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# Self-perceived health status in older adults: regional and sociodemographic inequalities in Spain

## Estado de saúde percebido em idosos: desigualdades regionais e sociodemográficas na Espanha

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### ABSTRACT

**OBJECTIVE:** To assess regional and sociodemographic differences in self-perceived health status among older adults.

**METHODS:** A face-to-face quality of life survey was conducted in a representative sample of the Spanish population comprising 1,106 non-institutionalized elderly aged 60 or more in 2008. Logistic regression models were used to explain self-perceived health status according to the EuroQol Group Visual Analogue Scale (EQ-VAS). Independent variables included sociodemographic and health characteristics as well as the nomenclature of territorial units for statistics level 1 (NUTS1: group of autonomous regions) and level 2 (NUTS 2: autonomous regions).

**RESULTS:** Younger and better off respondents were more likely to have a positive self-perceived health status. Having no chronic conditions, independence in performing daily living activities and lower level of depression were also associated with positive self-perceived health status. People living in the south of Spain showed a more negative self-perceived health status than those living in other regions.

**CONCLUSION:** The study results point to health inequality among Spanish older adults of lower socioeconomic condition and living in the south of Spain. The analysis by geographic units allows for international cross-regional comparisons.

**DESCRIPTORS:** Aged. Health Status. Quality of Life. Socioeconomic Factors. Health Inequalities. Social Inequity. Residence Characteristics. Regional Development.

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## RESUMO

**OBJETIVO:** Analisar as diferenças regionais e sociodemográficas no estado de saúde percebido por adultos mais velhos.

**MÉTODOS:** Realizou-se um inquérito de qualidade de vida mediante entrevista pessoal com amostra representativa da população espanhola de 1.106 pessoas com 60 e mais anos não institucionalizadas, em 2008. Aplicaram-se modelos de regressão logística para explicar a saúde percebida segundo a escala visual analógica do EuroQol Group (EQ-VAS). As variáveis independentes incluíram características sociodemográficas e de saúde, assim como unidades territoriais estatísticas de nível 1 (grupo de comunidades autônomas) e nível 2 (comunidades autônomas).

**RESULTADOS:** Os participantes dos grupos mais jovens e os que tinham uma melhor situação econômica mostraram maior probabilidade de ter uma percepção positiva da sua saúde. A ausência de problemas crônicos de saúde, a independência para realizar atividades da vida diária e menor nível de depressão também se associaram positivamente à saúde percebida como boa. Os idosos que viviam no sul mostraram uma percepção mais negativa da saúde do que as que vivem noutras regiões.

**CONCLUSÕES:** Os resultados indicam uma desigualdade relativa no estado de saúde dos adultos mais velhos de níveis socioeconômicos inferiores e dos habitantes do sul do país. A análise por unidades territoriais estatísticas permite estabelecer comparações entre regiões em nível internacional.

**DESCRITORES:** Idoso. Nível de Saúde. Qualidade de Vida. Fatores Socioeconômicos. Desigualdades em Saúde. Iniquidade Social. Distribuição Espacial da População. Desenvolvimento Regional.

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## INTRODUCTION

Aging of the population is a worldwide trend in recent decades. According to the United Nations, among populations of developed countries, the proportion of people aged 60 or more is projected to increase from 21% in 2009 to 33% in 2050, with greater increase among the older-elderly (80 years or more).<sup>a</sup> In Spain, people aged 60 years or more accounted for 21.8% of total population in 2009 (45,828,172 people), and this segment is estimated to increase to 37.7% in 2049.<sup>b</sup>

The aging process implies higher probability of suffering from disease and disability, particularly in the very old population. Self-perceived health status is a measure widely used in many studies as it is closely associated with objective health status and health care demand. It is a useful indicator of health care needs when designing programs and is highly sensitive to social factors that cause health inequalities.<sup>12</sup>

The impact of sociodemographic, socioeconomic and health-related factors on health status perception among older adults is well known,<sup>13,c</sup> but there are few studies that have analyzed geographic differences in self-perceived health in Spain.

Geographic differences between diseases and health indicators at different territorial scales have become evident nationwide. Many of these studies have shown a disadvantage of the south and northwest<sup>1,4,8,11,26</sup> in regard to mortality, health status and disability, among others. Regional differences have been seen in socioeconomic and health indicators among the general population.<sup>8</sup> They reflect contrasts in social and economic conditions between geographic areas, which in turn are associated with health outcomes. Little is known about such inequalities specifically among older adults, a population segment that is particularly susceptible to socioeconomic inequalities and their impact on health.

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<sup>a</sup> United Nations, Department of Economic and Social Affairs, Population Division. Population ageing and development 2009. New York; 2009 [cited 2012 Jan 7]. Available from: <http://www.un.org/esa/population/publications/ageing/ageing2009.htm>

<sup>b</sup> Instituto Nacional de Estadística (ES). Total population and population aged 60 years or more in 2009 and projected to 2049. [cited 2012 Jan 29] Available from: <http://www.ine.es/jaxi/tabla.do?path=/t20/p270/2009-2049/10/&file=01001.px&type=pcaxis&L=0>

<sup>c</sup> Fernández-Mayoralas Fernández G, Rojo Pérez F, Prieto Flores ME, León Salas B, Martínez Martín P, Forjaz J, et al. El significado de la salud en la calidad de vida de los mayores. *Informes Portal Mayores*. 2007;(74):1-60.

This study aimed to assess the association between geographic and socioeconomic factors and self-perceived health status among people aged 60 or more.

## METHODS

This study was based on a quality of life survey among community-dwelling older adults in Spain (CadeViMa-Spain) in 2008. Drawing from a population of 9,812,307 people aged 60 years or more according to the Municipal Census of December 2007,<sup>d</sup> the sample was calculated with an allowable error of 3.5% for a 95% confidence level. It was estimated a nationally-representative sample of 1,106 people. Proportionate stratified sampling was applied to improve representativeness. The strata consisted of 14 of the 17 peninsular autonomous regions in Spain, population size of municipalities (seven groups), age (three groups) and gender.

Sample selection was carried out by three-step automated randomization method based on census tracts, gender, and age group. Those with cognitive decline according to Pfeiffer's Short Portable Mental Status Questionnaire<sup>22</sup> were excluded (4.4%). Those who refused to be interviewed or showed cognitive decline were replaced by others from the same strata.

Data was obtained through personal home interviews carried out by specially trained interviewers from a consulting company specialized in social and health surveys. The research group supervised the interviewers.

The dependent variable was the EuroQol Group instrument Visual Analogue Scale (EQ-VAS), for assessing self-perceived current health status,<sup>9</sup> validated in Spain, ranging from 0 (worst imaginable health) to 100 (best imaginable health). An EQ-VAS dichotomous variable was used: good self-perceived health status ( $\geq 70$ ) and fair-to-poor self-perceived health status ( $< 70$ ).

The independent variables comprised sociodemographic characteristics including age (60 to 69; 70 to 79; 80 or more); gender; marital status; children; living arrangement (living alone, living with a partner; living with others); education (less than elementary school; elementary school; middle/high school; or higher); satisfaction with economic condition and financial future security (0 [very unsatisfied] to 10 [very satisfied]); perceived household income status (0 [very poor household] to 10 [very wealthy household]); region of residence, and health status.

The rate of missing information on income was high (30.1%). A principal component analysis of perceived

economic condition, satisfaction with financial position and financial future security was performed to further assess economic condition. The three variables were grouped into one factor, explaining 87% of the variance. The variance-inflation factor ranged from 3 to 4 indicating that there was no multicollinearity problem for these three variables. The correlation coefficients between the variables and the factor ranged from 0.91 to 0.94 (factor loadings). The variable obtained was the economic factor, divided into five categories by quintiles, from low to high income status.

Geographic variables were based on the nomenclature of territorial units for statistics (NUTS) that was created by the European Statistics Office (EUROSTAT) and accepted by the European Union.<sup>e</sup> It is an objective and unchanging regional classification that allows to making comparisons between state members. There are three levels of classification: NUTS 1, NUTS 2 and NUTS 3. We used NUTS 1 (groups of autonomous regions): northwest, northeast, Madrid area, center, east and south, and NUTS 2 (autonomous regions) with 50 or more units: Castille and Leon, Castille La-Mancha, Catalonia, Valencia, Galicia, Madrid, Basque Country and Andalusia. These two classifications provided comparative information at two different levels in Spain, which is useful to identify regional differences within the country but also has potential for European cross-regional comparisons.

Three independent health variables were used. The presence or absence of self-reported chronic medical conditions was measured using a scale based on the Cumulative Illness Rating Scale (CIRS) for geriatrics.<sup>21</sup> The questionnaire collected information about the presence (yes; no) of 20 medical conditions, and "others" (open question). The Barthel Index was used to measure functional independence for daily living activities, from 0 (completely dependent) to 100 (completely independent).<sup>18</sup> The self-report depression subscale of the Hospital Anxiety and Depression Scale (HADS-D) was also used.<sup>27</sup> The scores ranged from 0 to 21, with 11 or higher indicating the presence of mood disorders.

We examined sociodemographic and health-related characteristics and self-perceived health status according to regional distribution. We explored differences in self-perceived health status by sociodemographic characteristics. Pearson's chi-square test was used to compare proportions for categorical variables. The Kruskal-Wallis non-parametric test was used to compare averages with category variables of NUTS 1 and NUTS 2 due to the skewness of the distribution of the HADS-D and EQ-VAS.

<sup>d</sup> Instituto Nacional de Estadística (ES). Cifras oficiales de población resultantes de la revisión del Padrón municipal a 1 de enero de 2007. [cited 2007 Mar 12]. Available from: <http://www.ine.es/jaxi/menu.do?type=pcaxis&path=%2Ft20%2Fe260%2Fa2007%2F&file=pcaxis&N=&L=0>

<sup>e</sup> European Commission. Eurostat. NUTS - Nomenclature of territorial units for statistics. [cited 2012 Jan 29]. Available from: [http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts\\_nomenclature/introduction](http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction)

Binary logistic regression analysis was performed to explain the contribution to self-perceived health status of sociodemographic, geographic and health-related characteristics. A forward stepwise approach was used, starting from an empty model and adding one independent variable at a time in the order of the closest association with the dependent variable.

Two binary logistic regression models were developed taking the EQ-VAS scale (dichotomous) as the dependent variable to predict good self-perceived health status. The adjustment variables were sociodemographic (age, gender, education levels and financial situation), health status (chronic medical conditions, depression, and functional dependence) and geographic (NUTS 1 for the first model and NUTS 2 or selected autonomous regions for the second one). We explored the behavior of the models when adding other adjustment variables such as marital status, having children, living arrangement and municipality size. The analyses were performed using the SPSS statistical package 15.0. A thematic map was prepared with ArcGIS version 9.1 to represent self-perceived health according to NUTS 1 and selected NUTS 2.

All respondents gave their consent for participation. The study was approved the Ethics Committee of Carlos III Institute of Health on May 23, 2006.

## RESULTS

The mean age of the sample was 72.1 (standard deviation [SD] 7.8 years; range 60 to 96). The proportion of women in the sample was 56.3%. The prevailing marital status was married or living with a partner (58.5%). With regard to education, 31.6% had less than elementary schooling (2.5% of the sample were illiterate), 38.1% elementary and the remainder had middle/high school education or higher. About 19.5% were low income; 19.0% middle-to-low; 20.0% middle; 17.2% high-to-middle; and 14.2% high income. The majority (89.4%) reported they suffered from some chronic medical condition, and 77.9% were functionally independent. The mean HADS-D and EQ-VAS scores were 4.9 (SD 4.3) and 66.2 (SD 20.9), respectively.

There was a higher proportion of elderly with less than elementary education, as well as a lower proportion with middle-high school education or higher in the southern. The southern and central regions showed a relatively more disadvantaged economic situation than in the other regions. A higher rate of some degree of dependence as well as chronic medical conditions was seen in the northwest. The highest mean HADS-D scores were seen in the NUTS 1 south and center (Table 1).

The highest proportion of respondents with less than elementary schooling was in Andalusia, and with a more disadvantaged economic situation was found in Castilla and Leon. The Valencian region showed a higher

proportion of elderly with some degree of dependence and chronic medical conditions than in other regions. Castilla and Leon showed the highest mean HADS-D scores. No significant differences were seen in terms of gender and age either by NUTS 1 or NUTS 2 (Table 2).

Poorer self-perceived health status was observed in the south and northwest regions according to NUTS 1 (grey scale) and in Andalusia and the Valencian region according to NUTS 2 (proportional circles) (Tables 1 and 2; Figure).

Positive self-perceived health status was more frequently reported by men than women (62.7 vs. 51.7%;  $p < 0.001$ ), younger than older respondents (68.6 vs. 35.5%;  $p < 0.001$ ), and among those with higher education and better economic condition compared to those with a more disadvantaged situation (67.3 vs. 41.5, and 79.6 vs. 41.2%, respectively;  $p < 0.001$ ).

The two logistic regression models used in the analysis of the impact of sociodemographic and regional (NUTS 1 and NUTS 2) factors on self-perceived health showed an independent association with age, economic situation, NUTS regions, morbidity, dependence and depression (Table 3).

In the NUTS 1 model, those with high-middle (OR = 1.8; 95%CI 1.1;2.8) and high (OR = 2.7; 95%CI 1.5;4.7) income were more likely to perceive their health positively than those with lower income, although the difference between middle-to-low and middle income with regard to the reference (low) was not statistically significant. Living in the northwest (OR = 1.9; 95%CI 1.1;3.2), northeast (OR = 2.3; 95%CI 1.3;4.0), Madrid area (OR = 2.9; 95%CI 1.6;5.0), center (OR = 3.2; 95%CI 1.9;5.2) and east (OR = 3.7; 95%CI 2.4;5.6) increased the likelihood of having good perceived health compared to the south ( $R^2$  of Nagelkerke = 0.355;  $X^2$  of Hosmer and Lemeshow,  $p = 0.120$ ).

In the regression model using the autonomous regions (NUTS 2) as geographic variable, respondents with middle (OR = 2.2; 95%CI 1.3;3.6), high-to-middle (OR = 2.6; 95%CI 1.5;4.5) and high (OR = 4.1; 95%CI 2.2;7.6) income were more likely to perceiving their health positively than those with low income. Living in Castilla and Leon (OR = 8.5; 95%CI 4.3;16.9), Catalonia (OR = 6.6; 95%CI 3.9;11.4), Valencia (OR = 1.8; 95%CI 1.1;3.2), Galicia (OR = 3.0; 95%CI 1.6;5.8) and Madrid (OR = 2.8; 95%CI 1.5;5.0) increased the likelihood of reporting good health compared to Andalusia ( $R^2$  of Nagelkerke = 0.390;  $X^2$  of Hosmer and Lemeshow,  $p = 0.748$ ).

Gender and education proved non-significant in both models. There was no substantial change in the estimates of the final model after adding the variables marital status, children, people living in the same household and municipality size.

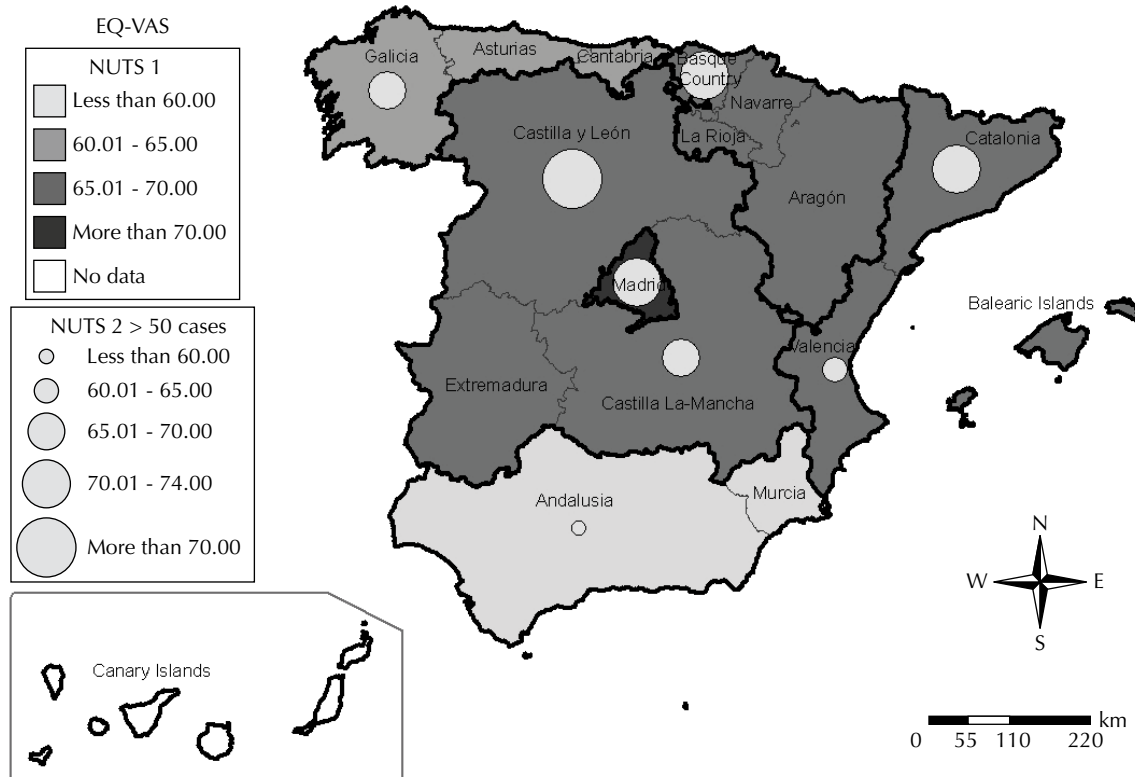
**Table 1.** Sociodemographic and health-related characteristics by nomenclature of territorial units for statistics, level 1. Spain, 2008.

Variable	Total sample		Northwest		Northeast		Madrid area		Center		East		South		p-value
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	
Total	1.106		133	12.0	117	10.6	130	11.7	162	14.6	323	29.2	241	21.8	
Gender															0.994*
Female	623	56.3	77	57.9	65	55.6	75	57.7	90	55.6	183	56.6	133	55.2	
Male	483	43.7	56	42.1	52	44.4	55	42.3	72	44.4	140	43.3	108	44.8	
Age (years)															0.776*
60 to 69	443	40.1	50	37.6	43	36.8	57	43.8	59	36.4	127	39.3	107	44.4	
70 to 79	449	40.6	58	43.6	50	42.7	51	39.2	74	45.7	128	39.6	88	36.5	
80 and more	214	19.4	25	18.8	24	20.5	22	16.9	29	17.9	68	21.1	46	19.1	
Education level															<0.001*
Less than elementary school	349	31.6	32	24.1	19	16.4	11	8.5	50	30.9	117	36.2	120	49.8	
Elementary school	432	39.1	35	26.3	51	44.0	51	39.2	82	50.6	130	40.2	83	34.4	
Middle/high school or higher	324	29.3	66	49.6	46	39.7	68	52.3	30	18.5	76	23.5	38	15.8	
Economic position															<0.001*
Low	197	23.3	26	24.1	15	14.9	5	4.3	58	36.5	55	19.4	57	25.1	
Middle-to-low	171	20.2	18	16.7	22	21.8	13	11.2	33	20.8	62	21.9	62	27.3	
Middle	186	22.0	23	21.3	23	22.8	25	21.6	33	20.8	63	22.3	54	23.8	
High-to-middle	154	18.2	25	23.1	18	17.8	36	31.0	20	12.6	57	20.1	34	15.0	
High	139	16.4	16	14.8	23	22.8	37	31.9	15	9.4	46	16.3	20	8.8	
Barthel Index (dependence)															<0.001*
Yes	269	24.3	41	30.8	16	13.7	23	17.7	28	17.3	91	28.2	70	29.0	
No	837	75.7	92	69.2	101	86.3	107	82.3	134	82.7	232	71.8	171	71.0	
Chronic medical conditions															0.053*
Yes	989	89.4	124	93.2	98	83.8	120	92.3	139	85.8	295	91.3	213	88.4	
No	117	10.6	9	6.8	19	16.2	10	7.7	23	14.2	28	8.7	28	11.6	
HADS-D (mean [standard deviation])	4.9 [4.3]		5.3 [3.9]		3.3 [2.9]		2.6 [3.1]		5.8 [4.3]		5.0 [4.1]		6.0 [5.1]		<0.001**
EQ-VAS (mean [standard deviation])	66.2 [20.9]		62.8 [21.0]		68.9 [19.1]		73.7 [12.8]		68.9 [22.7]		68.7 [20.8]		57.6 [21.2]		<0.001**

HADS-D: self-report depression subscale of the Hospital Anxiety and Depression Scale; EQ-VAS: EuroQoL Group Visual Analogue Scale.

\* Chi-square test

\*\* Kruskal-Wallis test



**Figure.** Self-perceived health status by nomenclature of territorial units for statistics, levels 1 (groups of autonomous regions) and 2 (selected autonomous regions). Spain, 2008.

## DISCUSSION

This study showed a positive relationship of self-perceived health status with better economic condition and poorer perception in the southern region. In addition, a positive self-perceived health status was associated with younger age, less chronic medical conditions, independence in performing daily living activities and lower levels of depression.

Women showed significantly lower scores than men, similar to that reported in other community studies on health status of older adult population, and further reductions were seen as age increased.<sup>2,12,23</sup> The gender difference was not maintained when adjusted for all other variables. It suggests that gender is not a determinant in self-perceived health status when combined with other factors such as economic condition, depression or disability. Authors have pointed out the association between health status and education,<sup>2,3</sup> although this relationship was no longer seen in our final models, probably due to its association with economic condition.

Functional dependence and depression negatively impact perceived health among older adults,<sup>3,13</sup> irrespective of sociodemographic and economic factors, as confirmed in the present study.

Poorer self-perceived health status in the south and northwest regions, as well as in the autonomous region of Andalusia, appear to be consistent with previous studies.<sup>1,10</sup> Although there is evidence of spatial inequalities regarding diseases and other health indicators on a national level, few studies have focused on older adult population.

Research on geographic mortality patterns in small areas of Spain, explained by deprivation indexes, draws attention to the southern areas with relative higher rates of unemployment and illiteracy.<sup>4</sup> A greater risk of avoidable mortality was found in the south and northwest.<sup>26</sup> García-Altés et al observed higher rates of mortality in the south.<sup>10</sup>

Some studies have analyzed the differences in mortality due to cerebrovascular and cardiovascular diseases, with greater risk in southern regions and a similar pattern for angina and suicide (higher risk in northwest and south).<sup>1,17</sup>

Disability-free life expectancy is higher in the northern communities and Madrid area and lower in the south,<sup>11</sup> however, for severe disability, higher rates were seen among those older than 65 years and in the southern area.<sup>1</sup> Worse results for self-reported health status have been observed among people living in the southern half of the country and better among those living in the north.<sup>1,10</sup>

**Table 2.** Sociodemographic and health-related characteristics by nomenclature of territorial units for statistics, level 2 or selected autonomous regions. Spain, 2008.

Variable	Total sample		Andalusia		Catalonia		Madrid		Valencian region		Galicia		Castille e Leon		Basque Country		Castille-La Mancha		p-value	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%		
Total	943		216	19.5	194	17.5	130	11.8	129	11.7	88	8.0	80	7.2	56	5.1	50	4.5		
Gender																				0.997*
Female	519	55.0	120	55.6	107	55.2	75	5.7	76	58.9	37	58.0	45	56.3	32	57.1	27	54.0		
Male	424	44.9	96	44.4	87	44.8	55	42.3	53	41.1	51	42.0	35	43.8	24	42.9	23	46.0		
Age (years)																				0.314*
60 to 69	384	40.7	97	44.9	68	35.1	57	43.8	59	45.7	33	37.5	28	35.0	23	41.1	19	38.0		
70 to 79	374	39.7	77	35.6	77	39.7	51	39.2	51	39.5	41	46.6	36	45.0	18	32.1	23	46.0		
80 and over	185	19.6	42	19.4	49	25.3	22	16.9	19	14.7	14	15.9	16	20.0	15	26.8	8	16.0		
Education level																				<0.001*
Less than elementary school	303	32.1	109	50.5	58	29.9	11	8.5	59	45.7	26	29.5	14	17.5	7	12.5	19	38.0		
Elementary school	371	39.3	74	34.3	93	47.9	51	39.2	37	28.7	21	23.9	60	75.0	21	37.5	14	28.0		
Middle/high school or higher	269	28.5	33	15.3	43	22.2	68	52.3	33	25.6	41	46.6	6	7.5	28	50.0	17	34.0		
Economic position																				<0.001*
Low	197	23.3	52	25.7	28	17.1	5	4.3	27	22.7	21	29.6	50	63.3	9	19.1	5	10.2		
Middle-to-low	171	20.2	57	28.2	45	27.4	13	11.2	17	14.3	10	14.1	13	16.5	8	17.0	8	16.3		
Middle	186	22.0	50	24.8	37	22.6	25	21.6	26	21.8	13	18.3	4	5.1	9	19.1	22	44.9		
High-to-middle	154	18.2	26	12.9	22	13.4	36	31.0	35	29.4	13	18.3	6	7.6	9	19.1	7	14.3		
High	139	16.4	17	8.4	32	19.5	37	31.9	14	11.8	14	19.7	6	7.6	12	25.5	7	14.3		
Barthel index (dependence)																				<0.001*
Yes	224	23.8	65	30.1	48	24.7	23	17.7	43	33.3	25	28.4	7	8.8	7	10.7	7	14.0		
No	719	76.2	151	69.9	146	75.3	107	82.3	86	66.7	63	71.6	73	91.2	43	89.3	43	86.0		
Chronic medical conditions																				<0.001*
Yes	841	89.2	189	87.5	171	88.1	120	92.3	124	96.1	84	95.5	74	92.5	40	71.4	39	78.0		
No	102	10.8	27	12.5	23	11.9	10	7.7	5	3.9	4	4.5	6	7.5	16	28.6	11	22.0		
HADS-D (mean [standard deviation])	4.9 [4.3]		6.0 [5.0]		5.1 [3.9]		2.6 [3.1]		5 [4.5]		5.7 [4.0]		6.1 [3.1]		2.6 [2.6]		3.3 [4.2]			<0.001**
EQ-VAS (mean [standard deviation])	66.2 [20.9]		57.3 [21.4]		71.5 [25.3]		73.7 [18.3]		64.6 [21.7]		65.9 [18.8]		74.6 [17.7]		70.8 [12.9]		67.2 [20.2]			<0.001**

HADS-D: self-report depression subscale of the Hospital Anxiety and Depression Scale; EQ-VAS: EuroQoL Group Visual Analogue Scale

\* Chi-square test

\*\* Kruskal-Wallis test

**Table 3.** Regression model for probability of good self-perceived health status among elderly. Spain, 2008.

Variable	$\beta$	SE	p-value	OR	95%CI
Model with nomenclature of territorial units for statistics, level 1 <sup>a</sup>					
Constant	-1.1	0.4	0.002	0.3	
Age (years; reference: 80 and more)			0.003		
60 to 69	0.7	0.2	0.001	2.0	1.3;3.1
70 to 79	0.3	0.2	0.128	1.4	0.9;2.1
Economic factor (reference: Low)			0.002		
Middle-to-low	0.0	0.2	0.887	1.0	0.7;1.6
Middle	0.2	0.2	0.282	1.3	0.8;2.0
High-to-middle	0.6	0.2	0.018	1.8	1.1;2.8
High	1	0.3	<0.001	2.7	1.6;4.7
NUTS1 (reference: South)			<0.001		
Northwest	0.6	0.3	0.021	1.9	1.1;3.2
Northeast	0.8	0.3	0.004	2.3	1.3;4.0
Madrid area	1.1	0.3	<0.001	2.9	1.6;5.0
Center	1.2	0.3	<0.001	3.2	2.0;5.2
East	1.3	0.2	<0.001	3.7	2.4;5.7
Chronic medical conditions (reference: any)					
None	1.4	0.3	<0.001	4.2	2.2;8.2
Barthel index (reference: any dependence)					
Full independence	0.7	0.2	<0.001	2.0	1.4;2.9
HADS-D (0-20)	-0.2	0.0	<0.001	0.8	0.8;0.9
Model with autonomous regions <sup>b</sup>					
Constant	-1.6	0.4	<0.001	0.2	
Age (years; reference: 80 and more)			<0.001		
60-69	1.0	0.3	<0.001	2.8	1.7;4.5
70-79	0.5	0.2	0.045	1.6	1.0;2.6
Economic factor (reference: low)			<0.001		
Middle-to-low	0.2	0.3	0.4	1.3	0.8;2.1
Middle	0.8	0.3	0.002	2.2	1.3;3.6
High-to-middle	1	0.3	<0.001	2.7	1.5;4.6
High	1.4	0.3	<0.001	4.1	2.2;7.6
Autonomous regions (reference: Andalusia)			<0.001		
Castille and Leon	2.1	0.4	<0.001	8.5	4.3;16.9
Castille-La Mancha	0.6	0.4	0.135	1.8	0.8;3.9
Catalonia	1.9	0.3	<0.001	6.6	3.9;11.4
Valencian region	0.6	0.3	0.028	1.9	1.1;3.2
Galicia	1.1	0.3	0.001	3.0	1.6;5.8
Madrid area	1.0	0.3	0.001	2.8	1.5;5.0
Basque Country	1.0	0.3	0.001	2.8	1.5;5.0
Chronic medical conditions (reference: any)					
None	0.7	0.4	0.071	2.1	0.9;4.5
Barthel index (reference: any dependence)					
Full independence	1.3	0.4	0.001	3.5	1.7;7.1
HADS-D (0-20)	-0.2	0.0	<0.001	0.9	0.8;0.9

$\beta$ : Parameter estimates. HADS-D: self-report depression subscale of the Hospital Anxiety and Depression Scale.

<sup>a</sup> n = 993. Cut-off: 0.5. Correctly classified percentage = 71.4%. Sensitivity (% correct classification in category "above the median") = 78.6%. Specificity (% correct classification in category "below the median") = 62.2%. Test Omnibus  $\chi^2 = 305.66$  p<0.001. Non-significant variables (p $\geq$ 0.05): gender, education level.

<sup>b</sup> n = 847. Cut-off: 0.5. Correctly classified percentage = 75.1%. Sensitivity (% correct classification in category "above the median") = 84.1%. Specificity (% correct classification in category "below the median") = 62.7%. Test Omnibus  $\chi^2 = 289.83$  p<0.001. Non-significant variables (p $\geq$ 0.05): gender, education level.



The close relationship with socioeconomic factors such as social condition or living in deprived areas has been described in previous studies.<sup>8,10,11</sup> It has also been shown in other international contexts<sup>14,16,20,24</sup> and was confirmed in our multivariable models, where economic condition had a key role in explaining perceived health status.

Deprivation, which may lie at the core of the geographic differences of health indicators within the Spanish territory, would be an objective state of disadvantage in a local community, society or country where an individual, family or group lives.<sup>4</sup> Therefore, deprivation can have an impact on many health-related factors such as fulfillment of basic needs or having fewer opportunities to lead a healthy lifestyle.<sup>25</sup>

Gonzalo & Pasarín<sup>12</sup> observed that the distribution of mortality due to cardiovascular diseases in older adult population in Spain follows a pattern showing that the southern area is the most disadvantaged and have the highest rates. The north-south pattern can be seen also for gastrointestinal diseases, of which male cirrhosis appeared to be the most prevalent.<sup>12</sup>

Regional differences in perceived health status among adults aged 65 or more were found in the United Kingdom.<sup>19</sup> The relationship between geographic deprivation and social condition and quality of life among older people has been noted,<sup>5</sup> as well as greater negative impact of socioeconomic factors on self-perceived health among older adults.<sup>6</sup> Geographic differences of self-rated health have also been reported in developing countries, where the number of older people is rapidly growing, as it is the case of Brazil. Previous research has shown a significant association between poorer health status with lower income neighborhoods and lower socioeconomic status.<sup>7</sup>

The inequalities observed in Andalusia compared to other autonomous regions in Spain are historical and the underlying causes should lie on structural and institutional factors. Significant progress has been made since the 1980s. Nevertheless, inequality persists within this region and compared to the rest of Spain.<sup>f</sup> More empirical studies are needed to better understand the varying geographic health inequalities.

No other studies were conducted in Spain addressing differences in self-perceived health status of older adults

by geographic location and sociodemographic characteristics. The present study can be a starting point for further research in Spain about these issues. On the other hand, as the NUTS classification was used, it might be serve as a term of comparison for the European context.

This study did not include institutionalized people or those suffering from dementia, which should be taken into account when comparing to other studies. Chronic medical conditions were self-reported allowing for over or underestimation of the actual effect of morbidities on perceived health. However, studies demonstrate the reliability of self-reporting when compared with information provided by the physician.<sup>15</sup> In addition, the variable of perceived economic situation was created by means of factorial analysis as an alternative to the objective variable of income which showed a high rate of missing values.

We used the NUTS1 classification as a geographic context variable, which enabled us to make a first approach towards any potential regional differences without losing cases. We were able to obtain more detailed information through the autonomous regions, although only from those in which we had a sufficient number of respondents. The NUTS groupings are a uniform and consistent classification that is available to all European Union countries allowing comparisons between different regions, and is deemed to be equally valid for the use and analysis of statistical data of state members.<sup>g</sup> Our results showed several broad confidence intervals in terms of geographic differences by autonomous regions, which led us to conclude that we could have increased the scope and impact of the study if we had had a larger sample size.

Despite its limitations, this study provides useful information on vulnerable groups with regard to health status in Spain. Economic condition and region of residence had a significant association with self-perceived health among the older adults. These results suggest socioeconomic and territorial health inequalities among older people in Spain. The potential association between certain geographic locations with higher deprivation rates and poorer health among older adults living therein may carry important implications. These differences might be possibly preventable by means of appropriate social and health policies.

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