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**Collateral damages of the great crisis in  
Spain. A longitudinal health study**

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# Collateral Damages of the Great Crisis in Spain. A Longitudinal Health Study

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## Abstract

We evaluate the impact of the double-dip Spanish recession (2008–2014) on self-rated health. We analyse four waves of the Bank of Spain’s Survey of Household Finances (2005, 2008, 2011 and 2014) and document significant differences in the probability of reporting poor self-rated health depending on age and gender. Even after adjusting for socio-economic factors, we still find remarkable inequalities among the demographic groups. Given our results, we discuss the link between financial wealth and self-rated health and how policy-makers could address health inequalities that arise from adverse economic and financial shocks.

**Keywords:** health, inequality, wealth, Great Recession, Spain

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# 1 Introduction

It is widely acknowledged that the Great Recession (2007–2013) and the period of general economic decline that followed it, had an adverse impact on health. Many studies that have assessed these effects and in January 2018 we carried out a PubMed database search of those published in English from January 2008 to December 2017. By combining the keywords health, economic crisis, economic downturn and financial crisis, we found 1760 studies, including 211 systematic literature reviews.

While self-rated health may be one of the most studied health indicators in the literature, the results are usually inconsistent. While most studies find that the Great Recession increased the risk of declaring poor health (i.e. fair, bad or very bad health)<sup>[1–10]</sup>, there are others that find a decrease in the risk of declaring poor health<sup>[11–18]</sup>. In a recent systematic review, Parmar *et al.*, point out that such heterogeneity in the results could be attributed to the country and group analysed<sup>[19]</sup>. However, much, if not all, of the heterogeneity could also come from methodological errors. In fact, only 5% (i.e. two from forty-one) of the studies Parmar *et al.*, reviewed were rated as being ‘strong’ and with a low chance of bias in the overall risk assessment they performed, thus they recommend caution when interpreting the results<sup>[19]</sup>. Among the twelve studies they reviewed<sup>[1–7,11–15]</sup> that assessed the effects the crisis had on self-perceived health, only one was rated as having a low risk of bias<sup>[6]</sup>. Furthermore, four of the five studies that concluded that the crisis decreased the probability of declaring poor health were rated as having a high risk of bias<sup>[11–13,15]</sup> and the remaining one as having a moderate risk<sup>[14]</sup>.

The most significant biases are those associated with the problems of evaluation<sup>[20]</sup> (paradoxically not indicated directly in Parmar *et al.*<sup>[19]</sup>). This is a consequence of using observational data from non-experimental designs. With some exceptions, these studies use cross-sectional data (health surveys) from before and after the crisis to assess its effects. However, the individuals interviewed before and after the crisis are not the same, thus making the pre- and post-crisis groups not comparable. In fact, even if the overall risk of declaring poor health declined over time, when these studies did evaluate specific groups (i.e. individuals with low levels of education<sup>[11,17]</sup>, people affected by foreclosure

or eviction or at risk of foreclosure or eviction<sup>[16,21]</sup>, the unemployed<sup>[18]</sup>, immigrants<sup>[15]</sup>, or older individuals<sup>[17]</sup>) the risk actually increased. This is because the members of these groups, despite not being the same individuals as before and after the crisis, share some common characteristics and therefore are more comparable. In fact, this may raise the problem of a lack of control for confounding (as is explicitly indicated in Parmar *et al.*<sup>[19]</sup>).

To control for this bias, several strategies could be followed. First, to make them comparable, individuals from both groups (before and after the crisis) could be matched. For the Spanish case, Urbanos-Garrido and López-Valcárcel<sup>[22]</sup> and Arroyo *et al.*<sup>[23]</sup>, using the same data as the majority of studies that find a decrease in the risk of declaring poor health did<sup>[11–17]</sup> (the 2006 and 2011–2012 Spanish Health Survey in both cases, and the 2006 and 2011–2012 Catalan Health Survey in the second case), matched the individuals. They found that the crisis did not alter the likelihood of reporting poor health for the general population<sup>[23]</sup>, and that unemployment had a significant negative impact on self-rated health, particularly for the long-term unemployed<sup>[22]</sup>. A second strategy is to control explicitly for the maximum number of possible confounders. In this regard, Pérez-Romero *et al.*, using the Spanish Health Survey for 2006 and 2011–2012, and including, among others, social support variables, found that the crisis did not change the probability of declaring poor health<sup>[24]</sup>. A third strategy is to use a different design, specifically a longitudinal one with repeated measurements of the same individuals before and after the crisis, so that the individual is their own control (before the crisis). This is the strategy followed by the studies using longitudinal data from the European Union Statistics on Income and Living Conditions (EU – SILC) survey<sup>[1–3,5,9,10]</sup> as well as other longitudinal data sources (the Greek Longitudinal Labour Market Study (LLMS)<sup>[6]</sup> and the World Values Survey (WVS)<sup>[8,25]</sup>) that find that the crisis increased the risk of declaring poor health.

Our objective in this study is to evaluate the impact the Great Recession had on self-perceived health in Spain. We use a longitudinal database with repeated observations of the same individuals before and after the crisis and we also control for both observed and unobserved confounders at individual and family levels.

We make use of a longitudinal database, the Survey of Household Finances (EFF in

Spanish) from the Bank of Spain<sup>[26]</sup>. This is a large database designed to harmonize with all the countries in the Euro area system. It provides detailed information on the income, assets, debts and spending of Spanish household units. It also contains sociodemographic information and some health indicators, among which is self-rated health. There are two main reasons why we chose the EFF. The first being its longitudinal nature. The EFF samples contain a common sub-set of households observed at various points in time. The second reason is that it is the only source of data that provides information on the wealth of Spanish families over time. Wealth is an important variable here. In particular, net wealth (i.e. assets minus debts), not just in absolute terms but according to its composition (housing or financial assets) subject then to different random shocks and risk premia. Household wealth is, in this sense, a kind of buffer that can make family income more resilient to shocks and thus may delay the direct financial consequences the crisis has on personal anxiety and family bankruptcy. Wealth is among the observed confounders we control for and we find it to be a significant determinant of self-assessed health status when we stratify the model for demographic groups and when we do not. We also find wealth to have significant explanatory power over self-rated health when we include it aggregating over sources of wealth (that is, including only net wealth) or when we detail different sources of wealth (real estate wealth, financial and others).

Furthermore, we control for some unobserved confounders by introducing random effects into the model. In particular, we account for the presence of heterogeneity, that is to say, unobserved variables, invariant over time, that were specific to the units of analysis. Specifically, we consider two levels in the analysis, the individual and the family to which the individual belonged.

## 2 Methods

### 2.1 Design

We use four waves of the EFF: two before the Great Recession (2005 and 2008), one during (2011) and another at the end (2014). Each wave consists of a random sample of

the Spanish population stratified by sex and age.

Spain went into recession twice. The first recession began in the third quarter of 2008 and ended in the first quarter of 2010 and the double dip began in the second quarter of 2011 and continued up to the third quarter of 2013.

Our sample only includes the members of those families who were interviewed in a minimum of two waves of the EFF ( $n = 28,678$  individuals belonging to 10,586 families, representing 20,038,899 individuals and 7,109,404 families).

## **2.2 Variables**

### **2.2.1 Response Variable**

We use the question, ‘In general, what is your health status?’, whose answers could be ‘Very good’, ‘Good’, ‘Fair’, ‘Bad’ and ‘Very bad’ to construct our response variable ‘poor health’, grouping the categories fair, bad and very bad (this took the value 1) and very good and good (value 0).

### **2.2.2 Explanatory Variables**

Our explanatory variable of interest is the year of the survey wave (2005, 2008, 2011 and 2014). We allow the relationship between the explanatory variable of interest and the response variable to be non-linear, using a smoothing spline. In particular, we include a random effect, associated with the year of the wave, structured as a random walk of order 1<sup>[27]</sup>.

As the explanatory variables of control, we include variables at the family level:

i) gross wealth, without stratifying (categorized in deciles, once trimmed – the first decile was the reference category), and stratified in: a) real estate wealth (categorized in deciles, once trimmed – the first decile was the reference category); b) financial wealth (categorized in deciles, untrimmed – the first decile was the reference category); and c) real wealth

other than real estate (categorized into quintiles, untrimmed – the first quintile was the reference category).

ii) total debt in identifying ‘net wealth’ (categorized in total debt equal to 0 - reference category- and then in quartiles of total positive debt greater than 0).

iii) income (categorized in deciles, untrimmed - the first decile was the reference category).

iv) saving rate (categorized in quintiles, once trimmed - the first quintile was the reference category).

v) number of family members.

vi) number of family members who work, and

vii) property regime of the family dwelling (not owned by the family – reference category-, owned by the family).

We also include an estimate for the savings rate of the household. This variable is the only one not taken directly from the survey. Instead, we approximate it by using information about household income and spending on durables and consumption goods. We inflate households’ spending on durables and consumption goods by a factor such that the aggregate savings rate (i.e. net income over income) matches the economy saving rates (as calculated by the European Central Bank). Our results are robust to the exclusion of the savings rate, thus concern about measurement error is mitigated.

We also include control variables at the individual level: sex (taking man as a reference category), age (categorized as under 35 years – reference category-, 35 to 44 years, 45 to 54 years, 55 to 64 years, 65 to 74 years, 75 or more years), educational level (categorized as insufficient instruction, i.e. illiterate, without studies or incomplete primary – reference category-, primary, secondary – including vocational training-, university), occupation (working as an employee - reference category), self-employed, unemployed, retired, disabled, student, housework, other situations), marital status (single - reference category), married or in a couple, divorced or separated, widows and widowers).

In some of the variables of control at family level there were some very extreme outliers

(both left and right), for this reason we trimmed them before categorizing them, thus excluding 2.5% of the values of the distribution of the variable both left and right.

## 2.3 Statistical Analysis

We specify a generalized linear mixed model with binomial response and a logistic link,

$$\log \left( \frac{\text{Prob}(Y_{ijt} = 1)}{1 - \text{Prob}(Y_{ijt} = 1)} \right) = \eta_i \quad (1)$$

where  $Y$  denotes the response variable (1 for poor health, 0 otherwise); the subscript  $i$  denotes the study subject;  $j$  the family to which the subject belongs; and  $\eta_i$  a linear predictor for subject  $i$ .

In the linear predictor of each subject in the model (1) we incorporate the variables that might explain the probability of declaring poor health, the explanatory variables described above (i.e. observed confounders) as well as two unstructured random effects to control for unobserved confounders. In particular, we considered individual heterogeneity, associated with each individual, and familiar heterogeneity, associated with the family to which the individual belonged.

However, the distribution of wealth is heavily skewed. For this reason, in the EFF the wealthiest households are oversampled. This is done to ensure that its sample is representative not only of the Spanish population as a whole, but also of the aggregate wealth of the Spanish economy. We corrected that oversampling by including in the models the weights provided by the EFF itself in each of its waves.

We estimate a model 1, both without stratifying and stratifying by the sex and the age group (under 35 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, 65 to 74 years, 75 or more years) of the reference person of the family.

Given the complexity of our model, we perform inferences using a Bayesian framework. In particular, we followed the Integrated Nested Laplace Approximation (INLA) approach<sup>[28]</sup>, within a (pure) Bayesian framework. All analyses were made with the free



software R (version 3.4.1)<sup>[29]</sup>, through the INLA package<sup>[28,30]</sup>.

### 3 Results

We summarise the results by analysing the crude odds ratio, without adjusting in a model (crude OR from here on) and adjusting in a model (adjusted OR henceforth), in both the whole and the stratified samples. Here, both ORs compare the risk of declaring poor self-rated health relative to the average risk of the whole period. Hence, an increase (decrease) in the OR implies larger (smaller) risk of declaring poor self-rated health compared to the average probability of declaring poor self-rated health over the four waves of the survey.

We first analyse the evolution of the reporting of poor self-rated health for the whole sample of individuals (Figure 1). The risk of reporting poor self-rated health decreased during the years previous to the crisis (2005 to 2008) – the real estate bubble period in Spain- and later peaked in 2011, (the worst moment of the crisis with a very demoralising double dip recession), before it dropped below pre-crisis values in 2014. When we control for the confounders in our model, the trend persists but is much closer to 1 (i.e. the average of the whole period of study). Hence, the first conclusion of our model is that changes in health status in Spain are partly explained by demographic and socio-economic factors.

A stratified analysis based on the age and gender of the reference person of the family reveals significant differences in the reporting of poor self-rated health trends. We consider six age categories in our analysis. The evolution of the crude OR by age group of the reference person is summarised in Figure 2. We find striking differences both across (that is, by age) and within groups (by gender).

While the crude OR remains virtually unchanged in households where the reference is a person under 35 years old, the other five groups experience significant variation over time. When we adjust, our results change upwards to some extent (Figure 3). It is worth noting that for all groups except the youngest, the adjusted OR is notably closer to 1, implying that a remarkable share of the variation in the outcome variable was captured

by the variables in the model.

In households where the reference person is between 35 and 44 years old, self-assessed health declines at the beginning of the economic crisis and then remains stable for the remaining two waves. When adjusting for the factors in our model, we find that female health recovers steadily, while in those households where the reference person is a man, self-rated health experiences a minor downturn. In both cases, the crude and adjusted ratios are close to average (1), thus implying little volatility in health for our reference group.

Households in which the reference person falls into our third age category (45 to 54 years old) show opposite trends. Individuals living in families where the reference person was a woman had a higher relative risk of declaring poor self-rated health before the crisis (2005). Their crude OR decreased steadily until 2011, before reaching average (1). Meanwhile, for households where the reference person is a man between 45 and 54, the risk of declaring poor self-rated health was lower in relative terms in 2005, and became almost 4 times larger in 2011. When we adjust (adjusted OR), men experience almost no change during the period, while women show higher risk after 2008.

Adults who are close to retirement (ages 55 to 64) display some of the most relevant findings. Opposite to what we find for the rest of the groups, the crude OR increases from 2005 to 2008 for both genders. While females recover from this, male self-rated health worsens in 2014. When adjusting the OR, we find male self-rated health returns (slightly better) to the period average, whereas women report worse self-rated health.

Those individuals who entered retirement age right before the crisis (ages 65 to 74) show a surprising peak in the crude OR in the economic recovery period (2014). The trend is common in both females and males, although it is significantly more pronounced for the latter group. Despite this fact, the trend is reversed when we adjust. For both genders the adjusted OR is similar to the average population pattern and shows the recurring minimum value in 2008 and maximum value in 2011, implying that self-rated health was better right at the end of the boom/start of the crisis and worsened in the toughest years for the Spanish economy. Also, the fact that the crude OR peaks in 2014 with

such extreme values suggests that the financial shock for this age group (captured by our model) was significantly larger than for other groups.

In the oldest age group (over 75 years old) men and women once again exhibit opposite trends. While female individuals had a lower probability of declaring poor self-rated health during the economic and financial crisis, males showed a higher risk. However, virtually all of this variation is captured by the variables in our model and the adjusted odds ratio remains approximately flat around 1 for the 4 waves.

## 4 Discussion

In this paper we document the uneven health impact of the economic and financial crisis that affected Spain from 2008 to 2014. We make use of the Bank of Spain's Household Financial Survey, which is a representative sample of the whole population followed over four waves (2005, 2008, 2011 and 2014). We obtain detailed information on individuals' socio-economic conditions as well as on their self-rated health. We summarise our analysis in two results that show the risk of declaring poor self-rated health for each group studied in relation to the average of the 2005–2014 period. Our first measure is the crude odds ratio, that is, the unadjusted risk of reporting poor self-rated health. The second and main methodological contribution of this paper is the adjusted OR, which corrects the dependent variable of the model (risk of reporting poor self-rated health) taking into account socio-economic individual controls, households' financial portfolios, family income levels, as well as individual and family heterogeneities.

The main takeaways of the paper are the following. First, we document an average downward trend in self-perceived health during the most severe period of the Great Recession (2009–2011). The recovery of the economy coincides with an improvement in self-perceived health, suggesting a close relationship between the two; also at the macroeconomic level. Second, the fact that the adjusted measures are less volatile than the crude ones shows that variation in health status can be (at least partially) captured by either demographic or socio-economic controls. Third, we document significant differences in the impact the

economic crisis had on health, showing that not all age/gender groups faced the same consequences. In particular, and unlike the average evolution for the whole sample, the (adjusted) risk of declaring poor health increases after the crisis only in those families in which the reference person is a woman under 45 years of age or a man aged 75 years or more.

While the aim of this paper is to document health inequalities arising from the financial crisis and not to find causal links, in this section we discuss where our evidence points to.

Several finance-related mechanisms may be behind our findings. Net wealth fluctuates little during the crisis (well below income). Between 2008 and 2014, households where the reference person is a man aged between 45 and 54 are those most severely punished by the crisis in terms of net wealth, (probably due to the overburden of the housing debt), but not as much on income levels. Young cohorts do not lose very much during the crisis since they have little accumulated wealth prior to the start of the Great Recession. Pensioners even increase their net wealth (up to 50%). On the contrary, income, in this respect, suffers a significant reduction (15 to 20%) for all non-pensioners, and particularly for those between 45 and 65 years old. This leaves the 45-55 year-old group in the more precarious financial situation; something which is reflected in their increased risk of declaring bad health status even after the economic recovery. Therefore, we find suggestive evidence that accumulated financial wealth is used as a buffer to offset adverse financial shocks, and self-perceived health deteriorates when such a buffer sharply declines.

In fact, this decline could explain the deterioration of self-perceived health, even after the crisis, in the two population groups that behave differently from the rest (i.e. families in which the reference person is a woman under 45 years of age or a man aged 75 years or more). It is worth noting that the EFF determines that a woman is the reference person of the family only when there is no adult man in the family. Thus, these families are mainly comprised either of single women (under 35 years of age) or separated or divorced women (between 35 and 44 years old) and, in both cases, with children who have not yet entered the labour market. These are the most precarious families. In this sense, the median gross wealth of these families is € 192,212 (€ 223,144 in the case of a family where the reference person is a man under 45 years of age, and € 331,733 without stratifying)

and the median income is € 29,331 (€ 35,391 in the case of a family where the reference person is a man under 45 years of age, and € 36,699 without stratifying). In the second case, the families comprise mainly widowed men who live alone (over 75 years old). In this case, we are dealing with families that, although they have a higher gross wealth than the average (median gross wealth € 504,854 vs. € 331,733 without stratifying) they have the second lowest income (median gross wealth € 31,338 vs. € 36,699 without stratifying) i.e. behind the families in which the reference person is less than 45 years old.

Second, we analyse self-perceived health, not objective health (morbidity or mortality). Although it is true that, since this is highly correlated with functional status, and self-perceived health can be considered a proxy for objective health, it must be taken into account that it is also related to psychosocial determinants and the socioeconomic position of the individual, and possibly even with other factors such as satisfaction with healthcare services<sup>[31]</sup>. For this reason, self-perceived health could be much more sensitive than other more objective indicators are.

Our final limitation is methodological because, as in any Bayesian analysis, the choice of the prior distributions of model parameters (i.e. priors) may have had a considerable impact on the results. However, we used priors that penalize the complexity (PC priors)<sup>[32]</sup> and which have been found to be very robust. Furthermore, we performed sensitivity analyses to assess how the prior on the hyper-parameters influenced the estimation results. To do this, we first increased the precision (lowering the variance) and then we tested other priors i.e. those used by default in R INLA (log gamma) with different shape and inverse-scales: uniform and centred half-normal. In all cases the PC priors provided better results.

We believe that these limitations are offset by the strengths of our study. For example, we make use of a longitudinal database with repeated observations of the same individuals before and after the crisis so that the subject is their own control and, therefore, the pre- and post-crisis samples are totally comparable. Furthermore, we control not only for observed confounders at the individual and at the family level, but also for the unobserved ones. In particular, we consider individual heterogeneity – associated with each individual- and family heterogeneity - associated with the unit to which the individual belonged.

Likewise, wealth is among the observed confounders we control for. In fact, household wealth is, in this sense, a kind of buffer that can make family income more resilient to shocks and so may delay the direct financial consequences the crisis has on personal anxiety and family bankruptcy. Finally, we use weights to recover the randomness of the sample, which is representative of the Spanish population as a whole.

Our study provides two key messages for policymakers. First, the links between wealth and income should not be disregarded when analysing health care, neither on their absolute levels, nor on disparities among groups and their evolution over time, since these account for a significant part of the changes in health status. Second, policymakers should design policies targeted to mitigate the impact of the financial crisis (for instance, on the effects leading to poverty from loan-to-value housing mortgages that are too high), given the observed uneven distribution (by age) of the risk aversion among individuals. This is reflected in taking on excess debt in terms of life-cycle earnings, particularly for those more exposed to income fluctuation, and therefore suffering a more serious impact from the recession, and probably on their health, as a consequence.

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## **Conflict of interest**

The manuscript is an original contribution that has not been published before, whole or in part, in any format, including electronically. All authors will disclose any actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations, that could inappropriately influence or be perceived to influence their work, within three years of beginning the submitted work.

## **Data availability**

We used Survey of Household Finances (EFF in Spanish) from the Bank of Spain. Public and freely accessible at:

[https://www.bde.es/bde/en/areas/estadis/Otras\\_estadistic/Encuesta\\_Financi/](https://www.bde.es/bde/en/areas/estadis/Otras_estadistic/Encuesta_Financi/)

## **Ethics**

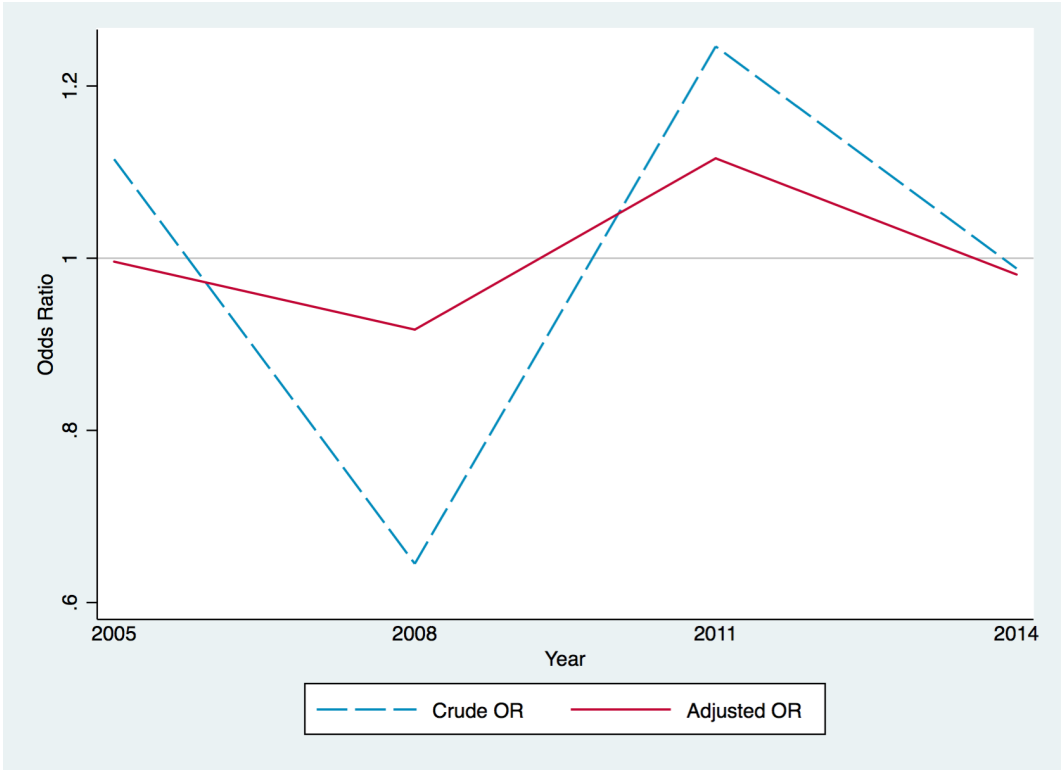
This article does not contain any studies performed by any of the authors using human participants or animals.

## **Authors’ Contributions**

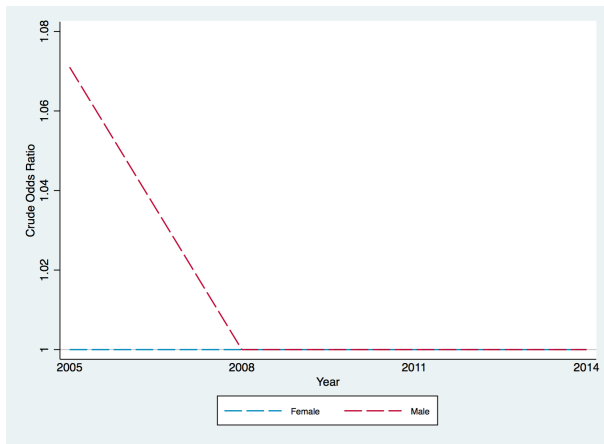
GL and MS had the original idea for the paper. MS designed the study. The bibliographic search and the writing of the introduction were carried out by JV and MS. The methods and statistical analysis were chosen and performed by MS. JV created the tables and figures. All authors wrote the results and the discussion. The writing and final editing was done by MS, JV and GL. All authors reviewed and approved the manuscript.

# Figures

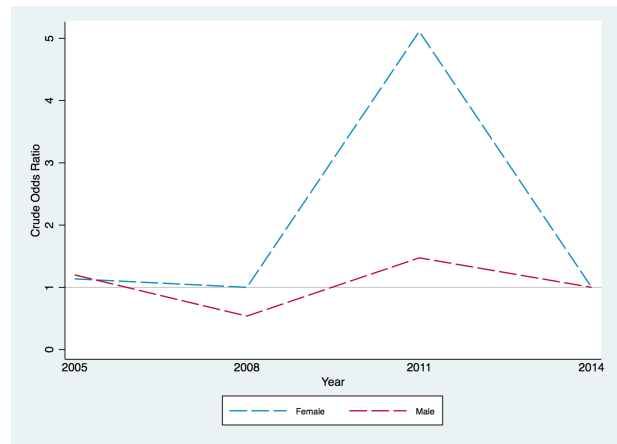
**Figure 1:** Evolution of self-assessed health status in Spain, 2005-2014



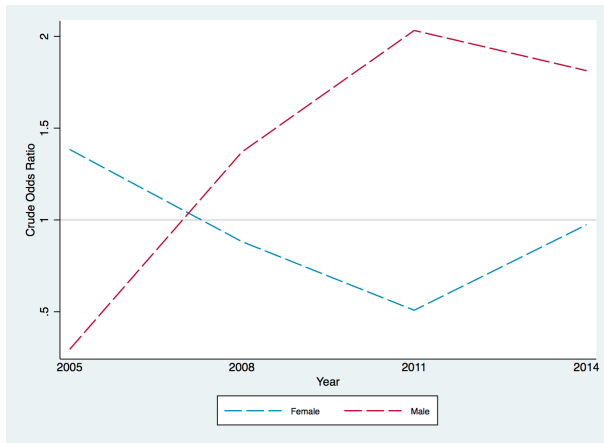




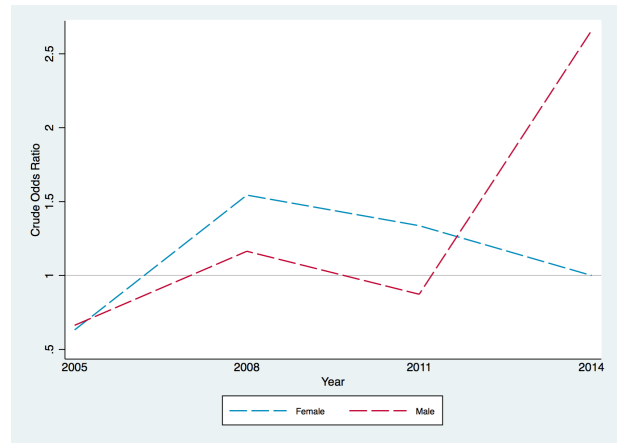
(a) < 35 Years Old



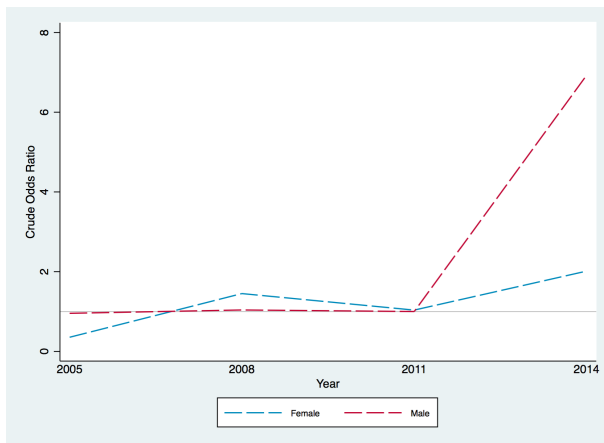
(b) 35-44 Years Old



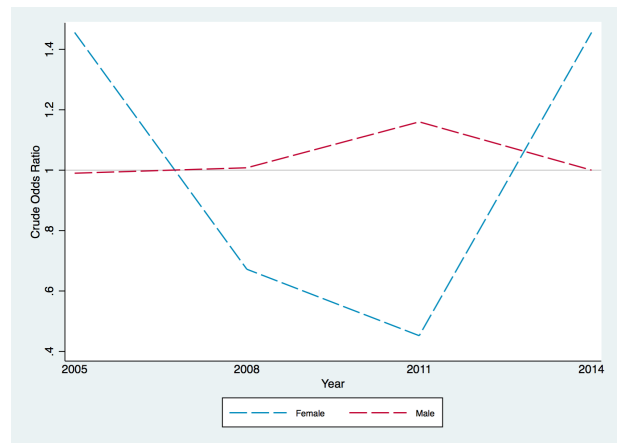
(c) 45-54 Years Old



(d) 55-64 Years Old

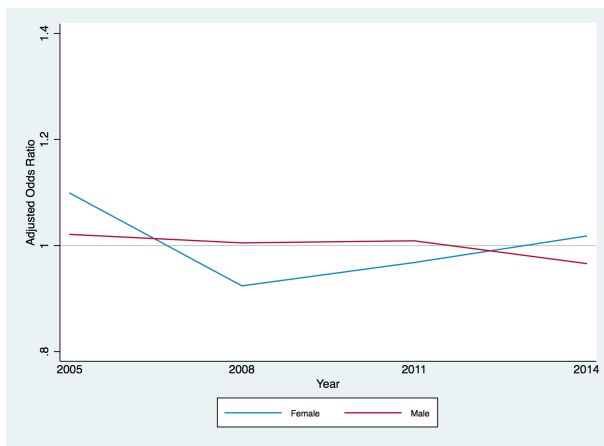


(e) 65-74 Years Old

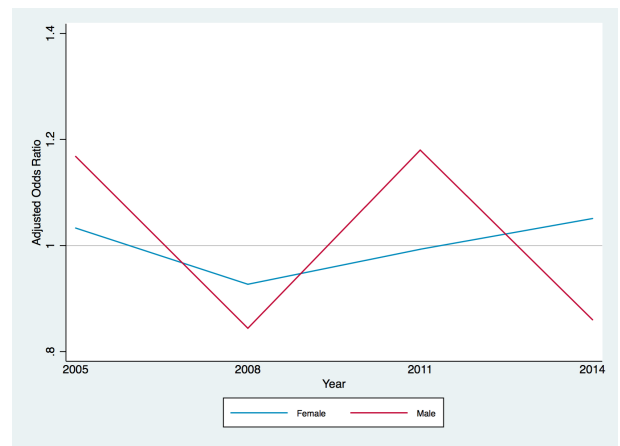


(f) > 75 Years Old

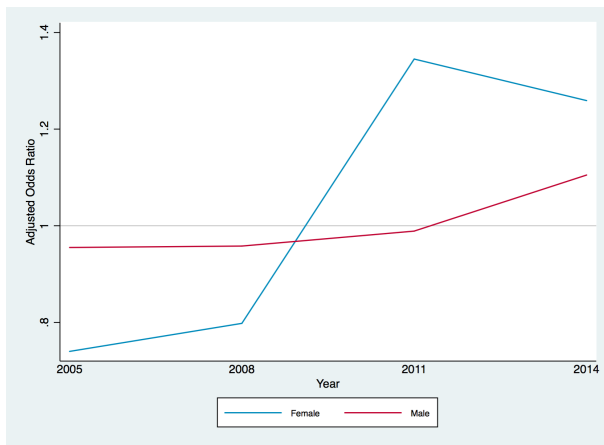
**Figure 2:** Evolution of self-assessed health status in Spain, 2005-2014, stratified by gender and age group of the reference person in the household



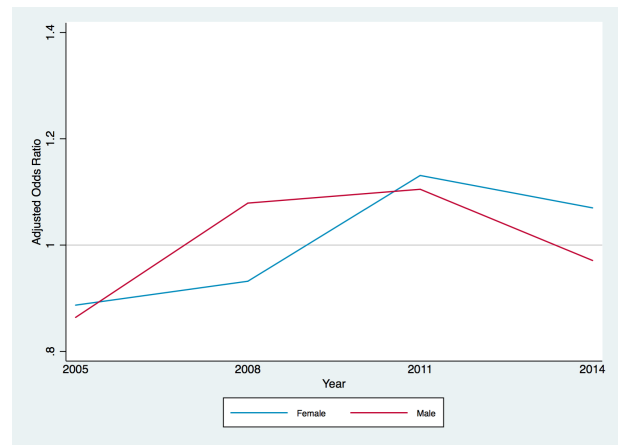
(a) < 35 Years Old



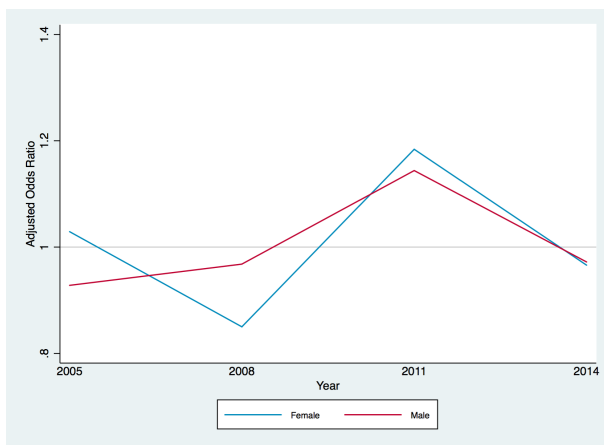
(b) 35-44 Years Old



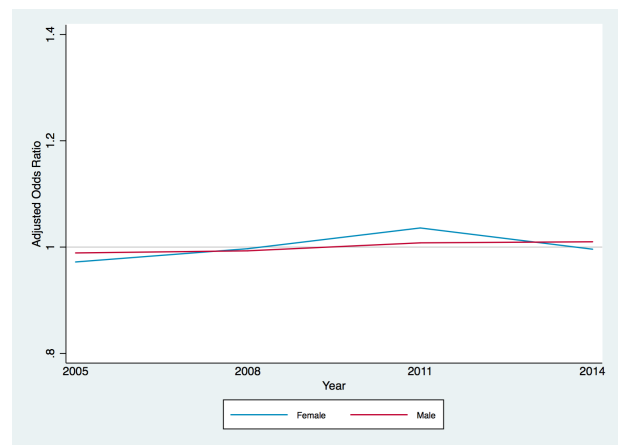
(c) 45-54 Years Old



(d) 55-64 Years Old



(e) 65-74 Years Old



(f) > 75 Years Old

**Figure 3:** Evolution of adjusted self-assessed health status in Spain, 2005-2014, stratified by gender and age group of the reference person in the household

## References

- [1] D. Zavras, V. Tsiantou, E. Pavi, K. Mylona, and J. Kyriopoulos. Impact of economic crisis and other demographic and socio-economic factors on self-rated health in Greece. *The European Journal of Public Health*, 23(2):206–210, 2013.
- [2] Sotiris Vitoros, Philipp Hessel, Tiziana Leone, and Mauricio Avendano. Have health trends worsened in Greece as a result of the financial crisis? A quasi-experimental approach. *European Journal of Public Health*, 23(5):727–731, 2013.
- [3] Tommy Ferrarini, Kenneth Nelson, and Ola Sjöberg. Unemployment insurance and deteriorating self-rated health in 23 European countries. *Journal of Epidemiology and Community Health*, 68(7):657–62, 2014.
- [4] Rainer Reile, Satu Helakorpi, Jurate Klumbiene, Mare Tekkel, and Mall Leinsalu. The recent economic recession and self-rated health in Estonia, Lithuania and Finland: a comparative cross-sectional study in 2004-2010. *Journal of Epidemiology and Community Health*, 68(11):1072–9, 2014.
- [5] Philipp Hessel, Sotiris Vitoros, and Mauricio Avendano. The differential impact of the financial crisis on health in Ireland and Greece: a quasi-experimental approach. *Public Health*, 128(10):911–919, 2014.
- [6] Nick Drydakis. 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. *Social Science & Medicine*, 128:43–51, 2015.
- [7] Tim Huijts, Aaron Reeves, Martin McKee, and David Stuckler. The impacts of job loss and job recovery on self-rated health: testing the mediating role of financial strain and income. *The European Journal of Public Health*, 25(5):801–806, 2015.
- [8] Isil Ergin and Aliye Mandiracioglu. Demographic and socioeconomic inequalities for self-rated health and happiness in elderly: The situation for Turkey regarding World Values Survey between 1990 and 2013. *Archives of Gerontology and Geriatrics*, 61(2):224–230, 2015.

- [9] Dawit Shawel Abebe, Anne Grete Tøge, and Espen Dahl. Individual-level changes in self-rated health before and during the economic crisis in Europe. *International Journal for Equity in Health*, 15(1):1, 2016.
- [10] Kenneth Nelson and Anne Grete Tøge. Health trends in the wake of the financial crisis—increasing inequalities? *Scandinavian Journal of Public Health*, 45(18\_suppl): 22–29, 2017.
- [11] Luis Rajmil, Antonia Medina-Bustos, María-José Fernández de Sanmamed, and Anna Mompart-Penina. Impact of the economic crisis on children’s health in Catalonia: a before-after approach. *BMJ*, 3(8):e003286, 2013.
- [12] Enrique Regidor, Gregorio Barrio, María J Bravo, and Luis de la Fuente. Has health in Spain been declining since the economic crisis? *Journal of Epidemiology and Community Health*, 68(3):280–282, 2014.
- [13] Isabel Aguilar-Palacio, Patricia Carrera-Lasfuentes, and M. José Rabanaque. Youth unemployment and economic recession in Spain: influence on health and lifestyles in young people (16–24 years old). *International Journal of Public Health*, 60(4): 427–435, 2015.
- [14] Xavier Bartoll, Laia Palència, Davide Malmusi, Marc Suhrcke, and Carme Borrell. The evolution of mental health in Spain during the economic crisis. *European Journal of Public Health*, 24(3):415–418, 2014.
- [15] Mercè Gotsens, Davide Malmusi, Nazmy Villarroel, Carmen Vives-Cases, Irene Garcia-Subirats, Cristina Hernando, and Carme Borrell. Health inequality between immigrants and natives in Spain: the loss of the healthy immigrant effect in times of economic crisis. *The European Journal of Public Health*, 25(6):923–929, 2015.
- [16] Luis Rajmil, Arjumand Siddiqi, David Taylor-Robinson, and Nick Spencer. Understanding the impact of the economic crisis on child health: the case of Spain. *International Journal for Equity in Health*, 14(1):95, 2015.

- [17] Clara Barroso, Ignacio Abásolo, and José J. Cáceres. Health inequalities by socioeconomic characteristics in Spain: the economic crisis effect. *International Journal for Equity in Health*, 15(1):62, 2016.
- [18] Silvia Calzón Fernández, Alberto Fernández Ajuria, María Puerto López Del Amo González, and José Jesús Martín Martín. [Sex Differences of Perceived Health before and During the Economic Crisis (2007 and 2011). Spain]. *Revista Española de Salud Pública*, 91, 2017.
- [19] Divya Parmar, Charitini Stavropoulou, and John P A Ioannidis. Health outcomes during the 2008 financial crisis in Europe: systematic literature review. *BMJ*, 354:i4588, 2016.
- [20] John Mullahy and Willard Manning. Statistical issues in cost-effectiveness analyses. *Valuing Health Care*, page 149–184, 1995.
- [21] Hugo Vásquez-Vera, Maica Rodríguez-Sanz, Laia Palència, and Carme Borrell. Foreclosure and Health in Southern Europe: Results from the Platform for People Affected by Mortgages. *Journal of Urban Health*, 93(2):312–330, 2016.
- [22] Rosa M. Urbanos-Garrido and Beatriz G. Lopez-Valcarcel. The influence of the economic crisis on the association between unemployment and health: an empirical analysis for Spain. *The European Journal of Health Economics*, 16(2):175–184, 2015.
- [23] Elena Arroyo, Gemma Renart, and Marc Saez. How the economic recession has changed the likelihood of reporting poor self-rated health in Spain. *International Journal for Equity in Health*, 14(1):149, 2015.
- [24] Shirley Pérez-Romero, Juan J Gascón-Cánovas, Ernesto de la Cruz-Sánchez, José F Sánchez-Ruiz, Pedro Parra-Hidalgo, and Olga Monteagudo-Piqueras. Economic recession (2006-2012) and changes in the health status of the Spanish population. *Salud Pública de México*, 58(1):41–8, 2016.
- [25] World Values Survey. URL <http://www.worldvaluessurvey.org/WVSContents.jsp>.

- [26] Bank of Spain. Survey of Household Finances. URL [https://www.bde.es/bde/es/areas/estadis/Otras\\_estadistic/Encuesta\\_Financi/](https://www.bde.es/bde/es/areas/estadis/Otras_estadistic/Encuesta_Financi/).
- [27] The R-INLA project. Random walk model of order 1. URL <http://www.math.ntnu.no/inla/r-inla.org/doc/latent/rw1.pdf>.
- [28] Håvard Rue, Sara Martino, and Nicolas Chopin. Approximate Bayesian inference for latent Gaussian models by using integrated nested Laplace approximations. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 71(2):319–392, 2009. URL <http://www.r-inla.org/papers>.
- [29] R Core Team. R Core Team. R: a language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria, 2013. URL <https://www.R-project.org/>.
- [30] R INLA Project, 2017. URL <http://www.r-inla.org/home>.
- [31] Pavitra Paul, Mihran Hakobyan, and Hannu Valtonen. The association between self-perceived health status and satisfaction with healthcare services: evidence from armenia. *BMC Health Services Research*, 16(1):67, 2016.
- [32] Daniel Simpson, Håvard Rue, Andrea Riebler, Thiago G Martins, Sigrunn H Sørbye, et al. Penalising model component complexity: A principled, practical approach to constructing priors. *Statistical Science*, 32(1):1–28, 2017.