

SOCIOECONOMIC GRADIENT IN HEALTH: HOW IMPORTANT IS MATERIAL DEPRIVATION?

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Abstract

In this paper we use the *Spanish Living Conditions Survey* (2005-2008) to investigate whether the socioeconomic gradient in health remains when alternative measures of socioeconomic status, apart from income, are considered. In particular we construct a material deprivation index that reflects some minimum standards of quality of life, and we analyze its impact on self-reported health. To address this issue, we use the deprivation measure proposed by Bossert et al., (2007) and we use a random effects model to estimate self-assessed health. Furthermore, we correct for the potential correlation between the error term and the regressors, derived from the fact that self-reported health is based on individual's perceptions, and we include previous health state in the empirical model in order to capture state dependence. Our results reveal that the relationship between socioeconomic status and health is not unidimensional. In particular the impact of material deprivation, in a variety of life domains, on self-reported health is much more significant than the effect associated to income.

Keywords: Self-assessed health, random effects model, material deprivation, social exclusion

JEL-Codes: C23, D63, I10

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1. Introduction

It is well documented that people in lower socioeconomic status groups have much worse health outcomes than those in higher socioeconomic groups (see Fox, 1994; Nazaroo, 1998; Marmot and Wilkinson, 1999; and Smith, 1999 among others). Socioeconomic status (SES) represents the position of an individual in the society, which comprises several components. On the one hand, components reflecting the material resources an individual controls (spending power, and physical living conditions as an example), on the other hand, components that reflect differences in lifestyles, attitudes, knowledge, etc.

But which dimensions of socioeconomic status actually matter to determine agents' health status? The level of income has been a commonly used indicator. After controlling for significant determinants of health, such as sex, age, educational level or occupation, there is a very striking relationship between self-reported health and income. However, other forms of deprivation, apart from that of income, might also exert a significance influence on health status. We refer to deprivation in terms of having access to basic functionings related to some minimum standards of quality of life.

Material deprivation is closely related to social exclusion, a concept that in the last years has received increasing attention among social scientists discussing the attributes, differences and novelties of it with respect to more traditional concepts such as income poverty, multidimensional poverty and inequality (see Duffy, 1995; Room, 1995; Atkinson, 1998; Klasen, 1998, Mejer, 2000; and Atkinson et al., 2002, among others). This shift from the concept of poverty to material deprivation and social exclusion reflects the need for a multidimensional approach to study social disadvantage. In this respect, the multidimensional aspect refers to the failure to attain adequate levels of various functionings that are deemed valuable in the society (Sen, 1985).

Another fundamental element identifying the concepts of material deprivation and social exclusion is relativity. Relativity comes from the idea that a person's feeling of deprivation in a society arises out of comparing his situation with those who are better off (Runciman, 1966, p.10). Thus, we cannot say whether an individual is deprived or socially excluded by looking at his position alone. The positions of others in the society have to be taken into consideration for a proper implementation of any criterion of deprivation or exclusion.

Using Spanish data of the *Living Condition Survey* for the period 2005-2008, this paper makes an important contribution to the literature focused on the socioeconomic gradient in health. In

particular, we examine the effect of material deprivation on individual self-assessed health (SAH). And we inspect whether the income effect is reduced when other forms of deprivation – in terms of financial situation, basic necessities, durables and housing conditions – are considered as integrated elements of the socioeconomic status. For that purpose we follow Bossert et al., (2007), and we define an individual measure of deprivation as the product of two terms. The first term corresponds to the Yitzhaki (1979) index, that is, the average of the functioning-failure differences between a person and those who are better off. The second term, the share of agents with fewer functioning-failures, captures the capacity of an individual to identify with other members of the society.

Information of health is derived from the question “How is your health in general”. It is a five-point response scale ranging from very good to very bad. The most relevant feature of subjective measures is that they focus on individual perceptions rather than on objective situations. This implies that individuals’ subjective evaluation of their own circumstances can change even when the objective situation remains the same. Thus, self-reported subjective measure of health may be prone to measurement error, which has been termed ‘state-dependent reporting bias’ (Kerkhofs and Lindeboom, 1995), ‘scale of reference bias’ (Groot, 2000) and ‘response category cut-point shift’ (Sadana et al., 2000; Murray et al., 2001).

In the context of ordered categorical responses models, this problem can be solved by making the cut points dependent on some or all of the exogenous variables used in the model and estimating a generalized ordered probit model. However, this requires strong a priori restrictions on which variables affect health and which affect reporting in order to separately identify the influence of variables on latent health and on measurement error. Alternative attempts to deal with this problem imply modeling the reporting bias based on more objective indicators of true health (Kerkhofs and Lindeboom, 1995; Lindeboom and van Doorslaer, 2003), and the use of ‘vignettes’ to fix the scale (Murray et al., 2001).

The approach followed in this paper is to exploit the panel structure of the data and estimate a random effects model. Furthermore, we follow Mundlak (1978) and we extend the model to allow for correlations between the individual random effects and the observable variables. Finally, as in Contoyannis et al., (2004) that uses the British Household Panel to investigate the effects of measures of socioeconomic status on self-reported health, we carry out separate estimations for males and females.

The paper is organized as follows. Section 2 provides a brief review on the relationship between socioeconomic status and health. In Section 3 we describe the data set and the

individual measure of deprivation. Section 4 focuses on the estimating strategy, while the main results are provided in Section 5. Finally Section 6 concludes.

2. Related literature

The existence of socioeconomic inequality in health is firmly established (see Adler et al., 1994; Van Doorslaer et al., 1997; Mackenbach et al., 1997, 2008; Smith, 1998, 1999; Van Doorslaer and Koolman, 2004). Most of this literature provides evidence of an inverse relationship between socioeconomic status and health – the so called health-gradient.

Health gradients are not unidimensional, reflecting the fact that there are multiple dimensions of social standing and multiple ways in which people can gain access to resources (Graham 2007; House et al., 2005). Two central ones have been considered in the literature: education and income. The majority of works have considered income has the main “marker” for an underlying concept of socioeconomic status, and therefore the underlying cause of health discrepancies.

Much of the evidence about the relationship between income and health is based on cross-sectional data (Benzeval et al., 2000a), and find a negative correlation between increasing income and poor health. More interesting, however, are those studies that examine the link between income dynamic and health status. Some common findings can be extracted from this branch of the literature based on longitudinal analysis. First, long-term income has a much larger impact on health than current income (Mullis, 1992). Second, income loss appears to have a much stronger effect on health than increases in income (Hirdes et al., 1986); 3). Finally a number of studies focus specifically on measures of very low income, or poverty (Smith and Zick, 1994; Menchik, 1993; Benzeval et al., 2000; Deaton, 2003; Contoyanis et al., 2004). They find that persistent poverty appears to be most damaging for health. Those people who are persistently poor have worse health outcomes than those who experience poverty only occasionally or not at all.

Some papers have also showed that the relationship between income and health is not a smooth linear relationship, but a non-linear one, which is steepest among low-income groups (Backlund et al., 1996; Mirowsky and Hu, 1996; Benzeval et al., 2001; Der et al., 1999; Benzeval and Judge, 2001).

Other researchers have, also, postulated that the correlation between income and health reflect the operation of some third factor, particularly education (Grossman, 1972, 1975,

2000). Thus, education might be a crucial component of SES and its relation to health, since in addition to the material resources it may provide, it gives people knowledge that shapes their health behaviors that impact health and illness (Lahelma, 2001).

If income causes health, it is possible that health is determined, not by absolute income but by income relative to some aspiration level, or relative to the income of others². This 'relative deprivation hypothesis' departs from more traditional approaches where individual's health is a function solely of his own income. While the concept of relative deprivation was introduced in the economics literature long time ago (with the seminal works of Duesenberry, 1949; Yitzhaki, 1979; and Frank, 1985), the studies that concern with its link to health are much more recent, and they mainly focus on the relationship between income inequality and population health (Kaplan et al., 1996; Wilkinson, 1997; Daly et al., 1998; Mellor and Milyo, 2002; Sturm and Gresenz, 2002).

Income inequality and relative deprivation are closely related concepts. However, while income inequality is a group measure, relative deprivation is specific to the individual. For instance, two people living in the same region would have the same inequality measure, but could have remarkably different measures of relative deprivation. Psychosocial stress is the pathway through which relative deprivation influences health (Wilkinson, 1997). Stress of an individual would depend on differences between own income and income of his peers, and that could affect health both directly (higher propensity of heart disease, high blood pressure, etc.) and indirectly (via increased smoking, poor eating habits, and alcohol abuse).

To date, very few studies focus specifically on the relationship between relative deprivation and health. The work of Eibner and Evans (2005) examines the impact of relative deprivation, within a reference group, on health, where reference groups are constructed based on observable demographic characteristics (state of residence, race, education and age). They find that relative deprivation in the sense of Yitzhaki may have detrimental implications on health.

In this paper we claim that other forms of relative deprivation, apart from income, might have significant impact on health. As pointed out in the work of Goldman (2001), which provides a survey of the health-gradient literature, the association between SES and health is found in different eras, places, genders, and ages, and occurs over the whole range of SES levels, so that it is not linked solely to poverty or education. In particular the association holds for a variety of

² The local housing case, where the people who live in a town are the market to local land for housing, is an example where relative income determines access to material goods.

health variables (most illnesses, mortality, self-assessed health status, psychological well-being, etc.) and alternative measures of SES (wealth, education, occupation, income, level of social integration).

Thus, this paper is intended to shed some more light on the health-gradient, considering material deprivation in different life domains – financial situation, basic necessities, housing conditions and durables – as a measure of SES. At the same time, making use of the longitudinal aspect of the data set, we take into account the dynamic aspect of health, by decomposing the persistence in health outcomes into components attributable to state dependence and unobserved heterogeneity.

3. Data set: health and deprivation measures

In estimating the effects of material deprivation on self-assessed health, we exploit the panel data of the Spanish *Living Condition Survey* for the period 2005-2008. This is the national version of the European Union Statistics on *Income and Living Conditions (EU-SILC)*, which is a voluntary (for potential respondents) survey of private households. The primary focus of the survey is the collection of comparative data on the income and living conditions of different types of households, from which indicators on poverty, deprivation and social exclusion are derived.

Social exclusion and housing condition information is collected at household level while labour, education and health information is obtained for persons aged 16 and over. The core of the instrument, income at very detailed component level, is mainly collected at personal level but a few components are included in the household part of the survey.

The two key variables in the analysis are health and deprivation. Information of health is self-assessed (SAH), and it is derived from the question “How is your health in general”. It is a five-point response scale ranging from very good to very bad.

SAH variables have been widely used in the literature that analyze the socioeconomic health-gradient (e.g. Adams et al., 2003; Benzeval et al., 2000; Deaton and Paxson, 1998; Ettner, 1996; Frijters et al., 2003; Salas, 2002; Smith, 1999). SAH is a simple subjective measure of health that provides an ordinal ranking of perceived health status. However, it has been shown to be a powerful predictor of subsequent mortality (see e.g. Idler and Kasl, 1995; Idler and Benyamini, 1997).

The individual measure of deprivation is based on functioning-failure profiles. With the Laeken European Council in December 2001 it was established that, apart from income, other indicators of the quality of life of an individual are necessary to evaluate the well-being of citizens. Thus, in order to distinguish these multidimensional indicators from pure income poverty measures, the concept of material deprivation has been used.³ The most common measure used in the literature belongs to what Atkinson (2003) and referred to as the “counting” approach. A counting measure of individual deprivation would be constructed as the number of dimensions in which the person is deprived, that is, the number of the individual’s lack of access to essentials in life. However, some dimensions may be more important than others. In such a case different weights should be assigned to the different dimensions, and the individual functioning-failure profile would then be constructed summing up these weights for the dimensions in which the failure is observed.

Following the suggestions of Eurostat (2000) and other EU studies on material deprivation (Bossert et al., (2007) among others) we consider a set of 14 indicators grouped according to four domains of quality of life (see Table 1).

Table 1: Dimensions of deprivation	
Indicator type	Indicators which determines material deprivation (Eurostat 2000) & Bosert et al., (2007)
Financial difficulties (2 items)	<ol style="list-style-type: none"> 1. Great difficulties in making ends meet (BOSSERT) 2. In arrears with (re)payment of housing or utility bills (BOSSERT, EUROSTAT)
Basic necessities (3 items)	<ol style="list-style-type: none"> 3. Cannot afford meat, fish or chicken every second day (BOSSERT, EUROSTAT) 4. Cannot afford a week’s holiday away from home (BOSSERT, EUROSTAT) 5. Cannot afford unexpected expenses (EUROSTAT)

³ See Fahey (2007); Whelan, Nolan and Maître (2008); Chakravarty and D’Ambrosio (2006); Bossert et al., (2006); Bossert et al., (2009); Haisken-DeNew and Sinning (2010) among others.

Housing conditions (4 items)	6. Dwelling with damp walls, floors, foundations, etc. (BOSSERT) 7. Cannot keep their home adequately warm in winter (EUROSTAT) 8. Dwelling without a bath or shower (BOSSERT) 9. Dwelling without toilet
Durables (5 items)	Not having specific durables due to a lack of financial resources in the household: 10. No telephone (BOSSERT, EUROSTAT) 11. No colour TV (BOSSERT, EUROSTAT) 12. No computer 13. No washing machine(BOSSERT, EUROSTAT) 14. No car (BOSSERT, EUROSTAT)

We will assume that, for each individual, there exists a measure of functioning-failure which indicates the degree to which functionings that are considered relevant are not available to the agent. Thus, let K be the set of binary variables that represents the dimensions we look at for the evaluation of individual well-being, such that a value of one indicates that the individual is deprived with respect to the attribute considered, while a value zero identifies a person who is not. For an individual $i \in \{1, 2, \dots, N\}$ we define $q \in \{0, 1\}^K$ as the individual functioning-failure profile and $D_i: \{0, 1\}^K \rightarrow \mathbb{R}_+$ the individual material deprivation measure such that:

$$D_i(q) = 0 \text{ if } q = 0 \tag{1}$$

$$D_i(q) = \sum_{k \in \{1, \dots, K\} | q_k = 1} \alpha_k \text{ if } q \neq 0$$

We consider the following alternatives:

1. The K variables are weighted equally: $\alpha_k = 1 \forall k \in \{1, \dots, K\}$

Higher weights are assigned according to the share of individuals who are not deprived from the functioning under consideration. This weighting scheme implies that the true importance of each component is determined by the proportion of people in the society who have access to that specific component.

However, as it happened to income, health is expected to be not solely influenced by individual's own situation in terms of functioning-failure profiles, but also in relative terms compared to some group of reference. This relativity aspect of material deprivation was first introduced by Runciman (1966), and implies that an individual is deprived in comparison with other members of the society. In order to capture this relative dimension, we consider an alternative measure of deprivation that is constructed as the product of two terms (see Bossert et al., (2007)). The first term corresponds to the Yitzhaki (1979) index, that is, the average of the functioning-failure differences between a person and those who are better off. The second term, the share of agents with fewer functioning-failures, captures the capacity of an individual to identify with other members of the society.

Thus, following the work of Bossert et al., (2007), we consider the following measure of individual material deprivation:

$$D_i(\mathbf{q}) = 0 \text{ if } B_i(\mathbf{q}) = 0 \tag{2}$$

$$D_i(\mathbf{q}) = \frac{|B_i(\mathbf{q})|}{|N|^2} \sum_{j \in B_i(\mathbf{q})} (q_i - q_j) \text{ if } B_i(\mathbf{q}) \neq 0$$

where $B_i(\mathbf{q}) = \{j \in N | q_j < q_i\}$ is the set of individuals whose functioning failure is lower

than that of i in \mathbf{q} , and $q_i \in \mathbb{R}_{++}$. The term $\frac{\sum_{j \in B_i(\mathbf{q})} (q_i - q_j)}{|N|}$ reflects the average of the functioning-failure difference between the individual and those who are better off (the Yitzhaki index). And the share of individuals with fewer functioning failures than the individual

under consideration is captured by $\frac{|B_i(\mathbf{q})|}{|N|}$.

The novelty of this deprivation measure is that, in addition to the aggregate alienation experienced by the agent with respect to those who have fewer functioning failures, this index also depends on the capacity of an individual to identify with other members of the society.

Furthermore, the index satisfies a number of desirable properties: normalization, focus, conditional anonymity, homogeneity, strong translation invariance, population proportionality and deprivation proportionality (see Theorem 1 in Bossert et al., (2007)).

Table 2: Descriptive Statistics (Mean values)

	Total	Very good (15,68%)	Good (54,71%)	Moderate (20,02%)	Bad (7,98%)	Very bad (1,61%)
$D_1(\mathbf{q})$ counting approach & equal weights	1,298	1,106	1,144	1,504	2,021	2,288
$D_1(\mathbf{q})$ counting approach & different weights	0,990	0,841	0,872	1,149	1,545	1,749
$D_1(\mathbf{q})$ Bossert et al., (2007) approach	0,614	0,505	0,525	0,725	1,033	1,223
Equivalent income (euros)	13,352	15,520	14,169	12,191	10,188	9,871
Female	37.69%	36.94%	34.26%	40.95%	45.86%	50.10%
Age	54	47	51	60	65	67
Marital Status						
Single	14.14%	21.04%	14.50%	12.08%	10.04%	11.09%
Married	67.23%	65.94%	71.53%	63.59%	58.54%	50.92%
Separated	3.31%	4.10%	3.05%	3.50%	3.20%	3.49%
Widow	12.07%	5.03%	7.86%	17.63%	24.55%	31.01%
Divorced	3.25%	3.89%	3.06%	3.19%	3.68%	3.49%
Education						
Primary	37.28%	18.40%	29.17%	49.56%	64.09%	70.23%
Secondary 1 st Stage	21.94%	23.37%	23.06%	20.81%	18.59%	15.40%
Secondary 2 nd Stage	16.95%	21.67%	19.68%	13.40%	8.00%	7.60%
Vocational training	0.65%	0.90%	0.67%	0.52%	0.68%	0.21%
Tertiary	23.18%	35.66%	27.43%	15.72%	8.64%	6.57%
Labour market status						
Employed full time	50.62%	68.09%	62.43%	35.73%	14.83%	6.16%
Employed part time	3.73%	5.63%	4.05%	3.14%	1.80%	1.44%
Unemployed	4.97%	5.38%	5.08%	4.79%	4.56%	4.11%
Retired	24.94%	12.26%	17.90%	35.41%	45.82%	46.20%
Disable	2.55%	0.31%	0.51%	3.57%	10.60%	16.22%
Housework	9.26%	6.35%	7.40%	12.58%	12.99%	14.17%
Other	3.93%	1.98%	2.62%	4.79%	9.40%	11.70%

N	25,260	2,880	13,086	6,306	2,501	487
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Sample statistics for the total sample and separately for the five categories of self-assessed health status are provided in Table 2. Around 70% of the sample report to have good or very good health status, 20% moderate health, and the remainder 10% bad or very bad.

The results show an inverse relationship between socioeconomic status and health. On the one hand, the distribution of SAH improves as per capita equivalent household income increases⁴. And on the other hand, higher values of the deprivation index are associated with worse categories of the SAH variable. Regarding the individual characteristics, we can observe that females, old people and people with lower educational level report worse health status. The labor market situation also affects self-assessed health, with a remarkable percentage of retired, disable and housework people reporting bad levels of health.

4. Econometric approach

In our data, information on health status is provided as an ordered discrete variable with the following $j = \{1, \dots, 5\}$ categories: Very bad ($j = 1$); Bad ($j = 2$); Moderate ($j = 3$); Good ($j = 4$); and Very good ($j = 5$). Many papers have relied on ordered probit models when the dependent variable is ordinal (see Blanchflower and Oswald, 2000a; Clark and Oswald, 1994; Plug, 1997; Ferrer-i-Carbonell, 2002; Frey and Stutzer, 1999, 2000; Hartog and Oosterbeek, 1998; McBride, 2001; Pradhan and Ravallion, 2000; van Praag et al., 2003; and Wottiez and Theeuwes, 1998). However, some papers in the literature have showed that linear and ordered categorical models provide very similar results in terms of the trade-offs between variables (see Ferrer-i-Carbonell and Frijters, 2004; van Praag and Ferrer-i-Carbonell, 2004, Chap 2; Ferrer-i-Carbonell and Gërkhani, 2010).

Following Ferrer-i-Carbonell and Frijters (2004), we take the ranking of health status to be more nearly cardinal. While the assumption of cardinality instead of ordinality is typically unimportant, it has the advantage of yielding coefficients that can be directly interpreted as marginal effects. We rely primarily on probit adapted ordinary least squares (POLS) as developed by Van Praag and Ferrer-i-Carbonell (2008 p. 29-34). Implementing POLS begins by

⁴ In order to compute per capita equivalent income we use the OECD equivalence scales, which assign weights of 1, 0.5 and 0.3 to the household head, each of the remaining adults and each child in the household respectively.

deriving $\{\mu_j\}_{j=0}^J$ values of a standard normal associated with the cumulative frequencies of the J different categories of the dependant variable, with $\mu_0 = -\infty$, $\mu_J = \infty$. Then the expectation of a standard normally distributed variable is taken for an interval between any two adjacent values. Thus if the true unobserved continuous variable for individual i at time t is h_{it}^* where the observed is $h_{it} = j$ if $\mu_{j-1} < h_{it}^* \leq \mu_j$, $j = 1, \dots, J$, then the conditional expectation of the latent variable is given by:

$$\bar{h}_{it} = E(h_{it}^* | \mu_{j-1} < h_{it}^* \leq \mu_j) = \frac{n(\mu_{j-1}) - n(\mu_j)}{N(\mu_j) - N(\mu_{j-1})} \quad (3)$$

where n is the normal density and N is the cumulative normal distribution. This approach allows the application of a linear estimator on the conditional expectations, which is assumed to be a function of observable characteristics

$$\bar{h}_{it} = \alpha X_{it} + \beta h_{it-1} + \gamma D_{it} + u_{it} \quad (4)$$

Where X is the set of individual and household characteristics mentioned in previous section which may have an impact on health. Both absolute and relative income measures are included. Similarly to the relative deprivation measure specified in equation (2) we follow Bossert et al., (2007), and we construct a measure of relative income according to the following equation:

$$D_i(\mathbf{I}) = 0 \text{ if } B_i(\mathbf{I}) = 0$$

$$D_i(\mathbf{I}) = \frac{|B_i(\mathbf{I})|}{|N|^2} \sum_{j \in B_i(\mathbf{I})} (I_j - I_i) \text{ if } B_i(\mathbf{I}) \neq 0$$

Where I_i denotes per capita equivalent household income of individual i , and $B_i(\mathbf{I}) = \{j \in N | I_j > I_i\}$ is the set of individuals with higher income than the individual under consideration.

Furthermore, in order to capture state dependence we include the vector of indicators for the individual's health state in the previous wave h_{it-1} as regressors. Finally, the vector D contains the material deprivation measures.

In this setting, it is assumed that the error terms are not correlated to the explanatory variables. However, it is plausible that individuals' perception of health depend not only on the individual's objective situation but also on some unobserved time-invariant characteristics.

These unobserved factors would, therefore, co-determine both SAH and some of the explanatory variables included in X . This would imply that such explanatory factors would be correlated with the error term u_i . In order to account for this possible endogeneity bias, we estimate a random effects (RE) model and we add a Mundlak correction term that parameterizes the potential correlation between the individual effect and the right-hand side variables (Mundlak, 1978). The Mundlak correction term consists of a vector \bar{X}_i^M with the time-averaged values of a subset of M explanatory variables. With this strategy the unobserved heterogeneity of the standard RE model is assumed to consist of two parts, $u_i = \varepsilon_i + \delta \bar{X}_i^M$. The first part is a pure error term. The second part is assumed to vary linearly with the within-group means, whereby a possible correlation between the independent variables and the idiosyncratic characteristics is accounted for. Thus, equation (4) becomes

$$\bar{h}_{it} = \alpha X_{it} + \beta h_{it-1} + \delta \bar{X}_i^M + \gamma D_{it} + \varepsilon_i + \eta_{it} \quad (5)$$

where ε_i is a time-invariant (random) effect and η_{it} is an independent error term, with $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$, $\eta_{it} \sim N(0, 1)$ ⁵.

We carry out separate estimations for males and females, using the three alternative deprivation measures: 1) counting approach and equal weights; 2) counting approach and different weights; 3) Bossert et al., (2007) approach. Furthermore, in the three cases, we first consider all domains together within an aggregate measure, and then separately according to the four domains: financial situation, basic necessities, durables and housing conditions.

5. Main results

The estimation results are reported for males and females in Tables 3 and 4 respectively. Our results confirm that the socioeconomic gradient in health is more latent when we consider deprivation in a variety of life dimensions to measure individual's socioeconomic status.

The first columns correspond to the case where income is included as the main indicator for socioeconomic status. For the male subsample we do not find a significant effect of absolute income on SAH. However, the coefficient of the relative income variable is found to be

⁵ The Mundlak variables are: proportion of years in the panel for which the individual is in either of the employment situations (employed full-time, employed part-time, unemployed, retired, housework, others), averaged number of members in the household.

negative (-0,027) and statistically significant, thus confirming that individual's health is affected by incomes of others in his reference group (the relative income hypothesis).

When the estimating model is extended by adding other forms of deprivation as determinants of individual's socioeconomic status, two aspects are worth noting. First, the income effect on health is reduced. For instance, the abovementioned value of -0,027 decreases to -0,016 when material deprivation measured is constructed according to a counting approach with equal weights (-0,017 for the counting approach with different weights, and -0,020 for the Bossert et al., approach). Second, we find that the impact of material deprivation on health is negative and statistically significant in all domains, and the magnitude of its effect is larger than that corresponding to relative income. It is especially large for the deprivation measure based on the Bossert et al. approach. In this case a 1-standard deviation increase in the aggregate deprivation score reduces self-assessed health by 0.084. Furthermore, when deprivation scores are computed separately for the four domains, we find that the impact of material deprivation on health is more important in the domains of housing (-0,128) and financial situation (-0,112), while it is less important in the domain of durables (-0,033).

For the female subsample the previous results still hold. However, some important points are worth mentioning. First, we find a negative and significant impact of absolute income on self-reported health. Second, in general the magnitude of the impact of material deprivation on health is larger than that to males. For instance, when we use the approach of Bossert et al., we find that a 1-standard deviation increase in the aggregate deprivation measure reduces health by an amount of 0,102.

The results also provide evidence of significant health state dependence. For the estimations where material deprivation measures are added as determinants of individual's socioeconomic status, the results reveal that having a "very bad" previous health status reduces the current health state approximately by 0,63, with very few gender differences.

Referring to age, as the descriptive analysis previously showed, we observe that older people have worse self-assessed health with no evidence of a non-linear effect.

The effect of marital status on self-perception of health is slightly different for men and women. Taking single persons as the reference category, there is any significant effect of marital status on men's health. On the contrary, widow women are more likely –compared to single women- to perceive a worse health, while there is no significant effect if they are married, separated or divorced.

Gender differences are also latent when looking at the variables that refer to the individual's position within the household. Taking the "reference person in the household" as the reference category, males who are married report significantly worse state of health. In contrast, these variables do not exert a significant impact on health among females.

A similar pattern is observed when looking at household characteristics. While household composition does not exert any impact on males' health, it is not the case among females. Here we find that health is reduced with the size of the household, but it is augmented with the number of children in the household.

Finally, for both males and females the results reveal that people with higher levels of education report better states of health, which is in line with previous works in the literature (Grossman, 1972, 1975, 2000; Lahelma, 2001).

Table 3: POLS Model (Male Sample)														
	Counting Approach (Equal Weights)				Counting approach (Different weights)				Bossert approach					
	Coef,	t	Coef,	t	Coef,	t	Coef,	t	Coef,	t	Coef,	t	Coef,	t
Log (income)	-0,004	-0,31	-0,011	-0,92	-0,010	-0,82	-0,012	-0,96	-0,010	-0,84	-0,014	-1,11	-0,012	-0,94
Log (depriv. Income)	-0,027	-5,56	-0,016	-3,36	-0,016	-3,37	-0,017	-3,52	-0,017	-3,45	-0,020	-4,20	-0,018	-3,80
<i>Deprivation measures</i>														
Deprivation total			-0,062	-18,89			-0,077	-18,69			-0,084	-17,23		
Deprivation financial					-0,068	-6,58			-0,089	-6,76			-0,112	-7,02
Deprivation basic					-0,054	-7,87			-0,074	-7,61			-0,087	-7,05
Deprivation durables					-0,028	-2,19			-0,030	-2,19			-0,033	-2,18
Deprivation housing					-0,093	-9,63			-0,105	-9,50			-0,128	-9,52
<i>Household characteristics</i>														
Log (Nº housh.members)	-0,060	-0,84	-0,072	-1,00	-0,065	-0,91	-0,074	-1,04	-0,066	-0,92	-0,072	-1,01	-0,066	-0,92
Log (Nº members<14)	-0,008	-0,57	0,004	0,28	0,002	0,16	0,004	0,29	0,002	0,16	0,004	0,25	0,002	0,13
<i>Position in the household</i>														
Reference person														
Partner	-0,031	-2,41	-0,026	-2,02	-0,026	-2,01	-0,026	-2,02	-0,026	-2,03	-0,027	-2,09	-0,026	-2,06
Other members	0,003	0,16	0,001	0,04	0,001	0,06	-0,001	-0,03	0,001	0,03	-0,001	-0,03	-0,001	-0,04
<i>Previous health status</i>														
Very good	0,042	2,84	0,040	2,72	0,040	2,75	0,040	2,69	0,040	2,76	0,040	2,73	0,041	2,77
Good														
Moderate	-0,154	-10,59	-0,148	-10,22	-0,147	-10,18	-0,147	-10,19	-0,147	-10,18	-0,148	-10,22	-0,147	-10,15
Bad	-0,483	-21,80	-0,467	-21,15	-0,467	-21,16	-0,467	-21,16	-0,467	-21,19	-0,469	-21,24	-0,468	-21,21
Very bad	-0,677	-13,28	-0,638	-12,57	-0,641	-12,62	-0,637	-12,55	-0,641	-12,63	-0,634	-12,48	-0,639	-12,59
<i>Personal characteristics</i>														
Age	-0,028	-11,48	-0,029	-11,78	-0,028	-11,73	-0,028	-11,77	-0,028	-11,73	-0,028	-11,71	-0,028	-11,72
Age ^2	0,000	4,41	0,000	4,44	0,000	4,41	0,000	4,42	0,000	4,42	0,000	4,39	0,000	4,41
<i>Marital status</i>														

Single														
Married	0,019	1,02	-0,004	-0,22	-0,005	-0,25	-0,005	-0,24	-0,005	-0,25	0,000	-0,02	-0,004	-0,20
Separated	-0,077	-1,92	-0,061	-1,55	-0,065	-1,63	-0,062	-1,56	-0,065	-1,63	-0,062	-1,56	-0,065	-1,64
Widow	0,012	0,32	-0,010	-0,26	-0,010	-0,27	-0,009	-0,26	-0,010	-0,26	-0,006	-0,16	-0,009	-0,24
Divorced	-0,001	-0,03	0,016	0,37	0,015	0,35	0,016	0,39	0,015	0,35	0,015	0,36	0,014	0,34
<i>Education Level</i>														
Primary														
Second. 1st stage	0,070	5,19	0,055	4,12	0,055	4,12	0,055	4,11	0,055	4,14	0,057	4,23	0,056	4,20
Second. 2nd. Stage	0,117	7,73	0,085	5,62	0,087	5,70	0,086	5,68	0,087	5,75	0,091	5,98	0,090	5,91
Vocational training	0,076	1,53	0,040	0,80	0,042	0,85	0,041	0,83	0,043	0,87	0,046	0,93	0,045	0,91
Tertiary	0,170	10,98	0,126	8,12	0,128	8,27	0,128	8,23	0,130	8,35	0,135	8,74	0,134	8,63
<i>Employment Status</i>														
Employed full-time														
Employed part-time	0,031	0,66	0,026	0,55	0,027	0,57	0,026	0,56	0,027	0,58	0,027	0,58	0,026	0,55
Unemployed	-0,040	-1,40	-0,024	-0,83	-0,024	-0,82	-0,024	-0,82	-0,023	-0,81	-0,022	-0,76	-0,023	-0,79
Retired	0,068	1,48	0,072	1,58	0,073	1,59	0,072	1,57	0,073	1,59	0,072	1,56	0,072	1,56
Disable	-0,097	-1,77	-0,097	-1,78	-0,095	-1,75	-0,098	-1,79	-0,095	-1,74	-0,095	-1,74	-0,095	-1,75
Housework	0,059	0,27	0,067	0,31	0,071	0,32	0,069	0,31	0,074	0,34	0,072	0,33	0,075	0,34
Other	-0,024	-0,67	-0,022	-0,62	-0,023	-0,63	-0,023	-0,63	-0,022	-0,62	-0,022	-0,62	-0,023	-0,63

Table 4: POLS Model (Female Sample)														
	Counting Approach (Equal Weights)				Counting approach (Different weights)				Bossert approach					
	Coef,	t	Coef,	t	Coef,	t	Coef,	t	Coef,	t	Coef,	t	Coef,	t
Log (income)	-0,026	-2,09	-0,042	-3,39	-0,039	-3,15	-0,043	-3,43	-0,040	-3,17	-0,044	-3,54	-0,041	-3,29
Log (depriv. Income)	-0,035	-7,04	-0,022	-4,58	-0,022	-4,44	-0,023	-4,78	-0,022	-4,54	-0,028	-5,71	-0,025	-5,08
Deprivation measures														
Deprivation total			-0,077	-24,15			-0,096	-23,79			-0,102	-21,23		
Deprivation financial					-0,055	-5,46			-0,071	-5,52			-0,090	-5,80
Deprivation basic					-0,085	-12,70			-0,118	-12,41			-0,135	-11,21
Deprivation durables					-0,028	-2,32			-0,031	-2,41			-0,036	-2,51
Deprivation housing					-0,120	-12,64			-0,137	-12,49			-0,165	-12,22
Household characteristics														
Log (Nº housh.members)	-0,146	-2,03	-0,157	-2,20	-0,155	-2,16	-0,159	-2,22	-0,156	-2,17	-0,160	-2,23	-0,158	-2,20
Log (Nº members<14)	0,012	0,81	0,029	2,02	0,026	1,80	0,029	2,03	0,026	1,81	0,029	2,01	0,026	1,80
Position in the household														
Reference person														
Partner	-0,003	-0,24	-0,015	-1,14	-0,015	-1,17	-0,014	-1,10	-0,015	-1,15	-0,012	-0,91	-0,013	-1,04
Other members	0,014	0,69	-0,011	-0,57	-0,009	-0,44	-0,011	-0,59	-0,009	-0,44	-0,007	-0,36	-0,007	-0,37
Previous health status														
Very good	0,054	3,51	0,056	3,70	0,057	3,72	0,056	3,67	0,057	3,71	0,056	3,65	0,056	3,68
Good														
Moderate	-0,154	-11,22	-0,150	-11,07	-0,150	-11,04	-0,150	-11,06	-0,150	-11,05	-0,150	-11,04	-0,150	-11,01
Bad	-0,534	-27,05	-0,512	-26,09	-0,511	-26,08	-0,512	-26,11	-0,512	-26,10	-0,514	-26,17	-0,512	-26,08
Very bad	-0,652	-15,37	-0,629	-14,94	-0,629	-14,94	-0,632	-15,00	-0,630	-14,98	-0,634	-15,02	-0,630	-14,96
Personal characteristics														
Age	-0,024	-10,47	-0,025	-10,94	-0,024	-10,87	-0,025	-10,93	-0,024	-10,86	-0,024	-10,83	-0,024	-10,82
Age ^2	0,000	2,30	0,000	2,41	0,000	2,39	0,000	2,41	0,000	2,40	0,000	2,39	0,000	2,39
Marital status														

Single														
Married	0,023	1,21	-0,016	-0,88	-0,015	-0,79	-0,017	-0,89	-0,015	-0,79	-0,010	-0,56	-0,012	-0,65
Separated	-0,043	-1,31	-0,020	-0,62	-0,026	-0,81	-0,021	-0,65	-0,027	-0,83	-0,024	-0,73	-0,029	-0,91
Widow	-0,050	-2,10	-0,056	-2,38	-0,057	-2,42	-0,057	-2,45	-0,057	-2,45	-0,059	-2,50	-0,058	-2,49
Divorced	-0,071	-2,08	-0,054	-1,59	-0,057	-1,68	-0,054	-1,61	-0,057	-1,70	-0,057	-1,69	-0,058	-1,73
<i>Education Level</i>														
Primary														
Second. 1st stage	0,099	7,28	0,078	5,83	0,078	5,77	0,079	5,88	0,078	5,79	0,083	6,14	0,080	5,97
Second. 2nd. Stage	0,164	10,58	0,119	7,68	0,119	7,72	0,120	7,78	0,120	7,77	0,128	8,28	0,125	8,08
Vocational training	0,208	3,77	0,174	3,19	0,174	3,20	0,174	3,19	0,174	3,20	0,181	3,31	0,179	3,27
Tertiary	0,201	12,16	0,137	8,31	0,139	8,42	0,140	8,49	0,141	8,51	0,153	9,24	0,148	8,97
<i>Employment Status</i>														
Employed full-time														
Employed part-time	-0,020	-0,77	-0,022	-0,84	-0,023	-0,87	-0,022	-0,85	-0,023	-0,87	-0,021	-0,82	-0,023	-0,89
Unemployed	0,000	0,02	0,012	0,45	0,012	0,43	0,012	0,43	0,012	0,43	0,012	0,44	0,012	0,43
Retired	0,007	0,17	0,000	0,01	0,000	0,00	0,000	-0,01	-0,001	-0,01	0,000	0,01	0,000	-0,01
Disable	-0,094	-1,53	-0,088	-1,44	-0,088	-1,43	-0,088	-1,44	-0,087	-1,43	-0,087	-1,42	-0,086	-1,41
Housework	0,008	0,29	0,006	0,23	0,007	0,24	0,006	0,20	0,006	0,23	0,007	0,24	0,007	0,25
Other	-0,036	-1,26	-0,038	-1,34	-0,038	-1,34	-0,039	-1,36	-0,038	-1,33	-0,038	-1,33	-0,038	-1,32

6. Conclusions

This paper analyzes the socioeconomic gradient in self-assessed health using 4 waves (2005-2008) of the Spanish Living Conditions Survey. Previous studies have considered income as the main indicator of socioeconomic status. However, in this paper we claim that other forms of deprivation, apart from income, may exert a significant influence on health status.

We construct several measures of deprivation. First is a measure based on the counting approach and equal weights; second is based on the counting approach and different weights; and the third is based on the approach introduced by Bossert et al., (2007), which is aimed at capturing the relative dimension of deprivation. Furthermore, in the three cases, we first consider all domains together within an aggregate measure, and then separately according to the four domains: financial situation, basic necessities, durables and housing conditions.

Our econometric strategy is based on a random effects model, we allow for health state dependence and correct for potential correlation between the error term and the regressors. Following Ferrer-i-Carbonell and Frijters (2004), we take the ranking of health status to be roughly-cardinalised. While the assumption of cardinality instead of ordinality is typically unimportant, it has the advantage of yielding coefficients that can be directly interpreted as marginal effects. Thus, in our estimations we rely primarily on probit adapted ordinary least squares (POLS). Results confirm that the relationship between socioeconomic status and health is not unidimensional. In particular the health effects of material deprivation, in a variety of life dimensions, including financial difficulties, basic necessities, housing conditions and durables are substantial and much larger than the health benefits of income. Finally, we also find that self-assessed health is characterized by substantial positive state dependence.

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