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"REGIONAL DIFFERENCES IN HEALTH IN SPAIN: AN EMPIRICAL ANALYSIS"

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Abstract

In this paper we report an analysis of income related health inequalities in Spain and at regional level. We use among others the self assessed health measure and explain the observed differences across Spanish regions due to the effect of socioeconomic characteristics. New data from the Spanish National Health Survey and the European Community Household Panel have been used. The results have important implications for health policies and provide empirical evidence about the relationship between health and socioeconomic factors in Spain which should affect the decisions about health care financing system.

Key words: Socio-economic inequalities, Self Assessed Health, ECHP, Spanish National Health Survey.

JEL Classification: I12, C23.

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1. INTRODUCTION

The study of population health is an important goal in modern societies and demands careful attention for economic analysis. However, health is conceptually a complex matter and therefore difficult to measure. Also, there have not existed until recent years reliable data which measure individuals´ health status. By this way, individuals' health has being specified as an individual characteristic function based on different inputs (Grossman, 1972; Bound, 1990; Smith, 1999; Fuchs, 2004). In this sense, one of the most commonly used indicators of individuals' health status is Self-Assessed Health (SAH) which is based on a very simple question: "how is your health in general?", with response categories ranging from "very good" or "excellent" to "bad" or "very bad".

Although this SAH variable is usually supplemented by a host of other measurement instruments, its use remains very popular in general socioeconomic surveys. By this way, SAH has been used in previous studies about the relationship between health and socioeconomic status (Benzeval *et al.*, 2000; Salas, 2002; Adams *et al.*, 2003; Fritjers *et al.*, 2003) and between health and lifestyles (Contoyannis and Jones, 2004). Also, it has been demonstrated that SAH can be a good predictor of use of medical care (Van Doorslaer *et al*., 2002) and mortality inequalities (Van Doorslaer and Gerdtham, 2003).

The validity of this subjective measure of health (SAH) has being discussed widely in health economics literature. Thus, SAH might be prone to measurement error (Van Doorslaer and Jones, 2003; Crossley and Kennedy, 2002). Furthermore, reporting bias and heterogeneity in the measure of SAH can be detected (Hernández-Quevedo *et al*., 2004). In some cases, the "true health" map into SAH categories may vary with individuals´ characteristics who respond in the survey. This type of measurement error occurs if subgroups of the population use different cut-point levels when reporting their SAH, despite having the same level of "true health" (Groot, 2000). In fact, there exists a growing literature which evaluate bias in SAH data being significant the systematic use of different thresholds for populations subgroups (Lindeboom and Van Doorslaer, 2003; Van Doorslaer and Jones, 2003). In summary, it supposes that different groups interpret the question about their SAH in their own personal framework and they use different reference points when respond to the same question.

The problem of an ordinal scale can be solved creating a dichotomy variable for healthy or not healthy status or arbitrarily by the imposition of some type of order. However,

the use of a dichotomy variable has several disadvantages since not the whole variation of health that is caught in the variable related to SAH is used and makes the comparisons of inequality over the time or among population segments not very reliable. By this way, the results would depend on the election of the threshold that consider healthy people *versus* non-healthy people (Lindeboom and Van Doorslaer, 2003). Another alternative consists on assuming that the underlying category of the empiric distribution of the answers related to the SAH is a latent variable. This last approach will be adopted in this study.

In this paper, we will focus on those factors which characterized health inequalities in Spain using the information contained in the European Community Household Panel (ECHP) and in the Spanish Health Survey (SHS). We will use order probit models and the econometric framework proposed by Solon (1992) and Zimmermam (1992) considering fathers' and sons' SAH.

The paper is organised as follows. Section two describes the data sources we have used and characteristics of the variables involved in our analysis together with the principal methodological decisions we have taken. In section three, we describe those characteristics related with health inequalities using order probit models and finally, section four gives a summary and conclusion.

2. DATA DESCRIPTION: THE EUROPEAN COMMUNITY HOUSEHOLD PANEL (ECHP) AND THE SPANISH HEALTH SURVEY (SHS)

The first source of data used in this paper is taken from the European Community Household Panel for Spain (ECHP). This survey contains data on individuals and households for the European Union countries with eight waves available (1994-2001)[1].

The ECHP is a representative database of households of different European Union countries, it was elaborated for the first time in 1994 and it was composed by 60.500 households (approximately 170.000 individuals). In the case of Spain, the first wave was

[1] See Peracchi (2002).

composed by 7.206 households (23.025 individuals). TABLE 1 includes information about households and individuals´ sample composition for Spain.

TABLE 1
Household´s sample composition in ECHP (1994-2001). Number of unweighted observations

Country		Wave 1 (1994)	Wave 2 (1995)	Wave 3 (1996)	Wave 4 (1997)	Wave 5 (1998)	Wave 6 (1999)	Wave 7 (2000)	Wave 8 (2001)
Spain	Household	7206	6522	6267	5794	5485	5418	5132	4966
	Individuals	23025	20708	19712	18167	16728	16222	15048	14320

Source: Authors´ calculation based on ECHP data.

The main advantage of this new survey is that information is homogeneous among countries since the questionnaire is similar across them. This source of data is coordinated by the *European Commission's Statistical Office* (EUROSTAT). Also, this survey includes rich new information about income, education, employment, health, etc. In this sense, it is important to highlight that it is the first fixed and harmonized panel for studying socio-economic factors of the households and individuals inside the European Union.

The variable we use as a proxy of individual's health status is the SAH that each individual reports of their own health status and the possible responses are ordered qualitatively. Thus, SAH variable is a subjective response to the question "How is your heath in general?" and it takes the values "1" (very good), "2" (good), "3" (fair), "4" (bad) and "5" (very bad). This variable is also included in other longitudinal surveys, such as the *British Household Panel Survey* (BHPS) in the case of the United Kingdom, the *Canadian National Population Health Survey* (NPHS) for Canada, the *National Health Interview Survey* (NHIS) for United States, etc., and it has facilitated recent research on individuals' health status explanation. However, there are large differences in SAH status between the European Union countries (see TABLE 2). For example, in 2001, Ireland, Greece and Denmark reported the best health status while Portugal, Germany, France, Italy and Spain reported the worst one. However, the differences between countries are not completely convincing as judged by other health measures, such as life expectancy.

TABLE 2
Average SAH by country in the ECHP (1994-2001)

		Wave 1 (1994)	**Wave 2 (1995)**	**Wave 3 (1996)**	**Wave 4 (1997)**	**Wave 5 (1998)**	**Wave 6 (1999)**	**Wave 7 (2000)**	**Wave 8 (2001)**
Germany	Average SAH	2.2453	2.2593	2.2684	-	-	-	-	-
	Number of Individuals	9484	8823	8579	-	-	-	-	-
Germany (SOEP)	Average SAH	2.5937	2.5944	2.5998	2.5887	2.5772	2.6034	2.6078	2.6236
	Number of Individuals	12208	12504	12267	12042	11535	11262	10975	10613
Denmark	Average SAH	1.7927	1.8060	1.8474	1.8169	1.8309	1.8548	1.8805	1.9009
	Number of Individuals	5902	5501	4990	4627	4187	3982	3833	3787
Netherlands	Average SAH	2.1179	2.1033	2.1161	2.1193	2.1234	2.1519	2.1544	2.1588
	Number of Individuals	9405	9150	9273	9089	8826	8916	8862	8603
Belgium	Average SAH	2.1099	2.0873	2.1041	2.0939	2.1128	2.1114	2.1063	2.0958
	Number of Individuals	6704	6403	6096	5674	5281	4960	4675	4258
Luxembourg (PSELL I)	Average SAH	2.1231	2.1512	2.1599	-	-	-	-	-
	Number of Individuals	2046	1964	1907	-	-	-	-	-
Luxembourg (PSELL II)	Average SAH	-	-	-	-	-	-	-	-
	Number of Individuals	-	-	-	-	-	-	-	-
France	Average SAH	2.2995	2.3515	2.3545	2.3744	2.4357	2.4255	2.4337	2.4363
	Number of Individuals	14242	13235	12959	12003	11101	10552	10202	10040
U. Kingdom	Average SAH	2.0273	2.0657	2.0782	-	-	-	-	-
	Number of Individuals	10443	7539	6099	-	-	-	-	-
U. Kingdom (BHPS)	Average SAH	2.1449	2.1702	2.1735	2.1678	2.1950	2.6185	2.2231	2.1845
	Number of Individuals	9022	8824	8946	8930	8861	8664	8634	8517
Ireland	Average SAH	1.7608	1.7651	1.7603	1.7418	1.7561	1.7361	1.7517	1.7391
	Number of Individuals	9893	8508	7462	6857	6311	5443	4524	4018
Italy	Average SAH	2.3654	2.3506	2.3465	2.3201	2.3522	2.3500	2.3523	2.3240
	Number of Individuals	17714	17779	17727	16592	15913	15380	14547	13385
Greece	Average SAH	1.9937	1.8989	1.8394	1.8880	1.8240	1.8365	1.8640	1.8046
	Number of Individuals	12492	12074	11321	10662	9776	9324	9195	9213
Spain	Average SAH	2.3637	2.3097	2.2655	2.2776	2.2939	2.2618	2.2555	2.2741
	Number of Individuals	17845	15827	15438	14521	13599	13045	12292	11921
Portugal	Average SAH	2.6881	2.7225	2.7701	2.7949	2.7827	2.7625	2.7674	2.7661
	Number of Individuals	11621	11766	11609	11559	11335	11183	11035	10915
Austria	Average SAH	-	2.0702	2.0610	2.0634	2.0553	2.0363	2.0388	1.9971
	Number of Individuals	-	7434	7270	6999	6557	6240	5798	5602
Finland	Average SAH	-	-	2.2278	2.2132	2.2273	2.2283	2.2168	2.2034
	Number of Individuals	-	-	7473	7192	6612	6390	5063	5072
Sweden	Average SAH	-	-	-	1.8668	1.8636	1.8892	1.9161	1.9596
	Number of Individuals	-	-	-	5887	5802	5725	5724	5679

Acronyms: *German Socioeconomic Panel* (SOEP), *Luxembourg Socio-Economic Panel* (PSELL) *and British Household Panel Survey* (BHPS).
Source: Authors' calculation based on ECHP data.

Thus, according to World Health Organization (2001), life expectancy at birth is longest in France, Italy and Spain and shortest in Ireland and Denmark. TABLE 3 shows relative frecuencies for the classifications of SAH in Spain and we can observe a clear improvement in the frequency of reporting "good" health since 1994 to 2001 and approximately half of people interviewed report that their SAH is "good".

TABLE 3
Relative Frecuencies for the classifications of SAH. Country: Spain.

SAH	Wave 1 (1994)	Wave 2 (1995)	Wave 3 (1996)	Wave 4 (1997)	Wave 5 (1998)	Wave 6 (1999)	Wave 7 (2000)	Wave 8 (2001)
Very Good (1)	18.69	18.58	18.06	15.36	14.29	13.16	13.49	12.26
Good (2)	44.78	46.23	47.43	49.42	49.53	51.52	49.96	49.15
Fair (3)	23.63	23.46	23.74	23.82	24.03	24.23	24.02	26.15
Bad (4)	10.87	10.12	9.17	10.05	10.39	9.62	10.95	10.64
Very Bad (5)	2.04	1.62	1.60	1.35	1.77	1.46	1.58	1.81

Source: Authors' calculation based on ECHP data

However, it is important to point out the different distribution of SAH by gender (TABLE 4). In this sense, men report better levels of SAH than women. This fact might reflect the different perception of health by gender (maybe because men´s life expectancy is shorter than women´s). Another possible explanation of gender differentials, especially at older ages, is the mortality selection (Ahn, 2002). In this case, as the mortality rate is higher for men than for women, those who survive in higher mortality environment are on average genetically stronger than the survivors in lower mortality environment.

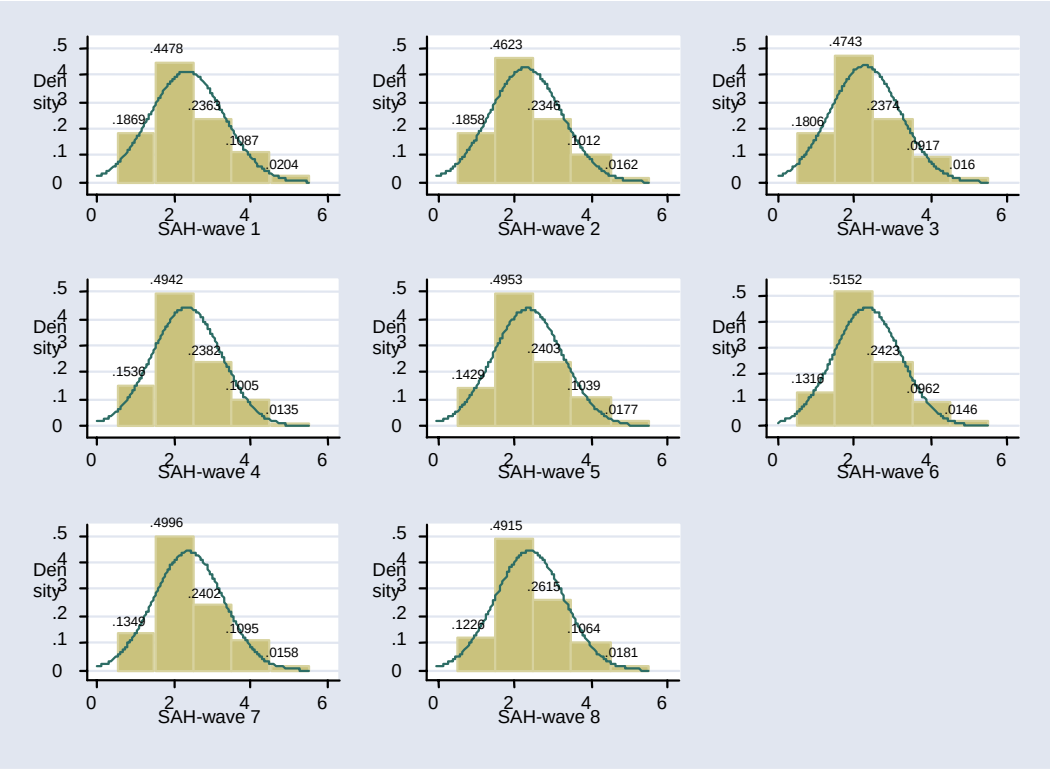
TABLE 4
Distribution of SAH by gender for each wave of ECHP. Country: Spain.

SAH-Male	Wave 1 (1994)	Wave 2 (1995)	Wave 3 (1996)	Wave 4 (1997)	Wave 5 (1998)	Wave 6 (1999)	Wave 7 (2000)	Wave 8 (2001)
Very good (1)	20.23	21.29	22.01	19.74	18.65	18.26	19.55	18.94
Good (2)	46.34	48.35	48.90	51.47	52.65	54.61	53.00	52.31
Fair (3)	21.83	20.40	19.92	19.53	19.29	19.02	18.78	20.78
Bad (4)	9.23	8.19	7.84	8.13	7.63	6.80	7.69	6.79
Very bad (5)	2.37	1.77	1.33	1.12	1.78	1.31	0.98	1.17
SAH-Female	**Wave 1 (1994)**	**Wave 2 (1995)**	**Wave 3 (1996)**	**Wave 4 (1997)**	**Wave 5 (1998)**	**Wave 6 (1999)**	**Wave 7 (2000)**	**Wave 8 (2001)**
Very good (1)	16.91	17.33	17.92	16.22	15.06	14.90	16.65	15.33
Good (2)	41.86	43.36	45.63	47.43	49.02	50.85	48.74	49.03
Fair (3)	24.19	23.50	22.80	22.83	22.19	22.03	21.48	22.71
Bad (4)	13.32	12.78	11.01	11.27	11.39	10.29	11.30	10.98
Very bad (5)	3.72	3.03	2.64	2.26	2.35	1.94	1.84	1.95

Source: Authors' calculation based on ECHP data

FIGURE 1 shows the distribution of SAH for each wave, using the Spanish balanced panel of individuals who are observed for the whole 8 waves. The different categories are shown on the horizontal axis with "1" representing the highest level of health and "5" the lowest. The histograms have a similar pattern and we can observe a skewed distribution with the majority of individuals reporting that their health is good.

FIGURE 1
Distribution of SAH for each wave.
Country: Spain. Waves 1-8. Period 1994-2001



Source: Authors' elaboration based on the ECHP data.

Similar results are obtained using the Spanish Health Survey (2003). In this survey 21.650 individuals have been interviewed. TABLE 5 includes information about individuals´ sample composition by Autonomous Communities.

Again, the variable we use as a proxy of individual's health status is the SAH that each individual reports of their own health status and the possible responses are ordered qualitatively. Thus, SAH variable is a subjective response to the question "How is your heath in general?" and it takes the values "1" (very good), "2" (good), "3" (fair), "4" (bad) and "5" (very bad). Also, there are large differences in SAH status between the Spanish regions (see TABLE 6) and by gender (see TABLE 7).

TABLE 5

Individual´s sample composition in the SNS (2003).
Number of unweighted observations

Autonomous Communities	Number of Individuals	Autonomous Communities	Number of Individuals
Andalucía	2005	C. Valenciana	1359
Aragón	1451	Extremadura	745
Asturias	758	Galicia	1138
Baleares	710	Madrid	1498
Canarias	856	Región de Murcia	780
Cantabria	674	Navarra	671
Castilla y León	4319	País Vasco	1008
Castilla- La Mancha	888	La Rioja	569
Cataluña	1811	Ceuta y Melilla	410

Source: Authors' elaboration based on the SHS data (2003).

TABLE 6

Average SAH by Autonomous Communities in the SNS (2003).

Autonomous Communities	Average SAH	Autonomous Communities	Average SAH
Andalucía	2,43	C. Valenciana	2,32
Aragón	2,33	Extremadura	2,48
Asturias	2,52	Galicia	2,59
Baleares	2,38	Madrid	2,27
Canarias	2,50	Región de Murcia	2,43
Cantabria	2,34	Navarra	2,27
Castilla y León	2,36	País Vasco	2,23
Castilla- La Mancha	2,47	La Rioja	2,28
Cataluña	2,33	Ceuta y Melilla	2,35

Source: Authors' elaboration based on the SHS data (2003).

TABLE 7

Distribution of SAH by gender. SHS (2003).

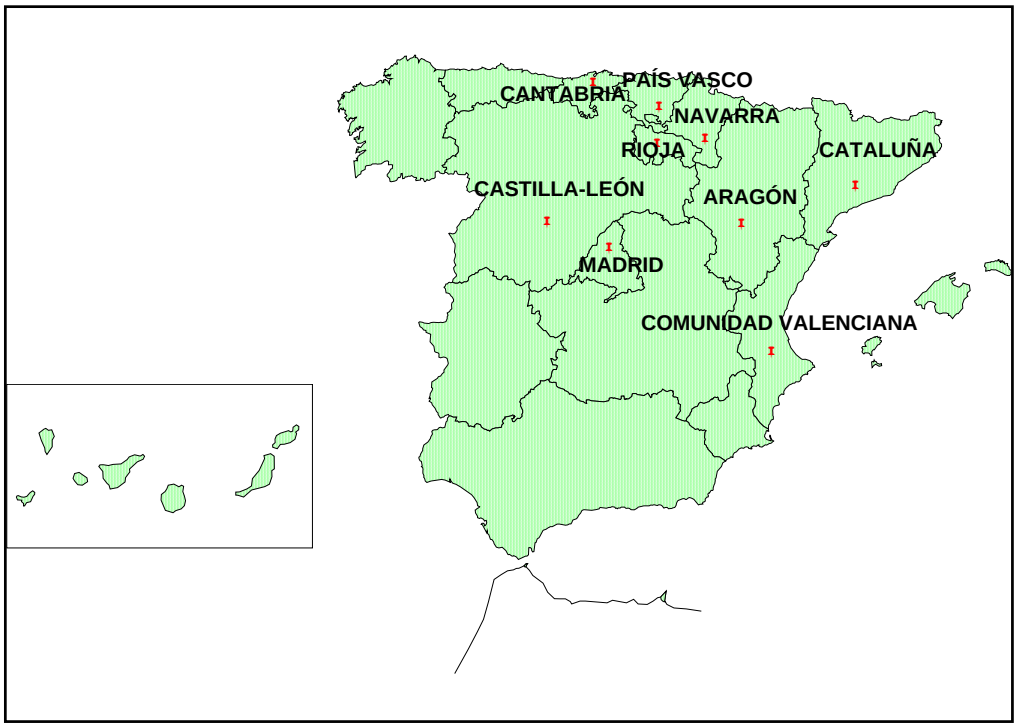
Males	**Andalucía**	**Aragón**	**Asturias**	**Baleares**	**Canarias**	**Cantabria**	**C. León**	**C.Mancha**	**Cataluña**	**C.Valen**
Average SAH	2,277	2,249	2,371	2,234	2,402	2,280	2,266	2,305	2,219	2,231
Females	**Extremad.**	**Galicia**	**Madrid**	**Murcia**	**Navarra**	**P. Vasco**	**La Rioja**	**Ceuta y Melilla**	**SPAIN**	
Average SAH	2,339	2,472	2,154	2,260	2,160	2,118	2,247	2,254	2,264	
Males	**Andalucía**	**Aragón**	**Asturias**	**Baleares**	**Canarias**	**Cantabria**	**C. León**	**C.Mancha**	**Cataluña**	**C.Valenc.**
Average SAH	2,557	2,406	2,641	2,496	2,574	2,402	2,431	2,611	2,434	2,380
Females	**Extremad.**	**Galicia**	**Madrid**	**Murcia**	**Navarra**	**P. Vasco**	**La Rioja**	**Ceuta y Melilla**	**SPAIN**	
Average SAH	2,602	2,685	2,356	2,569	2,373	2,334	2,312	2,426	2,470	

Source: Authors' elaboration based on the SHS data (2003).

Thus, there exist nine Autonomous Communities with higher SAH than the average in Spain. They are País Vasco, Navarra, Cantabria, Rioja, Castilla-León, Madrid, Aragón, Cataluña and Comunidad Valenciana (see FIGURE 2).

FIGURE 2

Autonomous Communities with higher SAH than the average in Spain. SHS (2003).



Source: Authors' elaboration based on the SHS data (2003).

3. SOCIO-ECONOMIC STATUS AND SELF-ASSESSED HEALTH INEQUALITIES IN SPAIN: AN EMPIRICAL APPROACH BASED ON ORDERED PROBIT MODELS

In the last years new techniques allow us to deepen in the study of multinomial choice variables (Greene, 2003; Jones, 2000). In particular, we will focus our analysis on individuals´ SAH. This variable takes five values that vary from "very bad" to "very good". The logit multinomial and probit multinomial model do not take into account that dependent variable reflects an order. In this way, regression analysis of SAH can be achieved through specifying an ordered probit model. Thus, our starting model is

formulated through a latent health variable *H** that it is unobserved (an individual's "true" health) and which depends on a lineal combination of explanatory variables:

$$H^* = \beta' x + \varepsilon, \tag{1}$$

where *x* is a set of explanatory variables, β a set of coefficients and ε an error term uncorrelated with the set of regressors with a normal distribution.

The dependent variable used is individual report of SAH. Thus, the higher value of our latent variable, the higher will be the probability that the individual reports a higher category in the self-assessed health scale.

However, *H** is unobserved and what we do observe is:

$$H_i = \begin{cases} 0 & if \quad \gamma_1 \geq H_1^* \\ 1 & if \quad \gamma_2 \geq H_1^* \geq \gamma_1 \\ \ldots & \ldots \quad \ldots \\ (M-1) & if \quad H_1^* \geq \gamma_{(M-1)} \end{cases} \tag{2}$$

where $\gamma_1, \gamma_2, \ldots, \gamma_{(M-1)}$ are unknown parameters to be estimated with β. The probabilities of each category are:

$$\begin{aligned} &\Pr(H_i = 0 / X_i, \beta, \gamma) = \Phi(\gamma_1 - X_i\beta) \\ &\Pr(H_i = 1 / X_i, \beta, \gamma) = \Phi(\gamma_2 - X_i\beta) - \Phi(\gamma_1 - X_i\beta) \\ &\ldots \\ &\Pr(H_i = (M-1) / X_i, \beta, \gamma) = 1 - \Phi(\gamma_{(M-1)} - X_i\beta) \end{aligned} \tag{3}$$

where function $\Phi(.)$ denotes the standard normal distribution.

The corresponding estimators are obtained maximizing the log-likelihood function:

$$\Gamma(\beta, \gamma) = \sum_{Y=0} \log\left[\Pr(H_i = 0 / X_i, \beta, \gamma)\right] + \sum_{Y=1} \log\left[\Pr(H_i = 1 / X_i, \beta, \gamma)\right] + \ldots + \sum_{Y=(M-1)} \log\left[\Pr(H_i = (M-1) / X_i, \beta, \gamma)\right]. \tag{4}$$

The sign of the coefficients shows the tendency of the variation in the probability of belonging to the highest answer due to an increment in the corresponding explanatory variable and the marginal effect of a regressor on the probability of belonging to each category is as follows:

$$\begin{aligned}
&\frac{\partial \Pr(H=0)}{\partial X_k} = -\Phi(\gamma_1 - X_i\beta)\beta_k, \\
&\frac{\partial \Pr(H=1)}{\partial X_k} = \left[-\Phi(\gamma_2 - X_i\beta) + \Phi(\gamma_1 - X_i\beta)\right]\beta_k, \\
&\ldots \\
&\frac{\partial \Pr(H=M-1)}{\partial X_k} = -\Phi(\gamma_{(M-1)} - X_i\beta)\beta_k
\end{aligned} \tag{5}$$

So, marginal effect of a regressor X_k depends on the coefficient value β_k and on the values of a normal density function $\Phi(.)$ for each person.

In order to establish the main factors which affect health levels, we have classified them into seven groups of variables: personal characteristics, education level, marital status, income, occupational status and other variables related to individuals' health, household characteristics and social relationships.

Firstly, as personal characteristics we have included two variables: individual's age and gender. To allow for a flexible relationship between the SAH and age, a quartic polynomial function of this variable is included (AGE, AGE2=Age^2/100, AGE3=Age^3/10000, AGE4=Age^4/1000000). Also, the gender of individuals has been taken into consideration and a dummy variable which takes value of 1 if individual is male has been built.

The second group of variables are refered to the maximum level of education completed. In the ECHP, education is classified into three categories based on ISCED classification: less than secondary level (ISCED 0-2), second stage of secondary level (ISCED 3) and third level (ISCED 5-7). Thus, two dummy variables have been included: third level of education (HEDUC) and another one for second stage of secondary level (SSEDUC). In this sense, many studies have shown that education is an important socioeconomic characteristic in determining health status, so the attainment of higher educational levels can be reflecting important changes in SAH.

Thirdly, representing marital status, we have considered four variables (never married, separated, divorced and widow) with married as the reference category.

On the other hand, we are concerned with the influence of income on health status. In fact, higher income should be associated with better health although this relationship is not clear and correlation can vary from highly positive to weakly negative, depending on context, covariates and level of aggregation (Fuchs, 2004). Our income variable is equivalised annual net household income (LINCOMEOCDMO) adjusted using OECD modified scale to take into account household size and composition. In this sense, we have used household information rendering the component family by using equivalence scales. The modified OECD scale gives a weight of 1 to the first adult, 0.5 to other persons aged 14 or over and 0.3 to each child aged less than 14. For each person, the “equivalised total net income” is calculated as its household total net income divided by equivalised household size. In this case, we use the logarithm of household´s income (OECD modified scale) taking into account the concavity in the health-income relationship (Gravelle, 1998; Jones and Wildman, 2004).

Other variables included in the analysis related to occupational status are status in employment and working in the public sector. We have considered a dummy variable that takes the value one if the individual is working with an employer in paid employment as a salaried and zero otherwise (SALA) and another one which takes the value one if current job is in the public sector (including non-profit private organisations) and zero otherwise (PUBLI).

Also, we have considered other variables related to health status. The variable IN-PATIENT indicates whether or not the individual has been admitted to a hospital during the past 12 months. The variable CDACTSM (cut down acts/mental condition) reflects whether or not the individual has had to cut down some activities in home, at work or in their leisure time, due to an emotional or mental health problem.

Finally, we have considered number of people in household including respondents (Household size-HHSIZE). Also, we have included variables related to social relationships, and another dummy variable has been built in order to take into account whether an individual is a member of a club or organisation (SOCIALCL) or not. TABLE 8 shows explanatory variables used in estimations and their corresponding definitions.

We have used ordered probit models, because they have advantages compared with other econometric methods in the treatment of categorical ordered variables as in our case. Results have been obtained using STATA 8.0. Estimation of the models are based on the method of maximum likelihood and results for the case of Spain in 1994-2001 are presented in TABLE 9.

Table 8
Variables Definitions

Variable Name	Variable Definition
Personal Characteristics	
Gender (MALE)	1 if male, 0 otherwise
Age (AGE)	Age in years at 31st December of current wave
Age squared (AGE2)	$Age^2/100$
Age cube (AGE3)	$Age^3/10000$
Age quartic (AGE4)	$Age^4/1000000$
Education Level	
Higher Education (HEDUC)	1 if highest academic qualification is third level (ISCED 5-7), 0 otherwise
Second Stage Education (SSEDUC)	1 if highest academic qualification is second stage of secondary level (ISCED 3), 0 otherwise
Marital status	
Never Married (NVRMAR)	1 if never married, 0 otherwise
Separated (SEPARATED)	1 if separated, 0 otherwise
Divorced (DIVORCED)	1 if divorced, 0 otherwise
Widow (WIDOW)	1 if widowed, 0 otherwise
Income	
Net Income (LINCOMEOCDMO)	Logarithm of equivalised annual household net income (OECD modified scale)
Occupational Status	
Status in employment (SALA)	1 if paid employment, 0 otherwise
Sector of current job (PUBLI)	1 if individual works in public sector, 0 otherwise
Health Status	
Hospital admission (IN-PATIENT)	1 if during previous twelve months the individual has been admitted in a hospital as an internal patient, 0 otherwise
Cut down acts/mental condition (CDACTSM)	1 if during previous fourteen days individual has had to cut down some activities in home, work or in their leisure time, due to an emotional or mental health problem, 0 otherwise
Household	
Household size (HHSIZE)	Number of people in household including respondent
Social Relationships	
Personal relationships (SOCIALCL)	1 if member of a club or organisation, 0 otherwise

Source: Authors´ elaboration from ECHP.

Table 9

Ordered probit model estimation of individuals´ SAH (1994-2001). Country: Spain.

Explanatory variables		Year 1994		Year 1995		Year 1996		Year 1997	
		Coeff.	Z	Coeff.	Z	Coeff.	Z	Coeff.	Z
Personal Characteristics	MALE	-0.1378	-5.21	-0.1797	-6.63	-0.1268	-4.70	-0.1422	-5.22
	AGE	0.1291	2.33	0.0226	0.37	0.1038	1.60	0.1495	2.15
	AGE2	-0.3397	-1.81	0.0288	0.14	-0.2768	-1.32	-0.3967	-1.80
	AGE3	0.5255	1.97	-0.0297	-0.11	0.4102	1.44	0.5552	1.90
	AGE4	-0.3020	-2.24	-0.0069	-0.05	-0.2221	-1.60	-0.2884	-2.07
Education level	HEDUC	-0.2609	-6.07	-0.2442	-5.49	-0.2275	-5.08	-0.2409	-5.37
	SSEDUC	-0.2616	-6.89	-0.2241	-5.71	-0.2396	-6.09	-0.1975	-5.01
Marital Status	NVRMAR	0.0317	0.77	-0.0418	-0.98	-0.0674	-1.59	0.0089	0.21
	SEPARATED	0.1984	1.64	0.1239	1.01	0.2488	2.10	0.1960	1.63
	DIVORCED	0.2001	1.21	0.1502	0.90	0.2322	1.40	-0.0286	-0.18
	WIDOW	0.0397	0.74	-0.0044	-0.08	0.0459	0.87	0.0547	1.05
Income	LINCOMEOCDMO	-0.0793	-4.51	-0.0705	-3.52	-0.1266	-6.13	-0.0924	-5.21
Occupational Status	SALA	-0.1406	-4.05	-0.0408	-1.16	-0.0539	-1.51	-0.0657	-1.83
	PUBLI	-0.1285	-2.38	-0.0466	-0.85	-0.0154	-0.28	-0.0271	-0.49
Health status	IN-PATIENT	0.5952	12.69	0.4056	8.49	0.4126	8.57	0.4083	8.85
	CDACTSM	1.2223	14.52	0.9385	9.70	0.9674	9.44	0.7056	6.96
Household	HHSIZE	-0.1381	-1.56	0.0030	0.33	0.0025	0.27	0.0123	1.30
Social Relationships	SOCIALCL	-0.0293	-1.04	-0.0679	-2.37	-0.0813	-2.77	-0.1219	-4.18
Cut1		0.0895		-0.7635		-0.8664		0.1916	
Cut2		1.5960		0.9287		0.8547		2.0336	
Cut3		2.6008		2.1878		2.1306		3.3079	
Cut4		3.7268		3.5349		3.4047		4.7184	
Log. Likelihood		-9050.6098		-7979.7148		-7995.4829		-7740.7355	
LR chi2 (10)		2769.26 (0.0000)		4160.73 (0.0000)		3937.99 (0.0000)		4059.67 (0.0000)	
Pseudo R^2		0.1327		0.2068		0.1976		0.2077	
Number of observations		7819		7689		7732		7708	

Source: Authors´ calculation based on ECHP.

Table 9(continued)

Ordered probit model estimation of individuals´ SAH (1994-2001). Country: Spain.

Explanatory variables		Year 1998		Year 1999		Year 2000		Year 2001	
		Coeff.	Z	Coeff.	Z	Coeff.	Z	Coeff.	Z
Personal Characteristics	MALE	-0.1189	-4.40	-0.1258	-4.61	-0.1032	-3.82	-0.1182	-4.40
	AGE	0.0936	1.28	0.0556	0.71	0.0203	0.25	0.1194	1.38
	AGE2	-0.2285	-1.01	-0.1175	-0.50	-0.0528	-0.22	-0.2626	-1.05
	AGE3	0.3349	1.13	0.1960	0.65	0.1616	0.53	0.3141	1.02
	AGE4	-0.1838	-1.33	-0.1179	-0.85	-0.1185	-0.86	-0.1411	-1.03
Education level	HEDUC	-0.2896	-6.97	-0.2327	-5.55	-0.2161	-5.29	-0.1823	-4.47
	SSEDUC	-0.2422	-5.96	-0.2067	-4.96	-0.1859	-4.39	-0.0933	-2.25
Marital Status	NVRMAR	0.0110	0.26	-0.0778	-1.84	-0.0689	-1.64	-0.0519	-1.25
	SEPARATED	0.2191	1.88	0.1991	1.74	0.0118	0.10	0.1537	1.40
	DIVORCED	-0.1827	-1.19	0.0082	0.06	0.1778	1.34	0.1851	1.45
	WIDOW	0.0194	0.38	-0.1041	-2.07	-0.0151	-0.31	0.0364	0.76
Income	LINCOMEOCDMO	-0.1149	-5.87	-0.0630	-3.17	-0.1216	-5.92	-0.0987	-4.99
Occupational Status	SALA	-0.0576	-1.64	-0.0720	-2.01	-0.1083	-3.04	-0.1071	-3.00
	PUBLI	0.1173	2.13	-0.1033	-1.86	0.0319	0.58	0.0778	1.45
Health status	IN-PATIENT	0.4458	9.60	0.5624	11.96	0.5383	11.77	0.4796	11.06
	CDACTSM	0.9370	9.82	0.8951	8.34	0.9586	10.30	0.9927	11.12
Household	HHSIZE	0.0084	0.88	-0.0196	-1.98	-0.0027	-0.28	-0.0046	-0.46
Social Relationships	SOCIALCL	-0.1542	-5.29	-0.1379	-4.58	-0.1174	-3.92	-0.1386	-4.72
Cut1		-0.8616		-0.7762		-2.0444		-0.2795	
Cut2		0.9987		1.2145		-0.0893		1.6345	
Cut3		2.2551		2.5489		1.2155		2.9678	
Cut4		3.5781		3.9284		2.7154		4.3226	
Log. Likelihood		-7863.1797		-7553.7018		-7640.0861		-7794.2049	
LR chi2 (10)		4111.72 (0.0000)		4336.38 (0.0000)		4637.22 (0.0000)		4316.37 (0.0000)	
Pseudo R^2		0.2073		0.2230		0.2328		0.2169	
Number of observations		7782		7848		7863		7848	

Source: Authors´ calculation based on ECHP.

A first point to note is that most of coefficients of the explanatory variables are very stable for the eight waves, in particular, those related to personal characteristics, education level, income, health status and social relationships. Because of SAH appears in the ECHP on a scale from “1” to “5”, where “1” corresponds to very good health and “5” to very bad, a negative sign in the coefficients implies an increase in the probability of reporting good health.

Thus, we can observe that some personal characteristics, such as being male, have a positive and significant impact on individuals’ health while individuals’ age has a negative one reflecting the on-going general deterioration of health. The education coefficients maintain statistical significance showing that more education leads to an increase in the probability of reporting good health. Marital status variables (never married, separated, divorced, widow) have no a clear positive or negative sign and it varies among the different waves although have an important impact on individual´s health. Also, we can observe that income coefficient is always significance and has a positive effect on reporting good health. With respect to occupational status variables, salaried and working in public sector have a positive effect on individuals´ health in most of the waves. On the other hand, the two variables related to health status (IN-PATIENT and CDACTSM) increase the probability of individual reporting bad health status as expected. Household size has not a clear positive or negative sign and again it varies among the different waves. Finally, social relationships have a positive effect on health status.

Finally, it is important to note that in the whole years, the models account for about 20% of the variation of the health transition probabilities, based on the values of

the pseudo-*R* squared statistics. TABLE 9 also includes estimates of the threshold parameters $\gamma_1, \gamma_2, \gamma_3$ and γ_4 (denoted as Cut1, Cut2, Cut3 and Cut4). These imply that, for example, in 2001, a value of the latent variable less than -0.2795 corresponds to very good health, a value between -0.2795 and 1.6345 corresponds to good health, a value between 1.6345 and 2.9678 corresponds to fair health, a value between 2.9678 and 4.3226 corresponds to bad health and a value above 4.3226 corresponds to very bad health. Thus, the predicted value of H^* for the reference individual (where all the explanatory variables equal zero) lies between –0.2795 and 1.6345, hence the reference individual would be predicted to report good health in 2001. So, the cutpoints can be interpreted in terms of *z*-scores (Greene, 2003). That is, the boundary between very good and good health is at $z = -0.2795$, the boundary between good and fair health is at 1.6345, the boundary between fair and bad health is at 2.9678 and the boundary between bad and very bad health is at 4.3226. These values leave $\Phi(-0.28) = 0.3897$ or 38.97% of the reference group in the very good health category, $\Phi(1.63) - \Phi(-0.28) = 0.5587$ or 55.87% of the reference group in the good health category, 5.01% in the fair health category and only 0.15% of the reference group in the bad health category.

Finally, the same methodology has been used considering the Spanish National Health Survey. The results are shown in TABLE 10.

TABLE 10
Order Probit Model. SHS (2003).

Variables		Year 2003	
		Coef.	Z
Personal Caracteristic	MALE	-0.15060	-4.57
	EDAD	0.01140	0.17
	EDAD2	-0.00046	-0.21
	EDAD3	0.00001	0.42
	EDAD4	-0.00000	0.57
Education	HEDUC	-0.2391	-5.19
Occupation	UNEMPLOYED	0.17786	2.61
Health Status	ILLNESS	1.17880	28.83
	IN-PATIEN	0.30729	5.45
	SMOKE	0.00850	5.79
Cut1			-0.73529
Cut2			1.43308
Cut3			2.60220
Cut4			3.43005
Log. Likelihood			-5100.06
LR chi2 (10)			1396.53 (0.0000)
Pseudo R^2			0.1204
Number of Observation			5557

Source: Authors' elaboration based on the SHS data (2003).

4. CONCLUSIONS

In this paper, we have developed different ordered probit models in order to identify interactions between health (self-assessed health) and different explanatory factors in Spain from 1994 to 2001. Results from microdata of ECHP indicate, firstly,

that income has positive effects on health so an income redistribution to poor population groups could raise average health status and decrease health inequalities given the concativity of the relationship between income and health. This is a very important conclusion that remains constant for the eight years considered. Similar results are obtained using the Spanish Health Survey (2003). However, there exist considerable differences among Autonomous Communities.

Nevertheless, the analysis of Spanish individual's health status suggests that not only income, but also other variables such as gender (male), education level and social relationships have a positive impact on self-assessed health. Other factors such as age and other variables related to health status (hospital admission and cut down acts/mental condition) have a negative effect.

Finally, the results have important implications for health and welfare state policies and provide more empirical evidence about the relationship between health and different socioeconomic factors using individual data in Spain. By this way, as average education level of Spanish population is increasing and better educated younger generations are replacing older ones (with lower levels of education), it is expected a shift on population health status.

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