focused on the impact of the crisis on self rated health, finding mixed results depending on the country and group analysed. Three studies on Spain, analysing data from the Spanish National Health Survey, found an improvement in self rated health during the crisis. Aguilar-Palacio and colleagues¹⁶ found that people aged 16-24 years had better self rated health in 2012 than in 2006, and this is more evident among women. They found no association between unemployment and self rated health, but students of both sexes had lower risk of poor self rated health than workers did. Bartoll and colleagues²¹ showed that the probability of good self rated health increased for by 7.6% ($P<0.01$) for men and by 9.6% ($P<0.01$) for women in 2011-12 versus 2001. Regidor and colleagues⁵⁰ found that the prevalence of poor self rated health fell during the financial crisis by 5.7%. A fourth Spanish study using data from the same survey³⁷ found that immigrants who arrived before 2006 had worse self rated health than natives. For women, inequalities in poor self rated health between immigrants and natives increased.

A study on Catalonia⁴⁷ observed an improvement in health related quality of life, but children whose mothers had only a primary education had poorer scores for health related quality of life in 2010-12 than in 2006.

In Greece, Zavras and colleagues⁵⁶ found that the overall prevalence of good and very good self rated health in 2006 was 71%, whereas in 2011, the prevalence decreased to 69% ($P<0.05$), with unemployed people less likely to report good health. Another study using a different cross sectional survey found that unemployment was associated with poor self rated health, and women were more affected than men.³⁰ A difference-in-difference study comparing Greece with Ireland, using Poland as a control, found an increase in the prevalence of poor self rated health in Greece but not in Ireland in 2010.³⁸ A similar study comparing Greece to Poland found an increase in poor self rated health in Greece after the crisis.⁵⁴

Three comparative studies found evidence of a negative impact of the crisis on self rated health. Comparing Estonia, Lithuania, and Finland, Reile and colleagues⁵¹ found that during 2008-10, the prevalence of poor self

rated health increased from 50% to 52% in Estonia and from 47% to 48% (from 47%) in Lithuania. The increase was not statistically significant, but marked the end of the previous positive trend of improving health status. Studying 23 European countries, Ferrarini and colleagues³⁴ found that unemployment insurance reduced the transition to deteriorating self rated health during the crisis. Huijts and colleagues³⁹ examined the impact of job loss and recovery on self rated health in 27 European countries. Job loss during the crisis was negatively associated with self rated health for both women and men. Job recovery within a year led to health recovery for women, while men had an enduring health disadvantage.

Mortality

Of the two studies on mortality rates, Regidor and colleagues,⁵⁰ using 1995-2011 national registry data from Spain, found that premature mortality rates from several causes fell during the crisis. Overall mortality in 2008-11 dropped by 2.5% (cardiovascular diseases 5.6%, respiratory diseases 2.8%, digestive diseases 2.8%, genitourinary diseases 7%, HIV 6.8%, other infectious diseases 8.7%, road accidents 14.2%, other unintentional injuries 3.8%, suicides 1.3%, homicides 6.9%, cancer mortality remained constant). Tapia-Granados and Rodriguez⁵³ analysed WHO data on Iceland, Finland, and Greece for 1990-2012 and concluded that the crisis had no impact on mortality, as mortality dropped faster or continued falling after 2007 as quickly as in previous years, for almost all age groups. Comparisons between Greece and the other two countries showed no significant differences in most mortality indicators.

Other health outcomes

Nine studies, examining other health outcomes, found mixed results. Eiriksdottir and colleagues,³² studying infant health in Iceland, found increased odds of low birthweight deliveries after the crisis (from 2.5% to 3%), particularly among mothers younger than 25 years and among unemployed mothers. After controlling for age, parity, and seasonality, the increase was significant (adjusted odds ratio 1.25, 95% confidence interval 1.02 to 1.53), but the association disappeared after controlling for other variables (sex, diabetes, hypertension, relationship status, place of residency, and employment status). There was no significant change in small-for-gestational-age and preterm births. In another Icelandic study, prevalence of pregnancy induced hypertensive disorders increased in the first year following the economic collapse (2.4% v 3.9%; adjusted odds ratio 1.47; 95% confidence interval 1.13 to 1.91) but not in subsequent years.³³ The association disappeared after controlling for unemployment.

Comparing Greece, Finland, and Iceland, a study found no effect on the incidence of tuberculosis and HIV during the crisis, which continued to drop.⁵³ Regidor and colleagues⁵⁰ found the same for HIV incidence in Spain (1% decrease, not significant). Gotsens and colleagues³⁷ and Rajmil,⁴⁷ when controlling for unemployment, also found no significant changes in Spain

regarding chronic activity limitation among immigrant women and child obesity. Zapata Moya and colleagues⁵⁵ presented mixed results in Spain, showing that in 2011, compared with 2006, diabetes increased among in both sexes, but the effect was non-significant when controlling for real GDP growth rate and low work intensity indicator. The study also found a marginal decrease in myocardial infarction for men and malignant tumours in women during the same period, but this effect was non-significant after controlling for the macroeconomic context. Astell-Burt and Feng¹⁸ reported an increased prevalence of cardiovascular (0.6%) and respiratory problems (1%) in the UK in 2010 versus 2008. Reeves and colleagues⁴⁹ combined data for 21 EU countries from 1991-2012 and concluded that during 2007-12, there was no significant association between social protection spending and tuberculosis case detection (-0.59% reduction in case detection for a US\$100 (£75.9; €88.3) increase in social protection spending, 95% confidence interval -1.31 to 0.14).

Discussion

Principal findings

The amount of evidence on the impact of the financial crisis on health outcomes in Europe is growing. Of the 41 studies that met our criteria and were analysed, the vast majority focused on two countries in the south: Spain and Greece. The main health outcomes that these studies explored were suicides and mental health.

We found that most of the studies had a substantial risk of bias and, therefore, we should be cautious with the interpretation of the results. There were only two studies that were rated as having a low risk of bias. The study by Drydakis³⁰ found that self rated health and mental health deteriorated among unemployed people versus employed people in Greece, and the study by Eiriksdottir³³ found only a temporary increase in the prevalence of hypertension among pregnant women in Iceland, but not in subsequent years.

Using the risk assessment tool we developed, we found several aspects in which the current evidence fell short of providing robust evidence on the health effects of the crisis. Earlier studies were inevitably constrained by data availability; many mortality and suicide studies used data from only one or two years into the crisis. Many studies did not adjust for pre-existing trends, for example, mortality rates were falling before the start of the crisis. There were issues with the design of some studies, such as those on self rated health that used cross sectional data and therefore had difficulties establishing temporality, let alone causality.

The cautious conclusions that we can draw from the studies we analysed, is that the effect of the crisis was different across and within countries. Most studies on suicides showed an increase in suicides during the financial crisis, in particular among men. Studies looking at mental health found similar increases, but these results were more mixed. Studies focusing on mortality seemed to show a different picture, with overall mortality not being affected or even declining during the crisis years. It has been argued that this was probably due to

fewer working hours⁵⁰ and healthier lifestyles during years of economic difficulties.¹⁶ Some claim that factors other than the crisis—such as improvements in road safety policies and a declining prevalence of injectable drug use,⁵⁰ explain these findings.

Our main finding of mixed effects on health outcomes accords with most previous literature on financial crises and health.⁵⁷ An empirical study conducted before the crisis⁵⁸ on data from 26 European countries (1970-2007) showed that unemployment was positively associated with suicide rates and homicides and negatively associated with deaths due to road accidents. Data from the USA also suggest that overall mortality is procyclical and decreases during financial crises, while suicides are countercyclical and increase when the economy worsens.¹⁵

Our findings shed some light on the groups most affected during the financial crisis. The results on sex and age were somehow contradictory, but, overall, men of working age seemed to be more severely affected, as reflected mainly in suicide trends and self rated health. In terms of mental health, however, women seemed to have performed worse than men. There is also some evidence that the health of immigrants, especially those who had illegal status and lacked social security, deteriorated much more during the crisis than that of natives. This is consistent with previous studies that showed worse effects on groups that lack social protection.⁵⁸ Finally, some evidence suggests that the crisis increased social inequalities in health, disproportionately affecting immigrants,³⁷ those who were less educated, and those living in certain regions.⁵²

Further, from a policy perspective, most studies failed to capture the mechanisms that affect health outcomes. In addition, studies that used year dummies to capture the impact of the financial crisis or that had split the data into pre-crisis and post-crisis periods were not informative as to whether the effect was due to reductions in government spending, increased household financial constraints, or both. Finally, observed age and sex differences should be interpreted cautiously because these were subgroup analyses, and it is difficult to know whether the subgroups were prespecified.

Strengths and limitations of study

A major limitation of this review is that it inevitably explored relatively short term effects of the crisis on health outcomes. It may take some years before the full consequences of the financial crisis are observed.⁵⁹ Moreover, reporting bias can be an issue not only for single studies, but also for the field at large. Publication bias could result in significant associations being preferentially published, which might be an even greater issue for secondary exploratory analyses of factors or subgroups associated with different health outcomes. Furthermore, depending on what investigators believe about topics that are socially and politically sensitive, the published evidence may be affected by allegiance and confirmation biases.

We also focused only on English language papers and those that were published in full text. As a robustness

check, we looked at studies that were published in Greek, Spanish, Italian, and Portuguese (113 studies) that were excluded from our analysis on the basis of language, only to confirm that these papers did not meet our other selection criteria. Proceedings abstracts could also contain some useful information, but their quality is less certain, and it is possible that allegiance biases might be even stronger in some of them. Although we excluded qualitative studies, we came across only one study that would have met our other selection criteria. This study by Ronda and colleagues⁶⁰ focused on immigrants in Spain, and concluded that the quality of life and self rated health of immigrants deteriorated during the crisis, but this does not change much the conclusiveness of the available evidence. Finally, measurement error could be substantial for some of the examined crisis indicators and health outcomes. In particular, suicides could have been under-recorded and misreported in death certificates for social or religious reasons in some countries, such as Greece. It is unknown whether the crisis affected the extent of this potential bias.

Despite its limitations, this is the first systematic review of the literature on the effect of the 2008 financial crisis in Europe on health outcomes, which also assesses the risk of bias of the reviewed studies. We believe that our emphasis on the assessment of risk of bias, can be influential for a wider range of studies looking at the effects of economic, environmental, and societal factors on health, such as the impact of climate change on health⁶¹ and of alcohol pricing and consumption.⁶² Currently, the availability of risk assessment tools for these types of studies are limited.

Future research

A review of the impact of the crisis on health behaviours, such as smoking and alcohol consumption, which was beyond the scope of this review, would have shed light on the links between changes in habits and health outcomes. From a first glance, the evidence seems mixed, with some favourable trends in smoking prevalence (eg, McClure and colleagues' study⁶³ for Iceland; Filippidis and colleagues' study⁶⁴ in Greece) and some more worrying results regarding vegetable consumption (Filippidis and colleagues⁶⁴). Finally, our study, by focusing on health outcomes exclusively, did not look at the impact of the crisis on health systems, such as shortages in health workforce and medical supplies, where several studies have shown a negative trend during the financial crisis.^{65 66} A review of this literature was beyond the scope of this study and it is left for future research.

Conclusions

The evidence on the impact of the financial crisis on health outcomes in Europe is mixed, and the data and methodologies used in many papers are susceptible to substantial bias. We need more empirical studies that explore the impact of the crisis on health and, more importantly, investigate the mechanisms that affect health outcomes. As more data becomes available, it is also possible to consider the potential lag effects of the

crisis, a clear limitation of most studies so far. Better quality data are needed and governments should make accurate data on health outcomes available as quickly as they seem to do for economic indicators.

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The lead authors affirm that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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- 1 Cylus J, Pearson M. The crisis and its implications for household financial security, government resources and health expenditure. In: Thomson S, Figueras J, Evetovits T, et al, eds. *Economic crisis, health systems and health in Europe: impact and implications for policy*. Open University Press, 2015.
- 2 Quaglio G, Karapiperis T, Van Woensel L, Arnold E, McDaid D. Austerity and health in Europe. *Health Policy* 2013;113:13-9. doi:10.1016/j.healthpol.2013.09.005.
- 3 Kentikelenis A, Karanikolos M, Papanicolas I, Basu S, McKee M, Stuckler D. Health effects of financial crisis: omens of a Greek tragedy. *Lancet* 2011;378:1457-8. doi:10.1016/S0140-6736(11)61556-0.
- 4 Karanikolos M, Mladovsky P, Cylus J, et al. Financial crisis, austerity, and health in Europe. *Lancet* 2013;381:1323-31. doi:10.1016/S0140-6736(13)60102-6.
- 5 Stuckler D, Basu S, Suhrcke M, Coutts A, McKee M. The public health effect of economic crises and alternative policy responses in Europe: an empirical analysis. *Lancet* 2009;374:315-23. doi:10.1016/S0140-6736(09)61124-7.
- 6 Tapia Granados JA, Diez Roux AV. Life and death during the Great Depression. *Proc Natl Acad Sci U S A* 2009;106:17290-5. doi:10.1073/pnas.0904491106.
- 7 Brainerd E, Cutler DM. Autopsy on an empire: understanding mortality in Russia and the former Soviet Union. *J Econ Perspect* 2005;19:107-30. doi:10.1257/0895330053147921.
- 8 Simou E, Koutsogeorgou E. Effects of the economic crisis on health and healthcare in Greece in the literature from 2009 to 2013: a systematic review. *Health Policy* 2014;115:111-9. doi:10.1016/j.healthpol.2014.02.002.
- 9 Van Hal G. The true cost of the economic crisis on psychological well-being: a review. *Psychol Res Behav Manag* 2015;8:17-25. doi:10.2147/PRBM.S44732.
- 10 Rajmil L, Fernandez de Sanmamed MJ, Choonara I, et al. International Network for Research in Inequalities in Child Health (INRICH). Impact of the 2008 economic and financial crisis on child health: a systematic review. *Int J Environ Res Public Health* 2014;11:6528-46. doi:10.3390/ijerph110606528.
- 11 Centre for Reviews and Dissemination. *Systematic reviews*. York Publishing Services, 2009.
- 12 Moher D, Liberati A, Tetzlaff J, Altman DG. PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med* 2009;6:e1000097. doi:10.1371/journal.pmed.1000097.
- 13 Wells G, Shea B, O'connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. www.ohri.ca/programs/clinical_epidemiology/oxford.asp.
- 14 Viswanathan M, Berkman ND. Development of the RTI item bank on risk of bias and precision of observational studies. *J Clin Epidemiol* 2012;65:163-78. doi:10.1016/j.jclinepi.2011.05.008.
- 15 Ruhm C. Health effects of economic crisis. National Bureau of Economic Research, 2015; working paper 21604.
- 16 Aguilar-Palacio I, Carrera-Lasfuentes P, Rabanaque MJ. Youth unemployment and economic recession in Spain: influence on health and lifestyles in young people (16-24 years old). *Int J Public Health* 2015;60:427-35. doi:10.1007/s00038-015-0668-9.
- 17 Antonakakis N, Collins A. The impact of fiscal austerity on suicide: on the empirics of a modern Greek tragedy. *Soc Sci Med* 2014;112:39-50. doi:10.1016/j.socscimed.2014.04.019.
- 18 Astell-Burt T, Feng X. Health and the 2008 economic recession: evidence from the United Kingdom. *PLoS One* 2013;8:e56674-74. doi:10.1371/journal.pone.0056674.
- 19 Barr B, Kinderman P, Whitehead M. Trends in mental health inequalities in England during a period of recession, austerity and welfare reform 2004 to 2013. *Soc Sci Med* 2015;147:324-31. doi:10.1016/j.socscimed.2015.11.009.
- 20 Barr B, Taylor-Robinson D, Scott-Samuel A, McKee M, Stuckler D. Suicides associated with the 2008-10 economic recession in England: time trend analysis. *BMJ* 2012;345:e5142. doi:10.1136/bmj.e5142.
- 21 Bartoll X, Toffolutti V, Malmusi D, Palència L, Borrell C, Suhrcke M. Health and health behaviours before and during the Great Recession, overall and by socioeconomic status, using data from four repeated cross-sectional health surveys in Spain (2001-2012). *BMJ Public Health* 2015;15:e865. doi:10.1186/s12889-015-2204-5.
- 22 Bartoll X, Palència L, Malmusi D, Suhrcke M, Borrell C. The evolution of mental health in Spain during the economic crisis. *Eur J Public Health* 2014;24:415-8. doi:10.1093/eurpub/ckt208.
- 23 Branas CC, Kastanaki AE, Michalodimitrakis M, et al. The impact of economic austerity and prosperity events on suicide in Greece: a 30-year interrupted time-series analysis. *BMJ Open* 2015;5:e005619. doi:10.1136/bmjopen-2014-005619.
- 24 Chang SS, Stuckler D, Yip P, Gunnell D. Impact of 2008 global economic crisis on suicide: time trend study in 54 countries. *BMJ* 2013;347:f5239. doi:10.1136/bmj.f5239.
- 25 Corcoran P, Griffin E, Arensman E, Fitzgerald AP, Perry IJ. Impact of the economic recession and subsequent austerity on suicide and self-harm in Ireland: An interrupted time series analysis. *Int J Epidemiol* 2015;44:969-77. doi:10.1093/ije/dyv058.
- 26 Coope C, Gunnell D, Hollingworth W, et al. Suicide and the 2008 economic recession: who is most at risk? Trends in suicide rates in England and Wales 2001-2011. *Soc Sci Med* 2014;117:76-85. doi:10.1016/j.socscimed.2014.07.024.
- 27 Córdoba-Doña JA, San Sebastián M, Escobar-Pujolar A, Martínez-Faure JE, Gustafsson PE. Economic crisis and suicidal behaviour: the role of unemployment, sex and age in Andalusia, southern Spain. *Int J Equity Health* 2014;13:55-55. doi:10.1186/s1475-9276-13-55.
- 28 Curl A, Kearns A. Financial difficulty and mental wellbeing in an age of austerity: the experience in deprived communities. *Soc Policy Soc* 2015;14:217-40. doi:10.1017/S1474746414000475.
- 29 De Vogli R, Vieno A, Lenzi M. Mortality due to mental and behavioral disorders associated with the Great Recession (2008-10) in Italy: a time trend analysis. *Eur J Public Health* 2014;24:419-21. doi:10.1093/eurpub/ckt173.
- 30 Drydakis N. The effect of unemployment on self-reported health and mental health in Greece from 2008 to 2013: a longitudinal study before and during the financial crisis. *Soc Sci Med* 2015;128:43-51. doi:10.1016/j.socscimed.2014.12.025.
- 31 Economou M, Madianos M, Peppou LE, Patelakis A, Stefanis CN. Major depression in the era of economic crisis: a replication of a cross-sectional study across Greece. *J Affect Disord* 2013;145:308-14. doi:10.1016/j.jad.2012.08.008.
- 32 Eiríksdóttir VH, Ásgeirsdóttir TL, Bjarnadóttir RI, Kaestner R, Cnattingius S, Valdimarsdóttir UA. Low birth weight, small for gestational age and preterm births before and after the economic collapse in Iceland: a population based cohort study. *PLoS One* 2013;8:e80499. doi:10.1371/journal.pone.0080499.
- 33 Eiríksdóttir VH, Valdimarsdóttir UA, Ásgeirsdóttir TL, et al. Pregnancy-induced hypertensive disorders before and after a national economic collapse: a population based cohort study. *PLoS One* 2015;10:e0138534. doi:10.1371/journal.pone.0138534.
- 34 Ferrarini T, Nelson K, Sjöberg O. Unemployment insurance and deteriorating self-rated health in 23 European countries. *J Epidemiol Community Health* 2014;68:657-62. doi:10.1136/jech-2013-203721.

- 35 Fountoulakis KN, Kawohl W, Theodorakis PN, et al. Relationship of suicide rates to economic variables in Europe: 2000-2011 [correction in: *Br J Psychiatry* 2015;206:169]. *Br J Psychiatry* 2014;205:486-96. doi:10.1192/bjp.bp.114.147454.
- 36 Gili M, Roca M, Basu S, McKee M, Stuckler D. The mental health risks of economic crisis in Spain: evidence from primary care centres, 2006 and 2010. *Eur J Public Health* 2013;23:103-8. doi:10.1093/eurpub/cks035.
- 37 Gotsens M, Malmusi D, Villarroya N, et al. Health inequality between immigrants and natives in Spain: the loss of the healthy immigrant effect in times of economic crisis. *Eur J Public Health* 2015;25:923-9. doi:10.1093/eurpub/ckv126.
- 38 Hessel P, Vondoros S, Avendano M. The differential impact of the financial crisis on health in Ireland and Greece: a quasi-experimental approach. *Public Health* 2014;128:911-9. doi:10.1016/j.puhe.2014.08.004.
- 39 Huijts T, Reeves A, McKee M, Stuckler D. The impacts of job loss and job recovery on self-rated health: testing the mediating role of financial strain and income. *Eur J Public Health* 2015;25:801-6. doi:10.1093/eurpub/ckv108.
- 40 Katikireddi SV, Niedzwiedz CL, Popham F. Trends in population mental health before and after the 2008 recession: a repeat cross-sectional analysis of the 1991-2010 Health Surveys of England. *BMJ Open* 2012;2:e001790. doi:10.1136/bmjopen-2012-001790.
- 41 Kontaxakis V, Papaslanis T, Havaki-Kontaxaki B, Tsouvelas G, Giotakos O, Papadimitriou G. Suicide in Greece: 2001-2011. *Psychiatriki* 2013;24:170-4.
- 42 Laanani M, Ghosn W, Jougle A, Rey G. Impact of unemployment variations on suicide mortality in Western European countries (2000-2010). *J Epidemiol Community Health* 2015;69:103-9. doi:10.1136/jech-2013-203624.
- 43 Lopez Bernal JA, Gasparrini A, Artundo CM, McKee M. The effect of the late 2000s financial crisis on suicides in Spain: an interrupted time-series analysis. *Eur J Public Health* 2013;23:732-6. doi:10.1093/eurpub/ckv083.
- 44 Madianos MG, Alexiou T, Patelakis A, et al. Suicide, unemployment and other socioeconomic factors: Evidence from the economic crisis in Greece. *Eur J Psychiatry* 2014;28:39-49. doi:10.4321/S0213-61632014000100004.
- 45 Malarid L, Chastang JF, Niedhammer I. Changes in major depressive and generalized anxiety disorders in the national French working population between 2006 and 2010. *J Affect Disord* 2015;178:52-9. doi:10.1016/j.jad.2015.02.027.
- 46 Rachiotis G, Stuckler D, McKee M, Hadjichristodoulou C. What has happened to suicides during the Greek economic crisis? Findings from an ecological study of suicides and their determinants (2003-2012). *BMJ Open* 2015;5:e007295. doi:10.1136/bmjopen-2014-007295.
- 47 Rajmil L, Medina-Bustos A, Fernández de Sanmamed MJ, Mompert-Penina A. Impact of the economic crisis on children's health in Catalonia: a before-after approach. *BMJ Open* 2013;3:e003286. doi:10.1136/bmjopen-2013-003286.
- 48 Reeves A, McKee M, Stuckler D. Economic suicides in the Great Recession in Europe and North America. *Br J Psychiatry* 2014;205:246-7. doi:10.1192/bjp.bp.114.144766.
- 49 Reeves A, Basu S, McKee M, Stuckler D, Sandgren A, Semenza J. Social protection and tuberculosis control in 21 European countries, 1995-2012: a cross-national statistical modelling analysis. *Lancet Infect Dis* 2014;14:1105-12. doi:10.1016/S1473-3099(14)70927-2.
- 50 Regidor E, Barrio G, Bravo MJ, de la Fuente L. Has health in Spain been declining since the economic crisis? *J Epidemiol Community Health* 2014;68:280-2. doi:10.1136/jech-2013-202944.
- 51 Reile R, Helakorpi S, Klumbiene J, Tekkel M, Leinsalu M. The recent economic recession and self-rated health in Estonia, Lithuania and Finland: a comparative cross-sectional study in 2004-2010. *J Epidemiol Community Health* 2014;68:1072-9. doi:10.1136/jech-2014-204196.
- 52 Saurina C, Bragulat B, Saez M, López-Casasnovas G. A conditional model for estimating the increase in suicides associated with the 2008-2010 economic recession in England. *J Epidemiol Community Health* 2013;67:779-87. doi:10.1136/jech-2013-202645.
- 53 Tapia Granados JA, Rodríguez JM. Health, economic crisis, and austerity: A comparison of Greece, Finland and Iceland. *Health Policy* 2015;119:941-53. doi:10.1016/j.healthpol.2015.04.009.
- 54 Vondoros S, Hessel P, Leone T, Avendano M. Have health trends worsened in Greece as a result of the financial crisis? A quasi-experimental approach. *Eur J Public Health* 2013;23:727-31. doi:10.1093/eurpub/ckv020.
- 55 Zapata Moya AR, Buffel V, Navarro Yáñez CJ, Bracke P. Social inequality in morbidity, framed within the current economic crisis in Spain. *Int J Equity Health* 2015;14:131. doi:10.1186/s12939-015-0217-4.
- 56 Zavras D, Tsiantou V, Pavi E, Mylona K, Kyriopoulos J. Impact of economic crisis and other demographic and socio-economic factors on self-rated health in Greece. *Eur J Public Health* 2013;23:206-10. doi:10.1093/eurpub/cks143.
- 57 Catalano R, Goldman-Mellor S, Saxton K, et al. The health effects of economic decline. *Annu Rev Public Health* 2011;32:431-50. doi:10.1146/annurev-publhealth-031210-101146.
- 58 Stuckler D, Basu S, Suhrcke M, Coutts A, McKee M. The public health effect of economic crises and alternative policy responses in Europe: an empirical analysis. *Lancet* 2009;374:315-23. doi:10.1016/S0140-6736(09)61124-7.
- 59 Fountoulakis KN, Gonda X, Dome P, Theodorakis PN, Rihmer Z. Possible delayed effect of unemployment on suicidal rates: the case of Hungary. *Ann Gen Psychiatry* 2014;13:12. doi:10.1186/1744-859X-13-12.
- 60 Ronda E, Briones-Vozmediano E, Galon T, García AM, Benavides FG, Agudelo-Suárez AA. A qualitative exploration of the impact of the economic recession in Spain on working, living and health conditions: reflections based on immigrant workers' experiences. *Health Expect* 2016;19:416-26. doi:10.1111/hex.12365.
- 61 McMichael AJ, Woodruff RE, Hales S. Climate change and human health: present and future risks. *Lancet* 2006;367:859-69. doi:10.1016/S0140-6736(06)68079-3.
- 62 Wagenaar AC, Salois MJ, Komro KA. Effects of beverage alcohol price and tax levels on drinking: a meta-analysis of 1003 estimates from 112 studies. *Addiction* 2009;104:179-90. doi:10.1111/j.1360-0443.2008.02438.x.
- 63 McClure CB, Valdimarsdóttir UA, Hauksdóttir A, Kawachi I. Economic crisis and smoking behaviour: prospective cohort study in Iceland. *BMJ Open* 2012;2:e001386. doi:10.1136/bmjopen-2012-001386.
- 64 Filippidis FT, Schoretsaniti S, Dimitrakaki C, et al. Trends in cardiovascular risk factors in Greece before and during the financial crisis: the impact of social disparities. *Eur J Public Health* 2014;24:974-9. doi:10.1093/eurpub/ckv028.
- 65 Correia T, Dussault G, Pontes C. The impact of the financial crisis on human resources for health policies in three southern-Europe countries. *Health Policy* 2015;119:1600-5. doi:10.1016/j.healthpol.2015.08.009.
- 66 Rachiotis G, Kourousis C, Kamilarakis M, Symvoulakis EK, Dounias G, Hadjichristodoulou C. Medical supplies shortages and burnout among greek health care workers during economic crisis: a pilot study. *Int J Med Sci* 2014;11:442-7. doi:10.7150/ijms.7933.

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Supplementary appendix: Supplementary material