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Regional Differences in Socioeconomic Health Inequalities in Spain

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Abstract

This working paper reports an analysis of income related health inequalities at the autonomous community level in Spain using the self assessed health measure in the 2001 edition of the Spanish National Health Survey. We use recently developed methods in order to cardinalise and model self assessed health within a regression framework, decompose the sources of inequality and explain the observed differences across regions. We find that the regions with the highest levels of mean health tend to enjoy the lowest degrees of income related health inequality and vice-versa. The main feature characterizing regions where income related health inequality is low is the absence of a positive gradient between income and health. In turn, the regions where income related health inequality is greater are characterized by a strong and significant positive gradient between health and income. These results suggest that policies aimed at eliminating the gradient between health and income can potentially lead to greater reductions in socioeconomic health inequalities than policies aimed at redistributing income.

Key words

Health inequalities, decomposition analysis, Spain.

Resumen

Este documento de trabajo presenta un análisis de las desigualdades de salud por motivos económicos en las comunidades autónomas españolas, basándose en la edición del año 2001 de la Encuesta Nacional de Salud. Se utilizan métodos recientes para cardinalizar y modelar el estado de salud autopercibido dentro de un marco de regresión, descomponer las fuentes de desigualdad y explicar las diferencias observadas entre CC. AA. Se observa que, en términos generales, las CC. AA. con los niveles medios de salud más elevados son las que menos desigualdades en salud sufren por motivos económicos, y viceversa. El principal rasgo que caracteriza a las CC. AA. con poca desigualdad de salud por motivos económicos es la ausencia de un gradiente positivo entre renta y salud.
A su vez, las CC. AA. que registran más desigualdades de salud por motivos económicos se caracterizan, de forma marcada, por un gradiente positivo significativo entre salud y renta. Estos resultados apuntan a que las políticas enfocadas a eliminar el gradiente entre salud y renta serán más eficaces a la hora de disminuir las desigualdades de salud socioeconómicas que las políticas de redistribución de la renta.

Palabras clave

Desigualdades en salud, análisis de descomposición, España.

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1. Introduction

THE Spanish health care system has been decentralized to an unprecedented extent in the course of the last 25 years. This process of devolution has coincided in time with a major overhaul in the nature of its functions at a national level. Two major features of the nation wide reforms are the introduction of universal coverage and the development of the primary care network as the basic pillar of the system, shifting emphasis away from hospital care. The process of devolution has not been homogeneous, however. Some regions were transferred health care responsibilities as early as 1981 while as many as 10 out of the 17 autonomous regions were transferred in 2002. It is widely accepted that this fragmented process of devolution has interfered with the aim of guaranteeing the system's equity and quality (European Observatory on Health Care Systems, 2000). In this paper we aim to investigate the degree of income related inequality across regions for the Spanish population in the year 2001. For this objective, we use recently developed methods in order to model health status, decompose the sources of inequality of health over income and explain the observed differences between regions. We shall use data from the 2001 Spanish National Health Survey, a health survey which is representative at the regional level and contains data on health status, income and other socioeconomic characteristics. Our contention in this paper is that the heterogeneity of resources and organizational arrangements across regions might reflect in differences in the joint distribution of health and income after controlling for other correlates of health such as demographic structure, education, activity status etc. In this paper we set out to measure such differences. Our results indeed show that there are important geographical disparities: Basque Country, Navarra and La Rioja are the regions with the highest levels of mean health and simultaneously enjoy the lowest degree of income related health inequality. By contrast, Murcia is the least favoured region in that its population report one of the lowest levels of mean health and suffers the greatest degree of income related health inequality. Other territories where income related health inequality is high relative to Basque Country include rich regions such as Madrid, the Balearic Islands and Catalonia. The main feature characterizing regions where income related health inequality is low is the absence of a positive gradient between income and health. In turn, the regions where income related health inequality is greater are characterized by a strong and significant positive gradient between health and income.

Section 2 briefly summarizes the characteristics of the Spanish health care system and provides background references within the Spanish literature. Section 3 presents the methodology that we adopt for the measurement and modeling of health, the measurement of socioeconomic health inequality and the explanation of its changes across space. Section 4 describes the data set employed throughout the analysis. Section 5 presents the empirical results, section 6 discusses the policy implication of the results and section 7 concludes.

2. Regional Differences in Health Care Arrangements at the Start of the XXIth Century in Spain

BY the start of the century health responsibilities were devolved to 7 regions with governments run by different political parties, with different demographic structures and traditions in the industrial organization of health care. This is compounded by the fact that Basque Country and Navarra have a distinctive fiscal arrangement which grants them more degrees of freedom in expenditure decisions. These two regions have given public coverage to dental care for children since the end of the 80's, for instance. The remaining 10 regions were managed by a central body until 2002, the INSALUD, but this did not guarantee a greater degree of homogeneity. Indeed, one source of potential differences arose from the calendar of devolution. Catalonia (1981), Andalucía (1984), Basque Country and Valencia (1988), Navarra and Galicia (1991) and Canary Islands (1994) gained responsibilities first, but the remaining 10 regions have had a regional government for a long period before they have gained health responsibilities. It has been argued (European Observatory on Health Care Systems, 2000) that the coexistence of a central regulating body and a regional government generated frictions which have led to an uneven implementation of reforms. The European Observatory on Health Care Systems (2000) cites the case of the primary care reforms in Galicia, which met opposition from the regional government from the mid 80's to the mid 90's. Galicia finally gained health care responsibilities in 1991 but the results from these frictions are present in recent data. By 2000, 81% of the Spanish population on average were covered by the new primary care network but the fraction was 50%, the lowest, in Galicia. It is important to stress that benefiting from the reformed primary health care network is important for equity purposes. The old network consisted of isolated outlets where general practitioners were typically available for two and a half hours per day (European Observatory an Health Care System, 2000).

Unsurprisingly, given the low quality of public primary care, the rich turned to private outlets except when hospital care was needed. In constrast, the new network comprises team based practices staffed by doctors and nurses who have received specific training in family medicine and whose activities not only included curative care, but also preventive care, health promotion, follow up of patients and services targeted to particular population groups such as the mentally ill, drug users etc.

The uneven development of the primary health care system reflects in many indicators of primary health care coverage displaying variation across regions in 2001. The Ministry of Health (2000a) provides information for the percentage of the population covered by specific primary health care programs (these programs include, among others, vaccinations against flu for elderly people, prevention of heart diseases, care for patients with chronic diseases such as hipertension, COPD, etc.). Heart disease prevention, for instance, reached 70.6% of the target population in Aragón but less than 50% in Murcia or Extremadura. Similarly, vaccination against flu for over 65's reached 65.2 of the target population in Castilla La Mancha but only 54.3% in Madrid or 58.4% in Murcia.

There are also regional differences in the stock of capital available for hospital care. Data from the Ministry of Health (2002b) reveal that in 2001 the average number of beds per 100,000 inhabitants was 386 but regions such as Andalucía (293.7), Castilla-León (208.75), Valencia (279.09) or Murcia (313) were well below the average. Moreover, the percentage of these beds belonging to the public sector varied remarkably around the Spanish average of 73% reflecting the unequal extent to which the public sectors contracts out the provision of health care. In this sense Catalonia, at 36.8%, had the lowest ratio of public to total beds. It is worth mentioning that these disparities in health care infrastructures across regions are not explained by differing degrees of need related to demographics or morbidity and mortality. A study by Puig Junoy and López Nicolás (1995) showed that the best regions in terms of the ratio of stock of health care capital to health care need were Navarra, Madrid, Aragón and Basque Country, while Balearic Islands, Extremadura and Galicia were ranked in the lowest positions. Territorial disparities in the supply of preventive services and high technology have also been found in a recent study (González, Urbanos and Ortega, 2004).

Thus the evidence suggests that by 2001 the Spanish health care system presents a good degree of heterogeneity across regions. This does not necessarily lead to regional disparities in health outcomes, because differences in the management of resources and/or poverty alleviation efforts from other areas of policy making might be more important at generating health differences between populations, as pointed out by García Vargas and del Llano Señaris (2003).

Our contribution to the literature focuses in evaluating the extent to which health is unequally distributed over income within each of the regions, controlling for other covariates of health such as demographic structure, education and activity status. The Spanish literature contains relevant antecedents in the topic. Regidor et al. (1995, 1999, 2002) have found a significant pro-rich bias in the relationship between socioeconomic class (as defined by several combinations of education levels and occupation) and outcomes such as the SF-36 instrument, self-assessed health, prevalence of chronic diseases, standardised death rates and risky habits. Van Doorslaer et al. (1997) use data from the Spanish National Health Survey 1987 and find that there is pro-rich inequality in self-assessed health as measured by the concentration index. Van Doorslaer and Koolman (2004) again find a significant degree of pro-rich inequality using data from the 1996 Spanish wave of the European Community Household Panel. Thus we know that, on average, there is pro-rich socioeconomic inequality in health outcomes in Spain. What we do not know, however, is how the degree of pro-rich socioeconomic inequality varies across regions. Indeed, Van Doorslaer and Koolman (2004) find significant regional effects in the determinants of self assessed health and the contributions to health inequality. This suggests that fully disaggregated regional analysis is bound to offer interesting evidence. In this sense the evidence contained in this paper is complementary to studies of regional differences in health and health care such as Abad Díez and Carreter Ordóñez (2002), who find important regional disparities in life expectancy in a recent study and López-Cassasnovas et al. (2005), who argue that political decentralization need not raise inequities in health care.

3. Methods

3.1. Measurement of health

Our measure of health is derived from the respondent's assessment of his/her health status during the year previous to the date of the interview. As in many health surveys, information on self assessed health (SAH) in the Spanish National Health Survey is presented in a categorical variable resulting from the following question: "During the last 12 months, would you say that your health has been i) very good, ii) good, iii) fair, iv) bad, v) very bad". There are several methods for the cardinalisation of this measure of SAH. A first approach (Van Doorslaer et al., 1997; Wagstaff and Van Doorslaer, 1994) would consist in assuming that SAH is an underlying latent variable with a standard log-normal distribution and then assigning to each observed SAH category the mid point of the intervals of a standard log normal as defined by the cumulative distribution of observed SAH categories. A natural extension of the underlying latent variable approach would consist in modelling SAH with an ordered probit structure (Cutler and Richardson, 1997; Groot, 2000). Since an ordered probit does not identify the scale of the latent variable, this procedure requires ex-post rescaling to the interval within which latent SAH is assumed to vary. The problem of ex-post rescaling can be solved by using external information on a generic health measure in conjunction with categorical SAH. One alternative along this line consists in using the mean value of generic health per SAH category to score latent SAH. In a recent paper, Van Doorslaer and Jones (2003) compare these alternatives with a new procedure consisting in combining external information on the distribution of a generic measure of health with the distribution of observed SAH in order to obtain the thresholds of generic health that delimit the SAH categories. Given this information, SAH can be modelled as an interval regression and no ex-post rescaling is necessary. Van Doorslaer and Jones (2003) show that this is the best procedure in terms of the ability to mimic the distribution of generic health departing from the SAH categories and the set of covariates used in the interval regression model. Subsequently this procedure has been used by Van Doorslaer and Koolman (2004) in their analysis of health inequalities in the European Union.

We adopt this method for this paper and, in common with their approach, we will use information on the empirical distribution of the Health Utility Index (HUI) in the 1994 Canadian National Population Health Survey. Thus, we assume that there is a stable mapping from HUI to the latent variable that determines reported SAH and that this applies not only for Canadian, but also for Spanish individuals. Therefore, we compute the cumulative frequency of observations for each category of SAH and then find the quantiles of the empirical distribution function for HUI in the NPHS that correspond to these frequencies. Table 3.1 presents the cumulative frequencies of the distribution of SAH and the corresponding quantiles in the distribution of HUI.

TABLE 3.1: Cumulative frequencies of SAH and quantiles of HUI

SAH	Cum. Frequency	HUI quantile
Very bad	1.64	0.34
Bad	7.20	0.68
Fair	29.70	0.86
Good	84.77	1
Very Good	100.00	1

Therefore, an individual who reports very bad health will be assumed to have a HUI level that belongs to the interval [0,0.34]. Similarly, the intervals for the remaining SAH categories are (0.34, 0.68] for the *bad* category (0.68, 0.86] for the fair category and (0.86, 1] for the *good* and *very good* categories.

In short, our procedure to measure health consists in using the predictions for the latent variable in the following econometric model

$$y^*_i = \beta_1 + \sum_{k=2}^{k} \beta_k x_{ki} + u_i$$

$$y_i = j \text{ if } \mu_{j-1} < y^*_i \leq \mu_j \; j = 1,2,3,4 \tag{3.1}$$

where u_i is a standard normal random error term, j = 1,2,3,4 denote the very bad, bad, fair and good or very good SAH categories and μ_j, are the thresholds whose values are given by the intervals above. Therefore the health measure used in the subsequent analysis for the ith individual is given by

$$\hat{y}_i^* = \hat{\beta}_1 + \sum_{k=2}^{k} \hat{\beta}_k x_{ki} \tag{3.2}$$

The linearity of the resulting health measure, which is expressed in HUI units, is a useful feature at the time of computing and decomposing inequality measures as we will see below.

3.2. Measurement and explanation of inequality

The literature on health inequalities has recently adopted a standard tool for the measurement of income related health inequalities: the concentration index (CI) of health on income (Wagstaff, Van Doorslaer and Paci, 1989). The concentration index has a similar interpretation to the more familiar Gini index for pure health inequality. In fact, the two inequality measures differ in the fact that the ranking variable is income (CI) rather than health (Gini). This means that, unlike the Gini, which takes only non-negative values, the standardized CI ranges between –1 and 1. A value of –1 would mean that all health is concentrated in the poorest person, whereas a value of 1 would result if all health were concentrated in the richest person. A value of zero would mean that health is equally distributed over income in the sense that the pth percentage of the population ranked by income has exactly the pth percentage of total health for any p. Concentration indices have been used in studies for the Spanish population previously (Rodríguez, Calonge and Reñé, 1993; Urbanos, 2001; Van Doorslaer and Wagstaff, 1999; Van Darslaer et al., 1997). Rodríguez, Calonge and Reñé (1993) and Van Doorslaer and Wagstaff (1999) measure the degree of equity in the financing and delivery of health care by means of such indices and related measures such as the Gini and Kakwani indices, while Van Doorslaer et al. (1997) use them for the measurement of socioeconomic health inequality.

Suppose we are interested in calculating the CI coefficient for a measure of health using individual data in a sample from the population of interest. Let y_i denote a measure of health for the i^{th} individual, i = 1,2,...N, and R'_i denote the cumulative proportion of the population ranked by income up to the i^{th} individual (their *relative income rank).*

Ignoring, for expositional purposes, the fact that in general sampling weights will be necessary, the CI of health on income is given by (see e.g. Van Doorslaer and Jones, 2003),

$$CI = \left(\frac{2}{\bar{y}}\right) \text{cov}\,(y_i, R'_i) \tag{3.3}$$

where $\bar{y} = E(y_i)$. Now let y_i be given by the following linear regression model

$$y_i = \beta_1 + \sum_{k=2}^{k} \beta_k x_{ki} + \varepsilon_i \tag{3.4}$$

where k is the number of regressors *(x)*. By substituting this for y_i, the CI of y can be written as (Wagstaff, Van Doorslaer and Watanabe, 2003),

$$CI = \sum_{k=2}^{k} \left(\beta_k \frac{\bar{x}_k}{\bar{y}} \right) CI'_k + \left(\frac{2}{\bar{y}} \right) \mathrm{cov}(\varepsilon_i, R'_i) \tag{3.5}$$

The first term in brackets is the elasticity of y with respect to x_k evaluated at the sample means ($\bar{x}_k$ and $\bar{y}$) and CI'_k denotes the concentration index of x_k against income. Thus this inequality measure can be decomposed into an *explained part* and an *unexplained part*. The *explained* part can be usefully broken down into the contributions of individual explanatory variables. As for the *unexplained* part, it is a scaled measure of the covariance of the residuals in the regression model with the position of the individual in the distribution of income. As such, the unexplained part should be zero if the regression model contains income as an explanatory variable (Gravelle, 2003).

As explained in section 3.1, our health measure is a linear combination of the explanatory variables included in the interval regression model. Given the nature of the dependent variable in the latter model, no residuals can be computed so the decomposition reduces to the deterministic term in equation (3.5). Moreover, if we define the estimated health elasticity with respect to determinant k as

$$\hat{\eta}_k \equiv \frac{\hat{\beta}_k \bar{x}_k}{\bar{y}} \tag{3.6}$$

then we can rewrite the decomposition in a way such that the CI is just a weighted sum of the inequality in each of its determinants, with the weights equal to the elasticities. That is,

$$C\hat{I} \equiv \sum_k \hat{\eta}_k \, \hat{C}I_k' \tag{3.7}$$

As mentioned by Van Doorslaer and Koolman (2004), the decomposition also clarifies how each correlate of health contributes to total income-related health inequality: this contribution is the result of (i) its impact on health, and (ii) how unequally distributed over income it is.

3.3. Decomposing inequality between autonomous communities

As put into practice by Van Doorslaer and Koolman (2004), we have used the approach suggested by Wagstaff, Van Doorslaer and Watanabe (2003) in order to decompose the difference in inequality between autonomous communities. The method is a derivation of the well known Oaxaca decomposition whereby the difference between the CI's of community i and community j can be written as

$$\Delta CI = CI_i - CI_j = \sum_k \eta_{kj} (CI'_{ki} - CI'_{kj}) + \sum_k CI'_{ki} (\eta_{ki} - \eta_{kj}) \qquad (3.8)$$

Then, the contribution of any variable to the difference in the income-related health inequality is decomposed as:

$$\Delta CI'_k = \eta_{kj} (CI'_{ki} - CI'_{kj}) + CI'_{ki} (\eta_{ki} - \eta_{kj}) \qquad (3.9)$$

In practice, for each region, we shall compute the differences in inequality (and contributions toward such difference) with respect to the region with the smallest level of inequality, Basque Country. Moreover, in order to assess the relative importance of the inequality versus the health elasticity component in the contribution of each variable, we also compute the relative excess elasticity compared to Basque Country, i.e. $(\eta_{ki} - \eta_{pv}) / \eta_{pv}$, and the relative excess inequality, $(CI_{ki} - CI_{pv}) / CI_{pv}$.

3.4. Statistical inference

Many of the statistics that we are going to report are non-linear functions of the data whose sampling distributions are hard to obtain. For this reason we shall use bootstrapping methods in order to derive standard errors. The bootstrap estimates for standard errors are computed following the five-step approach used by Van Doorslaer and Koolman (2004). The number of replications has been set to 500.

4. Data and Variable Definitions

WE use the 2001 edition of the Spanish National Health Survey. This is nation wide survey collecting information on health and socioeconomic characteristics of individuals. The survey contains separate adults (16 +) and children samples. The analysis in this paper is based on the adult sample. The sampling scheme is a complex multi-stage stratified process whereby primary strata are autonomous communities and, within the latter, sub-strata are defined according to residence area population size. Within substrata, municipalities (primary sampling units) and sections (secondary sampling units) are selected according to a proportional random sampling scheme. Finally individuals are randomly selected from the sections. The survey documentation includes weighting factors that correct for the fact that the number of observations within the primary strata is not proportional to actual population. We use these weights whenever a nationwide statistic is computed.

The information contained in the data files do not allow the identification of all the primary sampling units (because municipalities with a population below 100,000 are not identified). Similarly, information about the secondary sampling units is omitted so it is impossible to control for cluster effects at either the municipality level or the section level.

The ranking variable is total monthly income earned by the household. In the ENS this is measured as a categorical variable with 6 response categories. The midpoint of each income group was attributed to all households in the category and this is subsequently divided by an equivalence factor equal to (number of household members)$^{0.5}$, to adjust for differences in household size.

The initial ENS sample included 26,265 individuals from all the autonomous communities, although the 399 observations from Ceuta and Melilla were dropped. From the remaining 25,866, we have dropped 66 because self assessed health was not reported, 6,532 whose household income was missing, 3,954 whose age was missing. A further 38 individuals with missing values for marital status, job status or education are dropped from the sample. As a result, the estimating pooled sample contains 15,276, which are divided across autonomous communities as follows: 1,488 are from Andalucía, 756 from Aragón, 683 from Asturias, 664 from Balearic Islands, 787 from Canary Islands, 547 from Cantabria, 820 from Castilla-La Mancha, 1,134 from Castilla-León, 1,324 from Catalonia, 1,220 from Valencia, 827 from Extremadura, 1,045 from Galicia, 1,484 from Madrid, 641 from Murcia, 472 from Navarra, 820 from Basque Country and 564 from La Rioja.

5. Empirical Results

5.1. Measuring and decomposing inequality by autonomous community

As discussed in section 3.1, we specify and estimate an interval regression model for the level of SAH inspired in the specification used by Van Doorslaer and Koolman (2004). It is useful to stress that this is not a structural model for health and therefore its estimates cannot be given a causal interpretation. However, it might be interpreted as a reduced form static model of demand for health whose estimates provide an indication of how exogenous changes in health determinants can affect the degree of socioeconomic inequality in health. The explanatory variables in this model are:

i) the logarithm of equivalent household income;

ii) 14 age-gender categories corresponding to age groups 16-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 5-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80 + for men and women (the omitted category corresponds to a woman aged between 16 and 19);

iii) 5 educational categories: university (omitted category), secondary school, primary school, reads and writes and illiterate;

iv) 4 marital status categories: single (omitted category), married, divorced, widowed;

v) 5 activity categories: family care (omitted category), employed, pensioner, unemployed and student.

The first row of table 5.1 contains the mean predicted values for HUI for each of the regions. Note that there are important variations: Navarra, La Rioja and Basque Country are the three regions with the top scores for mean HUI, while at the bottom of the league there are Canary Islands and Murcia. In its second row, table 5.1 also shows that the richest regions (in terms of mean equivalised household income) are Asturias, Basque Country, Balearic Islands, Madrid, Navarra and Catalonia, while the poorest regions are Extremadura, Andalucía, Castilla-La Mancha and Canary Islands.

TABLE 5.1: Mean predicted HUI, mean log income and Health equations: interval regression coefficients per region

	Andalucía	Aragón	Asturias	Balearic Islands	Canary Islands	Cantabria	Castilla La Mancha	Castilla León	Catalonia	Valencia	Extremadura	Galicia	Madrid	Murcia	Navarra	Basque Country	La Rioja
Mean predicted HUI	0.852	0.869	0.861	0.855	0.843	0.863	0.871	0.863	0.850	0.865	0.851	0.854	0.859	0.848	0.891	0.880	0.889
Mean Log Income	11.276	11.505	11.699	11.574	11.331	11.455	11.317	11.387	11.544	11.403	11.222	11.413	11.573	11.377	11.544	11.654	11.439
Constant	**0.4357**	**0.8063**	**0.5911**	0.1494	**0.6607**	**0.8528**	**0.7168**	**0.7403**	**0.4615**	**0.7025**	**0.7121**	**0.4875**	0.2090	**0.4317**	**0.9998**	**0.8635**	**0.8704**
Log Income	**0.0396**	0.0084	0.0278	**0.0579**	0.0172	0.0059	0.0163	0.0157	**0.0380**	0.0159	0.0122	**0.0329**	**0.0553**	**0.0379**	–0.0053	0.0016	0.0049
F20-24	–0.0234	0.0099	–0.0142	0.0208	0.0032	–0.0275	–0.0324	–0.0011	–0.0072	–0.0105	0.0092	0.0165	–0.0277	–0.0004	–0.0705	–0.0211	0.0103
F25-29	–0.0091	–0.0027	–0.0289	–0.0247	0.0383	–0.0143	0.0148	–0.0110	–0.0388	–0.0138	0.0462	0.0090	–0.0086	0.0102	–0.0024	0.0128	0.0064
F30-34	–0.0201	0.0107	–0.0377	–0.0124	0.0290	–0.0060	–0.0064	–0.0050	–0.0204	–0.0121	0.0238	0.0015	–0.0087	0.0116	–0.0392	0.0026	0.0235
F35-39	–0.0496	–0.0292	–0.0294	–0.0129	0.0212	–0.0632	0.0086	–0.0313	–0.0412	–0.0039	0.0358	0.0116	–0.0462	0.0023	0.0006	–0.0294	–0.0182
F40-44	**–0.0661**	0.0030	–0.0176	–0.0555	0.0134	–0.0811	–0.0160	–0.0277	–0.0632	**–0.0630**	–0.0039	–0.0090	–0.0339	0.0360	–0.0320	–0.0279	–0.0142
F45-49	**–0.0634**	–0.0405	–0.0472	–0.0624	0.0188	–0.0339	–0.0299	–0.0170	–0.0445	–0.0402	0.0112	–0.0218	**–0.0748**	–0.0382	–0.1091	–0.0527	–0.0239
F50-54	**–0.0708**	–0.0435	–0.0747	–0.0465	–0.0272	–0.0674	–0.0057	–0.0455	**–0.0774**	–0.0466	–0.0625	–0.0205	**–0.0739**	–0.0551	–0.0666	–0.0335	–0.0304
F55-59	**–0.1461**	–0.0540	–0.0709	–0.0253	–0.0851	**–0.1304**	**–0.0886**	–0.0460	**–0.1241**	–0.0536	–0.0057	–0.0443	–0.0389	–0.0734	–0.0306	–0.0535	–0.0296
F60-64	**–0.1430**	–0.0590	–0.0339	0.0148	–0.0502	–0.0833	**–0.0873**	–0.0631	–0.0471	**–0.0744**	**–0.1093**	–0.0540	**–0.0836**	0.0045	–0.0526	–0.0377	–0.0510
F65-69	**–0.0939**	–0.0379	–0.0722	–0.0889	–0.0610	–0.0925	–0.0636	**–0.1156**	–0.0191	**–0.0685**	–0.0396	–0.0691	**–0.0755**	0.0230	–0.0660	–0.0028	–0.0581
F70-74	**–0.1491**	**–0.1028**	–0.0677	–0.0584	0.0119	–0.0813	**–0.1511**	**–0.1603**	–0.0652	**–0.1066**	–0.0539	–0.0496	**–0.1295**	–0.0065	–0.1143	**–0.1017**	–0.0516
F75-79	–0.0518	–0.0584	**–0.1834**	–0.0326	–0.0911	–0.0706	–0.0503	**–0.0998**	**–0.0934**	**–0.0892**	–0.0697	**–0.1186**	**–0.1213**	**–0.1281**	–0.0534	–0.0512	**–0.1228**
F80	**–0.0989**	**–0.1309**	–0.0817	–0.0219	–0.0788	–0.0626	**–0.1905**	**–0.1434**	**–0.1044**	**–0.0818**	–0.0659	**–0.0917**	**–0.1294**	–0.0589	–0.1058	–0.0380	–0.0730
M16-19	–0.0049	–0.0100	0.0046	0.0427	0.0208	–0.0466	0.0074	0.0110	–0.0041	–0.0116	0.0206	0.0294	–0.0229	–0.0036	–0.0165	–0.0114	0.0116
M20-24	–0.0018	–0.0059	–0.0106	0.0149	0.0596	–0.0255	–0.0009	0.0021	0.0023	–0.0215	0.0206	–0.0041	0.0115	0.0209	0.0010	0.0030	0.0065
M25-29	–0.0208	–0.0078	–0.0128	0.0277	0.0171	–0.0050	0.0037	–0.0017	–0.0148	–0.0072	0.0173	0.0141	0.0010	0.0122	–0.0114	0.0115	0.0152
M30-34	–0.0145	–0.0114	–0.0513	0.0154	0.0347	–0.0067	0.0003	–0.0089	–0.0228	–0.0266	0.0280	–0.0009	–0.0123	0.0264	–0.0222	–0.0322	0.0146
M35-39	–0.0483	–0.0068	–0.0304	–0.0122	0.0132	–0.0092	0.0039	–0.0139	–0.0093	–0.0164	0.0235	–0.0292	–0.0226	0.0447	0.0007	–0.0425	0.0184

TABLE 5.1 (continuation): **Mean predicted HUI, mean log income and Health equations: interval regression coefficients per region**

	Andalucía	Aragón	Asturias	Balearic Islands	Canary Islands	Cantabria	Castilla La Mancha	Castilla León	Catalonia	Valencia	Extremadura	Galicia	Madrid	Murcia	Navarra	Basque Country	La Rioja
M40-44	–0.0240	–0.0352	–0.0157	0.0238	–0.0029	–0.0417	0.0062	0.0054	–0.0455	–0.0066	0.0236	–0.0076	–0.0100	0.0314	–0.0301	–0.0262	0.0053
M45-49	–0.0454	–0.0283	–0.0932	–0.0571	–0.0376	–0.0430	0.0027	–0.0345	–0.0351	–0.0268	0.0347	0.0001	–0.0586	0.0415	–0.0076	–0.0090	0.0045
M50-54	**–0.0657**	0.0076	–0.0677	–0.0295	0.0065	0.0010	–0.0326	–0.0244	–0.0228	**–0.0752**	–0.0307	–0.0213	–0.0215	0.0080	–0.0484	–0.0508	–0.0316
M55-59	–0.0405	–0.0291	–0.0952	–0.0608	–0.0038	0.0396	–0.0136	–0.0414	–0.0500	**–0.0728**	0.0471	–0.0487	–0.0381	0.0219	–0.1156	–0.0661	–0.0215
M60-64	**–0.0710**	–0.0364	–0.0738	0.0234	0.0401	–0.0245	0.0037	–0.0549	0.0017	–0.0586	–0.0103	–0.0145	–0.0575	–0.0467	–0.0122	0.0552	–0.0262
M65-69	–0.0089	–0.0782	**–0.1213**	0.0295	–0.0498	0.0465	0.0287	–0.0146	–0.0369	–0.0655	0.0671	0.0061	–0.0636	–0.0052	–0.0874	–0.0175	0.0077
M70-74	**–0.0899**	–0.0185	–0.0730	0.0468	–0.0438	0.0398	0.0132	**–0.0840**	–0.0029	–0.0567	0.0444	**–0.0874**	–0.0320	–0.0271	–0.0531	–0.0134	–0.0586
M75-79	–0.0469	–0.0809	–0.0901	–0.0130	0.1140	0.0205	–0.0330	**–0.0877**	0.0193	**–0.1456**	0.0096	–0.0724	–0.0574	–0.0031	–0.0406	0.0266	–0.0160
M80	–0.0355	**–0.1356**	–0.0416	0.0481	**–0.1388**	–0.0190	0.0400	**–0.1328**	–0.0377	**–0.0932**	–0.1050	**–0.0875**	–0.0959	–0.1345	–0.0892	0.0202	**–0.1590**
Illiterate	–0.0347	**–0.2304**	0.0761	–0.0502	**–0.1053**	**–0.2411**	–0.0004	–0.0764	**–0.1277**	**–0.0621**	**–0.1452**	–0.0322	**–0.0803**	**–0.1149**	0.0058	–0.0009	–0.1442
Reads and writes	–0.0057	–0.0407	–0.0032	0.0230	**–0.0759**	0.0531	–0.0258	–0.0352	**–0.0492**	**–0.0498**	–0.0134	**–0.0537**	0.0099	–0.0441	–0.0856	0.0431	**–0.0447**
Primary School	0.0212	–0.0181	0.0037	0.0217	–0.0315	–0.0107	0.0149	–0.0163	–0.0147	0.0126	0.0043	–0.0100	0.0181	0.0152	–0.0012	0.0129	–0.0196
Secondary school	**0.0294**	–0.0026	0.0150	**0.0459**	0.0023	0.0174	0.0068	–0.0178	–0.0006	0.0095	0.0160	0.0060	0.0131	0.0175	–0.0113	–0.0037	–0.0054
Married	0.0111	–0.0005	–0.0192	0.0145	0.0002	–0.0120	–0.0019	0.0064	0.0013	0.0047	–0.0023	0.0080	**0.0222**	–0.0081	0.0013	0.0104	0.0000
Divorced/ Separated	–0.0249	–0.0405	**–0.0891**	–0.0011	–0.0314	**–0.0856**	–0.0218	–0.0300	0.0076	–0.0321	**–0.0785**	–0.0015	–0.0120	–0.0533	0.0121	–0.0446	–0.0065
Widow	0.0110	0.0099	**–0.0683**	**0.0564**	0.0186	–0.0375	–0.0087	0.0167	0.0243	–0.0089	**0.0952**	0.0282	0.0076	–0.0098	–0.0036	0.0209	**0.0495**
Employed	0.0122	0.0279	0.0207	0.0296	0.0178	0.0057	0.0063	0.0121	0.0091	**0.0287**	0.0280	**0.0291**	**0.0379**	0.0129	0.0068	**0.0343**	–0.0106
Pensioner	**–0.0483**	–0.0131	–0.0011	**–0.0684**	–0.0314	**–0.0764**	**–0.0713**	**–0.0306**	**–0.0601**	0.0030	**–0.0790**	–0.0148	0.0079	**–0.0753**	–0.0153	**–0.0479**	–0.0311
Unemployed	0.0020	–0.0043	0.0196	0.0324	–0.0357	–0.0412	–0.0029	–0.0115	–0.0126	0.0241	0.0268	0.0047	0.0336	0.0190	–0.0484	0.0249	–0.0295
Student	0.0038	0.0301	–0.0051	0.0138	0.0319	–0.0044	0.0238	0.0115	0.0265	0.0420	0.0408	0.0268	**0.0599**	0.0342	0.0289	**0.0586**	0.0023

Note: values significantly different from zero (at P < 0.05) in bold typeface.

The data also shows differences in the demographic structure across regions. The age pyramid is widest at the base in Balearic Islands, Canary Islands, Andalucía, Valencia and Murcia whereas mean age is greater in Castilla León, Castilla La Mancha, La Rioja and Aragón. There are important disparities in the education levels of the population. Concerning education the data show that in Castilla-La Mancha, Canary Islands, Extremadura and Andalucía more than 13% of the population have not completed primary school. At the other extreme, Basque Country has the highest proportion of university graduates followed by Madrid, Murcia, Asturias and La Rioja. Concerning marital state, there are important differences too. In Canary Islands 32% of the population are single, but in Catalonia the proportion is 10% smaller. Another important difference is found in employment rates. In Balearic Islands, Catalonia and Madrid the proportion of population who declares to be in employment exceeds 50% whereas in Andalucía, Asturias, the two Castillas and Extremadura the proportion is below 40%. The figures for these descriptive statistics for demographics, education, marital status and activity are available from the authors.

The results for Spain from the ECPH reported in Van Doorslaer and Koolman (2004) reflect a positive and significant association between the logarithm of equivalised household income and health. However, as can be seen in table 5.1, where the interval regression results for the separate regional models are presented, in this case the estimates show a somehow heterogeneous pattern. For Navarra, Basque Country, La Rioja, Cantabria, Aragón, Extremadura and Canary Islands the partial (log) income effect is not significantly different from zero at conventional levels. The concentration of insignificant impacts along the east Cantabric coast (Basque Country, Cantabria) and neighboring regions (Navarra, Aragón and La Rioja) would suggest a sort of common geographical effect. As reported above, these are also the regions with the highest mean HUI scores so this would suggest a concave relationship between health and income, with the healthiest regions situated at points where the profile is flat. For the two Castillas, Valencia and Asturias the partial effect of income is significant at the 10% level and the point estimates are small. In contrast, for Galicia, Murcia, Catalonia, Andalucía, Madrid and Balearic Islands the income effect is greater and clearly significant. The point estimates for Madrid and Balearic Islands have the greatest absolute value. This is a striking result in the sense that Madrid and Balearic Islands are rich regions. Thus, unlike the results reported in Van Doorslaer and Koolman (2004), the data do not generally support a negative relationship between the strength of the (log) income effect and the level of regional income per capita.

The patterns of health variations by demographics are similar to the evidence found by Van Doorslaer and Koolman (2004) for the 13 European countries. In general women report less health than men all else held equal and for both genders the level of health decreases with age. However, in Aragón, Asturias, Canary Islands, Valencia and Basque Country there is not a clear association between gender and health reported. Similarly, individuals within the two lowest educational categories (illiteracy and no formal qualifications) report a significantly lower level of health than those with secondary or university education. Also, divorcees tend to report a lower level of health than the rest of individuals. A surprisingly common feature for most of the regions, is the fact that, else equal, widows report a greater level of health than other individuals. Concerning activity status, there are two salient features. On one hand, those in employment tend to report better health than the rest of individuals, although this effect is not significant at conventional levels for quite a few regions, it is particularly strong in Basque Country and Madrid. On the other hand, pensioners tend to report a significantly lower level of health in Basque Country, Murcia, Andalucía, Extremadura, Catalonia, Castilla-La Mancha, Cantabria and Balearic Islands.

In table 5.2 we report the concentration indices of predicted HUI and the explanatory variables. A salient feature is that there is pro-rich health inequality in all regions, with the bootstrapped standard errors showing that the concentration indices are all statistically significant. However, the most prominent feature concerns the striking differences in the level of income related health inequalities across regions. The regions with the highest health levels, i.e Navarra, Basque Country and La Rioja turn out to enjoy the lowest levels of income related health inequalities. At the other extreme Murcia has the highest concentration index, and it is closely followed by Madrid, Balearic Islands and Catalonia. Note that there are also differences in the degree of equivalised household income inequality. The highest level of income inequality is found in Canary Islands, followed by Andalucía. At the other extreme Asturias, Navarra and Basque Country enjoy the lowest levels of income inequality. The concentration indices for the age-sex controls reveal that older people are concentrated in low income groups with and important difference across genders because, for women, the concentration into low income groups starts operates at earlier ages, i.e. while for males the age at which concentration into low incomes takes place is 60+, for women it is 45+. As one might expect, individuals with the lowest educational attainments (illiteracy, basic literacy and primary schooling) are concentrated into low incomes and those with secondary schooling or university degrees are concentrated in high incomes. In all regions there is pro-poor

TABLE 5.2: Concentration indices of dependent and independent variables per region

	Andalucía	Aragón	Asturias	Balearic Islands	Canary Islands	Cantabria	Castilla La Mancha	Castilla León	Catalonia	Valencia	Extremadura	Galicia	Madrid	Murcia	Navarra	Basque Country	La Rioja
HUI predicted	0.0192	0.0181	0.0142	0.0235	0.0210	0.0144	0.0171	0.0158	0.0229	0.0141	0.0169	0.0195	0.0240	0.0265	0.0089	0.0055	0.0094
Log Income	0.0221	0.0214	0.0154	0.0207	0.0246	0.0209	0.0220	0.0198	0.0206	0.0204	0.0206	0.0209	0.0215	0.0204	0.0185	0.0190	0.0207
F20-24	0.0345	0.0206	0.2271	0.0721	0.0672	0.2351	–0.2074	–0.0163	0.1535	0.1389	0.0292	–0.0062	0.1448	0.2358	0.1512	–0.0141	0.0993
F25-29	0.0330	0.3779	0.1314	0.3521	0.0557	0.0628	0.3388	0.0632	0.1805	0.2001	0.1780	0.1308	0.1527	0.0720	0.4246	0.3843	0.1843
F30-34	0.0662	0.1999	0.0548	0.1646	0.0744	0.0689	0.0612	0.1219	0.1922	0.0460	0.1315	0.1982	0.1959	0.0699	0.1631	0.1183	0.1387
F35-39	0.0625	0.1308	0.0259	–0.0756	0.1094	–0.1247	0.0689	0.0323	0.1169	0.0738	–0.0667	–0.0694	–0.1304	0.0928	0.2670	0.2109	0.1750
F40-44	0.1136	0.1567	–0.1439	0.1186	–0.1831	0.0448	–0.0604	0.0644	0.0149	–0.0453	–0.0071	0.0961	0.0271	0.1536	0.1343	0.1009	0.0004
F45-49	–0.1119	0.0156	–0.0903	0.1256	–0.0009	–0.0351	–0.1030	–0.0195	–0.0461	0.0471	0.1429	0.0357	0.0033	–0.2123	0.0793	–0.0587	0.2404
F50-54	0.0298	0.0070	0.1588	–0.1117	–0.0493	0.0943	–0.0101	–0.0492	0.0199	–0.1124	0.1235	–0.1090	–0.0810	0.1077	–0.1052	–0.1280	0.0227
F55-59	–0.1398	–0.1231	0.0294	–0.0268	0.0524	–0.1412	–0.0592	–0.0667	–0.2045	–0.0880	0.0575	–0.0506	–0.1451	–0.0796	–0.0526	0.0034	–0.0909
F60-64	–0.3327	–0.3877	0.0296	–0.2158	–0.3927	–0.3813	–0.0476	–0.1557	–0.1300	–0.3110	–0.2414	–0.1546	–0.1029	0.0219	–0.4274	–0.4987	–0.1887
F65-69	–0.1038	–0.2648	–0.1794	–0.3060	–0.4182	–0.1665	–0.4324	–0.3410	–0.3132	–0.2610	–0.1304	–0.0982	–0.3731	–0.2601	–0.2733	–0.2559	–0.4938
F70-74	–0.0853	–0.3605	–0.2006	–0.3591	–0.1627	–0.1614	–0.3276	–0.2500	–0.3855	–0.4201	–0.1435	–0.2235	–0.4124	–0.3192	–0.4442	–0.4738	–0.3163
F75-79	–0.2143	–0.4778	–0.5556	–0.3502	–0.1137	–0.2346	–0.3571	–0.3997	–0.4573	–0.2189	–0.0933	–0.1809	–0.4030	–0.2137	–0.4094	–0.1479	–0.1794
F80	0.0716	–0.4088	–0.6415	–0.5102	–0.0463	–0.3455	–0.2856	–0.2467	–0.3446	–0.2143	–0.1394	–0.2591	–0.3399	–0.2613	–0.3428	–0.2906	–0.4586
M16-19	0.0114	0.1356	–0.1255	0.0529	0.0960	0.0350	0.0188	–0.0031	0.2436	0.0814	0.0043	–0.1071	–0.1168	0.0855	0.2202	–0.1647	–0.0035
M20-24	0.1647	0.1470	0.1258	0.2195	0.1562	0.2216	0.2017	0.2443	0.1598	0.2979	0.1953	0.2322	0.2119	0.1047	0.2486	0.0449	0.2140
M25-29	0.1712	0.3172	0.2932	0.0875	0.1778	0.2963	0.2483	0.3521	0.2417	0.2329	0.3553	0.2616	0.1805	0.1042	0.3608	0.2439	0.2524
M30-34	0.1510	0.1499	0.2000	0.2373	0.1855	0.3478	0.4368	0.3462	0.4064	0.2400	0.1798	0.1262	0.2282	0.2826	0.3536	0.2268	0.2637
M35-39	0.1143	0.2096	0.1410	0.2121	0.1053	0.1520	0.2404	0.1707	0.0693	0.0746	0.1858	0.0892	0.0869	–0.0382	–0.0063	0.3330	0.2167
M40-44	0.1029	0.2918	–0.0044	–0.0382	–0.0052	0.0289	0.2783	0.0922	0.1779	0.0029	0.1944	0.0827	0.0664	0.3414	0.3277	0.0389	0.1361
M45-49	–0.0306	0.1946	–0.0260	0.0458	0.0161	0.1089	0.3237	0.1535	0.2294	0.0369	–0.1039	0.0617	0.1378	–0.0338	0.2496	0.0430	0.1590
M50-54	0.0797	0.1806	0.0990	0.2186	–0.0163	–0.0938	–0.0706	0.2599	–0.0615	–0.0455	0.0008	0.2131	0.0091	–0.0666	–0.1879	–0.0073	0.1892
M55-59	–0.0465	0.1018	0.2679	0.1546	–0.0289	0.2344	0.0207	0.2414	–0.1715	0.1389	0.0811	–0.0422	0.1514	–0.2178	–0.3036	0.2017	–0.1162
M60-64	–0.0658	–0.1490	0.0224	–0.1784	0.0480	–0.0846	0.0088	–0.0487	0.0771	0.0427	–0.1892	–0.1629	–0.0361	–0.1007	0.0323	–0.1161	–0.0265

TABLE 5.2 (continuation): **Concentration indices of dependent and independent variables per region**

	Andalucía	Aragón	Asturias	Balearic Islands	Canary Islands	Cantabria	Castilla La Mancha	Castilla León	Catalonia	Valencia	Extremadura	Galicia	Madrid	Murcia	Navarra	Basque Country	La Rioja
M65-69	−0.2158	−0.2339	−0.0289	−0.4126	−0.1985	−0.3639	−0.2693	−0.1717	−0.1941	−0.1471	−0.3566	−0.3075	−0.0705	−0.4091	−0.1619	−0.2608	−0.1829
M70-74	−0.2456	−0.4289	−0.2280	−0.4077	−0.3691	−0.2988	−0.3407	−0.2035	−0.1910	−0.2507	−0.3484	−0.2165	−0.3347	−0.2884	−0.3245	−0.0933	−0.4337
M75-79	−0.2326	−0.3879	−0.2723	−0.3689	−0.2368	−0.1569	−0.2895	−0.1267	−0.3711	−0.0969	−0.2860	−0.2411	−0.0389	−0.3670	−0.3926	−0.1965	−0.3414
M80	−0.0339	−0.4291	0.0305	−0.4558	−0.1455	−0.0624	−0.2416	−0.4205	−0.6055	−0.0164	−0.4035	−0.2212	−0.0157	−0.2667	−0.5007	−0.6008	−0.1782
Illiterate	−0.4572	−0.0883	−0.5410	−0.4751	−0.4298	−0.8123	−0.4627	−0.8377	−0.5089	−0.3794	−0.4088	−0.8233	−0.6401	−0.4256	−0.0827	−0.5104	−0.1397
Reads and writes	−0.2568	−0.5575	−0.3924	−0.3998	−0.2813	−0.3089	−0.3124	−0.1765	−0.4956	−0.4545	−0.3670	−0.3275	−0.4877	−0.5076	−0.7031	−0.4344	−0.1954
Primary School	−0.1588	−0.2630	−0.1673	−0.2555	−0.2481	−0.2144	−0.1858	−0.1710	−0.2647	−0.1813	−0.0633	−0.1883	−0.2839	−0.1967	−0.2765	−0.2291	−0.2363
Secondary School	0.0722	0.1703	0.0697	0.0539	0.0523	0.0762	0.1422	0.1089	0.1035	0.1180	0.0984	0.0807	0.0250	0.1196	0.1488	0.0803	0.1032
Married	−0.0241	−0.0447	0.0125	−0.0654	−0.0184	−0.0411	−0.0442	−0.0388	−0.0074	−0.0131	−0.0698	−0.0298	−0.0517	−0.0439	−0.0760	−0.0237	−0.0400
Divorced/ Separated	−0.0430	0.0978	−0.2552	0.2235	−0.0186	−0.1347	0.2161	0.1497	0.0316	−0.1470	0.2265	0.0360	−0.0023	0.0254	−0.1294	0.0729	0.0644
Widow	−0.0575	−0.3130	−0.4002	−0.3507	−0.2007	−0.2449	−0.1423	−0.2289	−0.3658	−0.2280	−0.0586	−0.2119	−0.2548	−0.1942	−0.2769	−0.2579	−0.2020
Employed	0.2430	0.2627	0.1551	0.1998	0.1931	0.2046	0.3017	0.2535	0.1939	0.2196	0.2125	0.1963	0.1898	0.1575	0.2609	0.2261	0.2332
Pensioner	−0.1993	−0.3035	−0.1666	−0.3329	−0.1973	−0.2477	−0.2469	−0.1887	−0.2706	−0.1803	−0.2144	−0.2470	−0.1992	−0.2775	−0.3067	−0.2189	−0.2832
Unemployed	−0.2247	−0.2619	−0.1817	−0.0762	−0.3063	−0.3758	−0.2091	−0.0459	−0.0745	−0.2578	−0.0994	−0.1475	−0.1831	−0.2972	−0.1631	−0.2383	−0.0755
Student	0.0804	0.2528	0.1122	0.1319	0.0725	0.1452	0.0066	0.0534	0.1691	0.1163	0.0939	0.1297	0.0449	0.2731	0.2073	−0.0955	−0.0708

inequality in the distribution of widowhood, as it might be expected from the fact that many individuals in this collective have a non-contributory pension as their main source of income. Finally note that pensioners and the unemployed are concentrated within low incomes, whereas, as expected, employment is concentrated among high incomes.

Next we analyse the contributions of the explanatory variables to the degree of income related health inequalities. These contributions are contained in table 5.3, where results are aggregated by groups of variables (results for the full set of variables are available upon request). Part of the inter regional differences in the degree of income related health inequality are due to differences in the age-gender structure of the population and the fact that there is heterogeneity across regions in both the joint distributions of age and gender with equivalised household income and the partial effects of age and gender on health. We can standardize the concentration index by age and gender by substracting the contributions of age and gender from the raw concentration index. The resulting figures are presented in the second row of table 5.3. In general the standardized indices reveal the same pattern as the raw counterparts, with Balearic Islands, Catalonia, Madrid and Murcia among the greatest levels of standardised inequality and Navarra, Basque Country and La Rioja at the opposite extreme. In the case of Balearic Islands, the standardized index is greater than the raw one. As we mentioned before, the population in this region is younger than on average, so this result suggests that the degree of income related health inequality would be greater if Balearic Islands had a population with the average Spanish age-gender distribution. On the contrary, the standardized indices for Madrid, Castilla-León, Castilla-La Mancha, Navarra, La Rioja and Aragón are notably smaller than their raw counterparts. There are striking variations in the contributions of the age-gender structure to the overall level of income related health inequality. For instance, it accounts for more than 64% of the raw index in La Rioja and more than 50% in Castilla-León and Aragón. On the other hand, it barely accounts for about 15% of the raw index in Murcia, Extremadura, Catalonia and Cantabria. The distribution of educational attainments accounts for a substantial part of income related health inequalities in some regions. In Canary Islands, Murcia, Extremadura and La Rioja they contribute to roughly 20% of the raw concentration index. Note that these are regions where the distribution of education is more unequal: Canary Islands and Extremadura have a high proportion of individuals with less than primary schooling and Murcia and La Rioja have a high proportion of university graduates. At the other extreme, in Andalucía, Asturias, Balearic Islands, the two Castillas, Madrid and Navarra, education

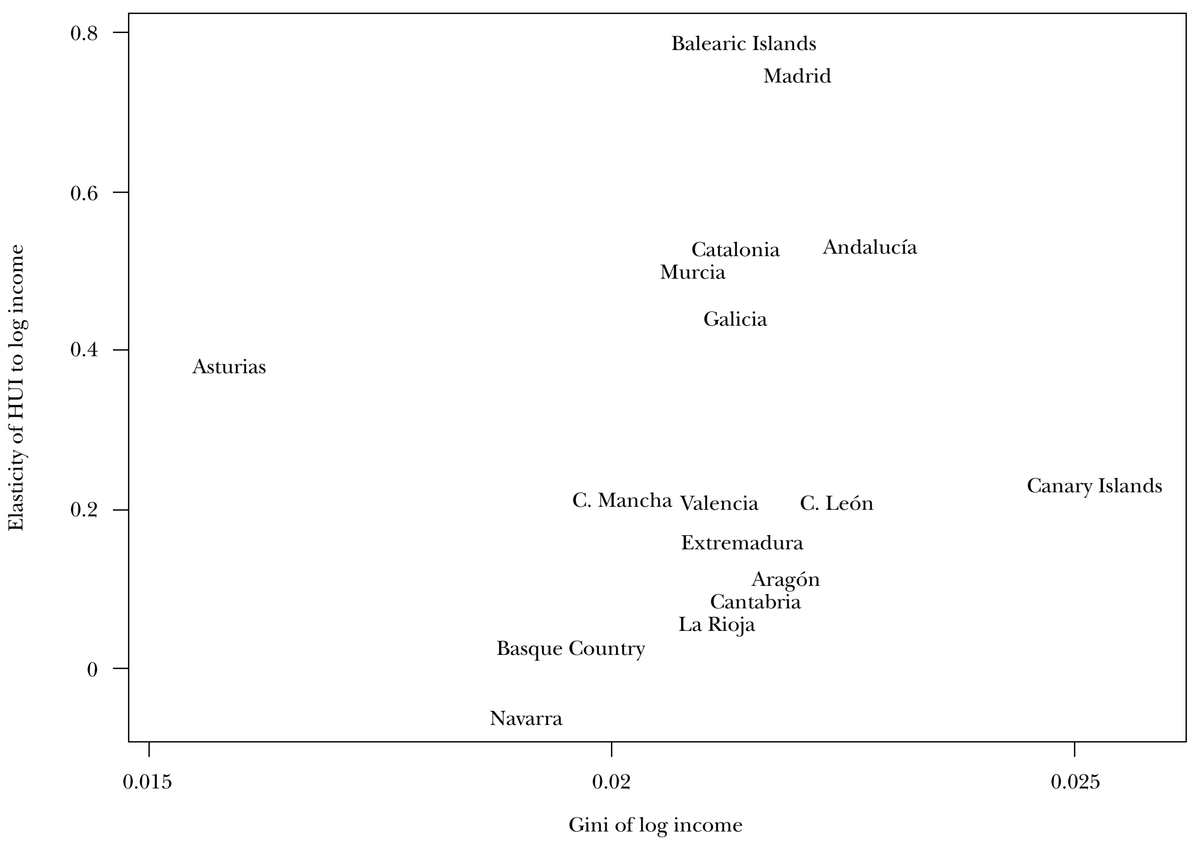
TABLE 5.3: Health inequality contributions of groups of explanatory variables per region

	Andalucía	Aragón	Asturias	Balearic Islands	Canary Islands	Cantabria	Castilla La Mancha	Castilla León	Catalonia	Valencia	Extremadura	Galicia	Madrid	Murcia	Navarra	Basque Country	La Rioja
C HUI predicted	0.01924	0.01812	0.01423	0.02355	0.02095	0.01435	0.01710	0.01582	0.02294	0.01414	0.01689	0.01947	0.02402	0.02651	0.00888	0.00546	0.00944
I* = C-C*	0.01600	0.00971	0.01026	0.02408	0.01691	0.01230	0.01079	0.00716	0.01951	0.00945	0.01447	0.01538	0.01822	0.02326	0.00142	0.00416	0.00333
Log Income	0.01157	0.00238	0.00583	0.01626	0.00571	0.00163	0.00465	0.00411	0.01066	0.00426	0.00331	0.00916	0.01603	0.01036	–0.00128	0.00040	0.00132
As %	60.12	13.16	40.93	69.05	27.25	11.37	27.21	25.98	46.46	30.15	19.57	47.05	66.75	39.08	–14.39	7.27	13.99
Demographics	0.00324	0.00841	0.00398	–0.00053	0.00404	0.00205	0.00630	0.00866	0.00343	0.00469	0.00243	0.00409	0.00579	0.00325	0.00746	0.00130	0.00611
As %	16.85	46.43	27.96	–2.24	19.28	14.30	36.87	54.73	14.95	33.16	14.36	20.99	24.12	12.26	83.98	23.81	64.70
Education	0.00111	0.00257	0.00034	0.00039	0.00646	0.00204	0.00061	0.00072	0.00355	0.00206	0.00450	0.00276	–0.00062	0.00492	–0.00015	–0.00148	0.00198
As %	5.78	14.16	2.37	1.68	30.86	14.23	3.54	4.54	15.48	14.55	26.67	14.20	–2.59	18.57	–1.70	–27.14	20.97
Marital Status	–0.00021	–0.00053	0.00285	–0.00262	–0.00028	0.00163	0.00008	–0.00074	–0.00094	0.00034	–0.00087	–0.00082	–0.00092	0.00038	0.00000	–0.00088	–0.00107
As %	–1.08	–2.94	20.05	–11.11	–1.34	11.34	0.48	–4.66	–4.10	2.42	–5.18	–4.23	–3.85	1.45	–0.01	–16.04	–11.39
Job Status	0.00353	0.00529	0.00124	0.01004	0.00502	0.00700	0.00545	0.00307	0.00624	0.00279	0.00753	0.00428	0.00374	0.00759	0.00285	0.00612	0.00111
As %	18.34	29.20	8.70	42.63	23.95	48.76	31.90	19.42	27.20	19.73	44.58	21.99	15.57	28.65	32.11	112.10	11.72

accounts for a small share of the concentration index. Moreover, in the case of Basque Country, education contributes negatively to income-related health inequality. Although the contribution of marital status is small in general, it is relatively high in some regions such as Asturias—20% of the CI—and Balearic Islands or Basque Country and Navarra , among others, where inequality in marital status actually reduce the CI.

By far the most important contributors to income related health inequality are equivalised household income itself and activity status. In Andalucía, Balearic Islands and Madrid the contribution of income exceeds 60%. For Catalonia, Galicia, Asturias and Murcia the contribution is in line with the Spanish average. For some the regions where we cannot reject that the partial effect of income is zero such as Aragón, Cantabria, Navarra, La Rioja and Basque Country the point estimate of the contribution is small (graph 5.1 plots the elasticity of HUI with respect to log income against the Gini index of log income in order to gauge the strength of the two components for the contribution of income). Concerning the contribution of employment

GRAPH 5.1: Elasticity of HUI to log income and income inequality



status, income related inequalities in the distribution of employment and pensioner status are the main drivers. In Basque Country these two factors together account for more than income-related health inequality itself. That is, if the rest of covariates had their effect neutralized, the CI for Basque Country would be a greater. In Balearic Islands, Castilla La Mancha, Extremadura, Catalonia, Murcia, Basque Country, La Rioja and Cantabria, the unequal distribution of pensioner status accounts for a large fraction of income related inequality on predicted HUI.

5.2. Decomposing excess inequality

Which are the factors that generate more income related health inequality in some regions? Table 5.4 provides the answer by showing the contribution of group of explanatory variables to the excess inequality of each region with respect to the region with the lowest CI, Basque Country (results for the full set of variables are available upon request). We note that an overwhelming fraction of excess inequality, is attributable to income in Andalucía, Asturias, Balearic Islands, Catalonia, Galicia, Madrid and Murcia. Note that among the latter there are the top four regions in terms of CI. For the rest of regions the contribution of income to excess inequality ranges between 37% for Castilla-La Mancha and 14% for Cantabria. The contribution of population structure is relatively unimportant in the regions with most inequality. In Murcia it accounts for 9%, in Catalonia 12% and in Balearic Islands the population structure actually reduces excess inequality with respect to Basque Country. In contrast, the contribution of population structure is important in regions whose degree of inequality is close to Basque Country. In Navarra it accounts for 180% of the difference, and in Aragón it accounts for 56%. The contribution of education attainments exceeds 50% in Canary Islands, and Extremadura and is above 25% for other regions with a high CI such as Murcia, Catalonia and Galicia. Note that in another region with a high CI, Madrid, the contribution of education to excess inequality is less than 5%. When assessing the contribution of employment status to excess inequality, note that income related health inequality in Basque Country is attributable to nearly exclusively (income related inequality in) employment status. Therefore, it is not surprising to find that the contribution to excess inequality is negative for some regions such as Asturias, the two Castillas and Valencia, Galicia and Madrid. In contrast, the unequal distribution of employment stata exacerbates inequality with respect to Basque Country in Balearic Islands, Extremadura and Cantabria.

TABLE 5.4: Contributions of groups of explanatory variables to excess health inequalities per region versus Basque Country (in % of excess concentration index of HUI in first row)

(percentajes)

	Andalucía	Aragón	Asturias	Balearic Islands	Canary Islands	Cantabria	Castilla La Mancha	Castilla León	Catalonia	Valencia	Extremadura	Galicia	Madrid	Murcia	Navarra	La Rioja
Excess inequality $CI\text{-}CI_{PV}$	252.4	231.9	160.7	331.3	283.7	162.8	213.1	189.7	320.1	159.0	209.4	256.6	339.8	385.5	62.6	72.8
Log Income	81.0	15.7	61.9	87.7	34.3	13.9	36.6	35.8	58.7	44.5	25.4	62.6	84.2	47.3	–49.0	23.2
Demographics	14.1	56.2	30.5	–10.1	17.7	8.5	43.0	71.0	12.2	39.0	9.8	19.9	24.2	9.3	180.1	120.9
Education	18.8	32.0	20.7	10.4	51.3	39.6	17.9	21.2	28.8	40.8	52.4	30.3	4.6	30.4	38.9	87.0
Marital Status	4.8	2.7	42.5	–9.6	3.8	28.2	8.2	1.3	–0.4	14.0	0.0	0.4	–0.3	6.0	25.6	–5.0
Job Status	–18.8	–6.5	–55.6	21.7	–7.1	9.9	–5.7	–29.5	0.7	–38.4	12.3	–13.1	–12.8	7.0	–95.6	–126.1

6. Discussion

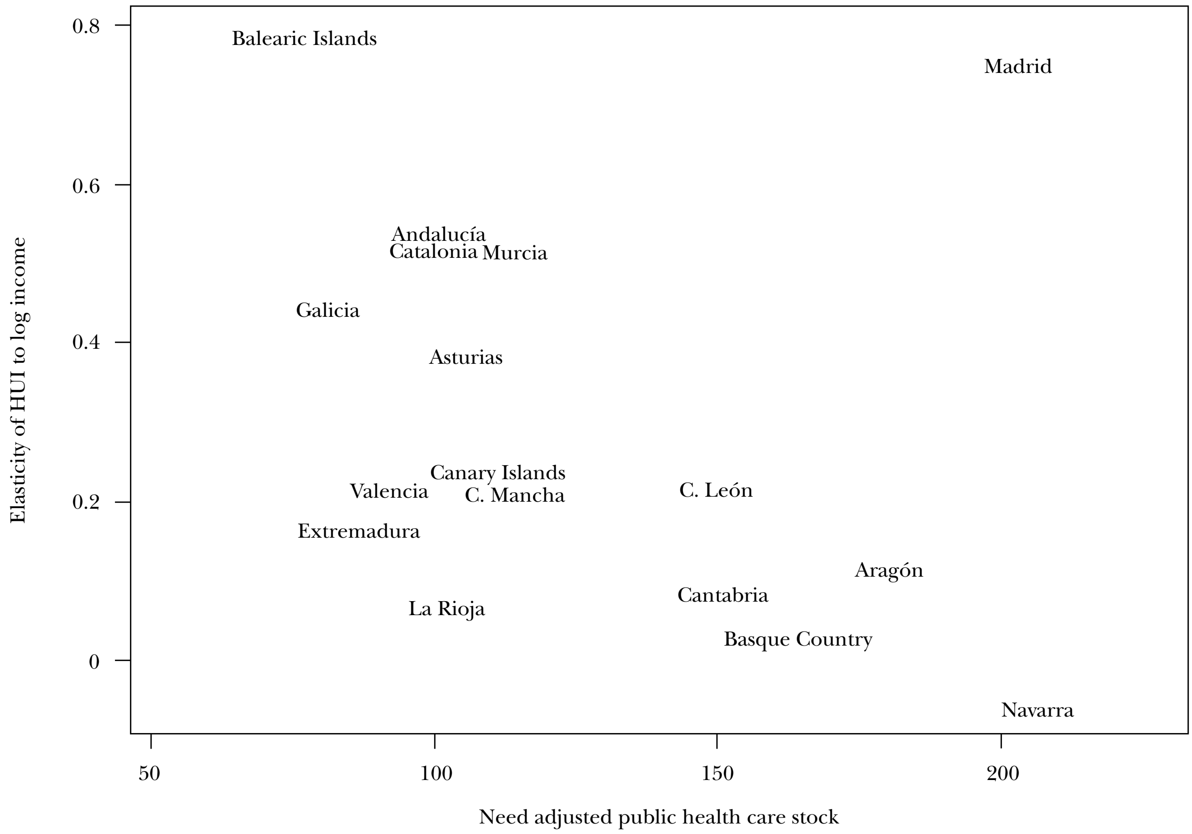
LET us now turn to the implications for policy prescriptions that one might draw from these empirical results. The evidence suggests that, in order of importance, income, employment status and education are the most important drivers of differences in income related health inequality across regions. For the contribution of each of these factors there are two components: its effect on health as measured by the elasticity and its degree of income related inequality. Thus policies aimed at reducing income related health inequality could be directed to either reducing the impact on health of these factors or to altering the distribution of these factors (or both). In the particular case of income, policies could be directed towards eliminating the positive gradient between health and income (as it occurs in Basque Country and other regions, where the gradient is null) or to make income more equally distributed. In order to gauge which of the two courses of action would potentially lead to a greater reduction in inequality it is useful to present the relative differences (with respect to Basque Country) of the elasticity of health with respect to income and the degree of inequality in the distribution of income (as measured by the concentration index). The figures in table 6.1 reveal that, for most regions, the difference in elasticities is much greater than the difference in the degree of income inequality. This suggests that, if differences in socioeconomic inequalities are to be reduced towards the Basque Country benchmark, investigating why the health-income gradient is steeper in the rest of regions and correcting the causes can be more effective than making income more equally distributed. Furthermore, for the other drivers of inequality we have also found that the differences in elasticities are more important than the differences in how unequally distributed are these factors (results for the full set of variables are available upon request). While the scope of this paper consists primarily in providing an empirical account of income related inequalities in SAH, it is interesting to suggest ways in which the causes for the differences in the gradient between health and income might be ascertained. In order to do so, we present a simple plot of the elasticity of HUI to income against the regional indices of public health care infrastructure adjusted by need derived by Puig-

Junoy and López Nicolás (1995). Graph 6.1 shows a clear inverse relationship among these two magnitudes, suggesting that differences in health care infrastructure might play an important role in understanding differences in income related health inequality.

TABLE 6.1: Relative excess elasticity and inequality (vs Basque Country) of log income per region
(percentage)

	Relative excess inequality	Relative excess elasticity
Andalucía	16.0	2.413.1
Aragón	12.6	433.7
Asturias	–18.9	1.711.4
Balearic Islands	8.9	3.663.8
Canary Islands	29.5	1.011.4
Cantabria	9.7	275.1
Castilla La Mancha	15.4	915.5
Castilla León	4.3	892.9
Catalonia	8.5	2.376.3
Valencia	7.1	903.8
Extremadura	8.0	671.4
Galicia	9.6	2.006.1
Madrid	13.0	3.474.5
Murcia	6.9	2.340.9
Navarra	–2.8	–431.5
La Rioja	9.0	205.4

GRAPH 6.1: Relationship between the elasticity of HUI to equivalised log household income and an index of public health care infrastructure adjusted by need



7. Summary and Conclusion

In this paper we have applied recently developed methodologies (Van Doorslaer and Koolman, 2004) to measure and explain the differences in the degree of income related health inequality across Spanish regions. The results reveal important geographical differences. Basque Country, Navarra and La Rioja are the regions with the highest levels of mean health and simultaneously enjoy the lowest degree of income related health inequality. By contrast, Murcia is the least favoured region in that its population report one of the lowest levels of mean health and suffers the greatest degree of income related health inequality. Other territories where income related health inequality is high relative to Basque Country include rich regions such as Madrid, Balearic Islands and Catalonia.

The main feature characterizing regions where income related health inequality is low is the absence of a positive gradient between income and health. Nevertheless, even in these regions there is income related health inequality operating through inequality of employment status (Basque Country, Cantabria and Extremadura) or age-gender structure (La Rioja, Navarra, Aragón) over the distribution of income. In turn, the regions where income related health inequality is greater are characterized by a strong and significant positive gradient between health and income. In some cases this is reinforced by the effects of education (Catalonia, Galicia and Murcia).

In similarity to the results for 13 European countries reported in Van Doorslaer and Koolman (2004), we do not find substantial differences in the degree of income inequality across regions, so the differential contributions of income to socio-economic health inequalities are ascribed to heterogeneity in the elasticities of health with respect to income across regions. This can be generalized to the other drivers of income related health inequalities. In this sense the policy implications of these results are similar in nature to Van Doorslaer and Koolman [17]: policies aimed at eliminating the gradient between health and income can potentially lead to greater reductions in socio-economic health inequalities than policies aimed at redistributing income. Although we find a clear pattern of association between the size of the elasticity of health with respect to income and an indicator for need adjusted health care infrastructure, it is necessary to obtain evidence on the causal pathways between health and income before being able to propose specific policies.

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