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Self-rated health and mortality: a follow-up study of a Spanish population



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ABSTRACT

Objectives: Self-rated health (SRH) is known to be a valid indicator for the prediction of health outcomes. The aims of this study were to describe and analyse the associations between SRH and health status, socio-economic and demographic characteristics; and between SRH and mortality in a Spanish population.

Study design: Longitudinal study.

Methods: A sample of 5275 adults (age ≥ 21 years) residing in the Valencian Community (Spanish Mediterranean region) was surveyed in 2005 and followed for four years. SRH was categorized into good and poor health. The response variable was mortality (dead/alive), obtained from the local mortality register. Logistic regression models were adjusted in order to analyse the associations between SRH and health status, socio-economic and demographic characteristics; odds ratios were calculated to measure the associations. Poisson regression models were adjusted in order to analyse the associations between mortality and explanatory variables; the relative risk of death was calculated to measure the associations.

Results: Poor SRH was reported by 25.9% of respondents, and the mortality rate after four years of follow-up was 3.6%. An association was found between SRH and the presence of chronic disease and disability in men and women. A perception of poor health vs good health led to a mortality risk of 3.0 in men and 2.7 in women. SRH was predictive of mortality, even after adjusting for all other variables. In men and women, the presence of disability provided additional predictive ability.

Conclusions: SRH was predictive of mortality in both men and women, and acted as a mediator between socio-economic, demographic and health conditions and mortality.

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Introduction

Self-rated health (SRH) is commonly used in epidemiological research. This measure provides a complete overview of the health status of a population, allowing dynamic and continuous assessment to reflect judgements about the trajectory of health and not just the current level of health.^{1,2} SRH has been described as a complex measure that joins multiple dimensions of health, and is used as a complementary indicator of objective measures.² Moreover, SRH may be useful as a global screening tool to establish people's health status, adding a predictive value to the known risk factors. In a clinical context, SRH is a sensitive measure to complement specific measures, detects different clinical states, predicts functional impairment, and may be an indicator in risk assessments and clinical practice.³

In Europe, SRH has been included in many surveys and questionnaires to monitor health due to international recommendations (World Health Organization Europe and European Commission).^{4–6} Several transverse and longitudinal studies have shown the validity and reliability of this subjective measure as an overall health indicator, as it has been related to different objective measures such as functional capacity, morbidity, use of health services and mortality.^{3,7–9}

Although comparison of SRH between countries is very complex, some studies have found large differences in distribution.^{10–16} In Europe, a north–south gradient has been described, with individuals living in Scandinavian countries having healthier perceptions than individuals living in countries in southern Europe.^{11,13,15} Other differences have been identified between people of Eastern and Western Europe, being generally worse in former communist countries than in Western European countries.¹⁰ These disparities may be explained, in part, by the true state of health, but also by differences in the standard of health thresholds;¹³ the style of reporting; the variability across different cultures;^{3,15–17} the wording, language and scale of response;^{18,19} or even the version of the instrument used in the survey.^{20–24}

In 2007, 34% of a European Community population (EU-25) reported poor SRH.¹⁶ The factors that best explained this result, in order of importance, included: chronic diseases, limitation of activity, increasing age, being outside the labour market (unemployed, retired or inactive), country of residence, low educational level, low income level and sex.¹⁶ Another study in 11 European countries described differences between the determinants of SRH in an elderly population, and reported that education, depression, chronic conditions, mobility difficulties, somatic symptoms and levels of physical activity were important components of SRH.¹⁵

Overall, between 1980 and 1990, poor SRH decreased in several European countries.¹² However, in Spain, the percentage of people who reported poor SRH increased from 27.0% in 1993 to 30.2% in 2006 (24.9% in men and 35.0% in women).²⁵

Moreover, the association of SRH with mortality has been established by several authors.^{7,8,17,26–36} This association is often weaker in women than in men.^{7,17,34} Regarding the ability of SRH to predict mortality, taking into account differences between socio-economic groups, several studies have

found discrepant results, including stronger associations in subjects with high socio-economic status,^{30,34,37} stronger associations in subjects with low socio-economic status^{28,33} and no association.^{32,35}

In Spain, although some studies have evaluated the association between SRH and mortality, they have all been conducted in populations over 60 years of age,^{37–40} and have reported differing results.

Given the lack of studies in Spain to establish the association between SRH and mortality, the predictive role of SRH for mortality in the general population, and the discrepancies in the findings in elderly populations, the aims of this study were: to describe and analyse the associations of health status, socio-economic and demographic characteristics with SRH, and the associations between SRH and mortality by follow-up of a cohort of subjects representative of the general population.

Methods

This longitudinal study monitored a cohort of subjects who were part of the sample for the 2005 Health Interview Survey of the Valencian Community (HISVC). The questionnaire normally used in health surveys was used in this study. The variables included in the questionnaire dealt with lifestyle, sociodemographic characteristics, SRH, health status and the use of health services.

Details about the survey methodology (sample design, sample size, sampling procedure, consent, ethics, etc.) have been published elsewhere.⁴¹ In brief, the response rate was 82.4% and the total size of the initial sample was 5481 non-institutionalized subjects, aged ≥ 21 years and resident in the Valencian Community (VC), Spanish Mediterranean region. The sample was representative for the VC, and was obtained from a complex sample design. Each subject was weighted according to his/her representativeness, and the weights were included in the HISVC databases provided by the Office of Health Plan (Conselleria de Sanitat of the Valencian Autonomous Government).

The response variable of this study was mortality (dead/alive) over four years of follow-up between 1 January 2006 and 31 December 2009. The results for the response variable were obtained by linking the survey database to the VC Mortality Register. Two hundred and six subjects were excluded from the study because they died in 2005 (28 cases) or could not be linked to the VC Mortality Register (178 cases). As such, the total number of subjects for the analysis was 5275. The main explanatory variable was SRH status, based on the HISVC question: 'Today, how would you rate your health?' (possible answers: very good/good/fair/poor/very poor). Answers were recorded, according to the most common categorization methods,⁴² into two categories: good (good, very good) and poor (fair, poor, very poor). In order to control the possible confounding effect or interaction of socio-economic, demographic context and morbidity on the effect of self-perception, the following explanatory variables with their respective categories were included in the analysis: sex (women, men), age (21–44, 45–64, 65–84, ≥ 85 years),

educational level (primary or lower, higher than primary), employment status (working, not working), self-perceived income level (low, high–medium), country of birth (Spain, other country), presence of chronic disease (yes, no), presence of a disability (yes, no) and use of hospital services in the year preceding the survey (yes, no).

Frequencies and percentages of deaths were calculated for each category of the explanatory variables by sex and for the total sample. Two types of multivariate models were fitted. Firstly, the association of SRH, as the dependent variable, with the other variables was analysed by means of logistic regression models with a binary response ('good/poor health'). To measure the associations between SRH and the explanatory variables, odds ratios (ORs) and their corresponding 95% confidence intervals (CI) were calculated. Next, Poisson regression models with the cumulative rate of death as the response variable were adjusted, controlling for possible overdispersion, in order to analyse the associations between mortality and SRH adjusted by explanatory variables. To measure the associations, risk ratios (RR) of death for the categories of the explanatory variables and their corresponding 95% CI were calculated, both as a simple analysis and as an analysis adjusted by sex and age, and a final model was built after adjustment for all variables. Possible associations between SRH (the main explanatory variable) and the other explanatory variables were analysed. The complex sample design was considered using the weighting of the sample subjects. R 2.12.2 was used for statistical analysis.⁴³

Results

After four years of follow-up, there were 188 deaths (3.6%) among the 5275 individuals in the cohort [99 men (52.9%) and 89 women (47.1%)]. The frequencies and percentages of deaths at the end of the follow-up period, by sex and for the total population, for each of the categories of the explanatory variables are shown in Table 1. In both men and women, there were more deaths in individuals who reported poor SRH, older age, unemployment, primary or no education, self-perceived low income, born in Spain, chronic disease, disability and use of hospital services in the preceding year. Of the 5275 individuals in the sample, 5256 (99.6%) answered the question about their perceived health status; 1364 (25.9%) of these reported their SRH as 'poor' [560 (41.1%) men and 804 (58.9%) women]. When analysed individually and adjusted for age, all explanatory variables were associated with SRH for both men and women, except the country of birth in women. Following joint adjustment for all variables, the presence of chronic disease had the greatest association with poor SRH in both sexes, followed by having a disability in women, and use of hospital services in the preceding year in men (Table 2). This variable was followed by low education, low income and use of hospital services in the preceding year in women. Not working was significantly associated with poor SRH in men, but this association was not significant in women.

Regarding the mortality results, all variables adjusted individually were significantly associated with mortality in

Table 1 – Frequencies and percentages of deaths by sex and for the total population for categories of the explanatory variables.

	Men		Women		Total	
	n	%	n	%	n	%
Self-rated health						
Good	34	1.7	31	1.7	65	1.7
Poor	65	11.4	58	7.1	121	8.9
Age (years)						
21–44	10	0.7	5	0.4	15	0.6
45–64	26	3.3	6	0.8	32	2.1
65–84	50	11.8	48	9.0	98	10.1
≥85	13	50.0	30	41.7	43	44.3
Employment status						
Working	21	1.2	5	0.5	26	0.9
Not working	74	9.8	78	5.1	152	6.7
Educational level						
Primary	84	5.3	86	5.0	170	5.2
Higher	14	1.4	2	0.2	16	0.8
Income level						
Medium–high	50	3.1	27	1.7	77	2.4
Low	39	5.3	42	4.9	81	5.1
Country of birth						
Spain	95	4.3	79	3.5	174	3.9
Other country	0	0.0	4	1.6	4	2.2
Chronic disease						
Yes	88	6.5	82	4.6	170	5.4
No	11	0.9	6	0.7	17	0.8
Disability						
Yes	38	17.1	38	14.3	76	15.6
No	61	2.6	51	2.1	112	2.3
Previous use of hospital services						
Yes	67	5.9	55	3.9	122	4.8
No	32	2.2	33	2.6	65	2.4

men and women, except country of birth and use of hospital services in the preceding year in women (Table 3). Adjustment for age, poor SRH, chronic disease, disability, not working and use of hospital services in the preceding year led to a significant RR for mortality for men; and having chronic disease, disability and low education led to a significant RR for mortality for women. Following adjustment for all variables, chronic disease, disability and not working were the categories with a significant excess risk in men, not including SRH. However, if this latter variable is included in the model, chronic disease and not working lose their significance. Thus, the probability of death among men who reported poor SRH and disability is approximately 6.9 times greater than that among men who reported good SRH and no disability.

In women, if SRH is excluded from the model, disability and low educational level are significant categories. If SRH is included in the model, low educational level loses its significance, but low income becomes significant. The only significant interaction between SRH and the other variables was detected in women for income level, resulting in perceived poor health leading to an increased risk of death in high-income women but not low-income women. The probability of death among women with high incomes with poor SRH and disability is approximately 5.7 times higher than that in women with high incomes with good SRH and without disability.

Discussion

This article reports the results of the first longitudinal study on the associations and predictive role of SRH. This study is based on the follow-up of a general population of Spanish adults (age ≥ 21 years), through data from a health interview survey and mortality results obtained from the local mortality register. This study found that all the variables studied were significantly associated with SRH, both in men and women, except country of birth. Thus, according to the results, the estimated probability of poor SRH for an individual aged 45–64 years (working age) with chronic disease, disability, low educational level, low self-perceived income and who used hospital services in the preceding year is approximately 236.6 times higher in men and 162.5 in women (total adjusted OR obtained as the product of the adjusted OR by changes in each of the variables) compared with an individual aged 21–44 years without chronic disease or disability, high educational level, high self-perceived income and who had not used hospital services in the preceding year. Furthermore, this probability increases 496.9 fold in men that do not work.

This study is consistent with other studies in Spain that have assessed the determinants of SRH and found that older age, unemployment, low educational level, use of health

services in the preceding year and restricted activity were associated with poorer SRH.⁴⁴ Most studies found an association between SRH and health status,^{11,15,16,21,44–46} where the main determinants were chronic disease and functional status. This study found the greatest association between chronic disease and SRH (OR 5.8 in men and 5.6 in women) following adjustment for all variables. These results indicate how these variables may be influencing self-perception of health, as the individual integrates a multidimensional perception of the context and the biological processes on his/her health.

In terms of the association between SRH and mortality, the results showed an RR (adjusted for all variables) of 3.0 (95% CI 1.9–4.8) for men and 2.7 (95% CI 1.1–6.4) for women. These results were consistent with most studies reviewed by Idler and Benyamini,⁷ Benyamini and Idler⁸ and DeSalvo et al.⁹ which showed that individuals with poor SRH had 2–5 times higher risk of death compared with individuals who reported good SRH after 2–13 years of follow-up.

The present results show that SRH has a predictive effect on mortality, even after adjustment for all other variables. Similar results were found in the studies reviewed,^{3,7–9} which showed that SRH remained strongly associated with increased risk of mortality despite the inclusion of functional status, depression, morbidity and other key variables.

Table 2 – Odds ratios (ORs) and 95% confidence intervals (CIs) for categories of the explanatory variables and self-rated health by sex.

	Men						Women					
	Simple analysis		Age adjusted		Analysis adjusting for all variables ^a		Simple analysis		Age adjusted		Analysis adjusting for all variables ^a	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age (years)												
21–44	1		–		1		1		–		1	
45–64	4.1*	3.2–5.2			2.5*	1.8–3.4	3.5*	2.8–4.3			2.0*	1.5–2.5
65–84	8.3*	6.3–10.9			1.7*	1.1–2.7	9.3*	7.4–11.7			3.5*	2.6–4.7
≥ 85	10.6*	4.7–23.8			1.3	0.5–3.4	14.8*	8.8–24.8			5.8*	2.9–11.7
Chronic disease												
No	1		1		1		1		1		1	
Yes	11.5*	8.6–15.3	7.7*	5.7–10.4	5.8*	4.1–8.2	10.3*	7.8–13.6	6.8*	5.1–9.0	5.6*	4.1–7.7
Disability												
No	1		1		1		1		1		1	
Yes	7.8*	5.8–10.5	5.2*	3.7–7.1	2.5*	1.7–3.6	9.0*	6.7–12.0	4.6*	3.3–6.2	3.2*	2.3–4.5
Employment status												
Working	1		1		1		1		1		NS	
Not working	4.6*	3.7–5.6	2.8*	2.1–3.7	2.1*	1.5–3.0	3.5*	2.9–4.3	1.5*	1.2–1.9		
Educational level												
Higher	1		1		1		1		1		1	
Primary	3.2*	2.5–4.0	2.0*	1.5–2.5	1.7*	1.2–2.3	3.9*	3.2–4.8	1.9*	1.5–2.4	1.8*	1.4–2.4
Income level												
Medium–high	1		1		1		1		1		1	
Low	2.3*	1.9–2.8	1.9*	1.5–2.4	1.6*	1.2–2.0	2.4*	2.0–2.8	1.7*	1.4–2.0	1.4*	1.1–1.7
Previous use of hospital services												
No	1		1		1		1		1		1	
Yes	4.0*	3.3–5.0	3.7*	3.0–4.5	2.4*	1.9–3.1	2.5*	2.1–2.9	2.5*	2.1–3.0	1.8*	1.5–2.2
Country of birth												
Other country	1		1		NS		1		1		NS	
Spain	2.7*	1.7–4.1	1.9*	1.2–3.0			1.3	0.9–1.8	0.9	0.7–1.3		

*Statistically significant OR (95% CI) with $P < 0.05$.

^a The final model only included variables with significant adjusted effects.

Table 3 – Relative risks (RRs) and 95% confidence intervals (CIs) for categories of the explanatory variables and mortality by sex.

	Simple analysis		Age adjusted		Analysis adjusting for all variables, including SRH ^a		Analysis adjusting for all variables, except SRH ^a	
	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Men								
Age (years)								
21–44	1		–		1		1	
45–64	4.6*	2.2–9.5			3.0*	1.4–6.4	2.9*	1.3–6.3
65–84	16.6*	8.5–32.5			8.3*	4.0–16.8	4.4*	1.8–10.4
≥85	90.2*	39.8–204.8			35.9*	15.0–85.7	17.4*	1.8–10.4
Self-rated health								
Good	1		1		1		–	
Poor	7.2*	4.8–11.0	3.6*	2.3–5.6	3.0*	1.9–4.7		
Chronic disease								
No	1		1		NS		1	
Yes	7.3*	3.9–13.7	3.0*	1.5–5.8			3.3*	1.5–7.0
Disability								
No	1		1		1	Ref	1	Ref
Yes	7.4*	5.0–11.1	3.2*	2.1–4.9	2.3*	1.5–3.7	2.7*	1.8–4.3
Employment status								
Working	1		1		NS		1	Ref
Not working	8.8*	5.4–14.3	3.0*	1.5–6.0			2.3*	1.2–4.6
Educational level								
Higher	1		1		NS		NS	
Primary	3.7*	2.1–6.5	1.6	0.9–2.9				
Income level								
Medium–high	1		1		NS		NS	
Low	1.7*	1.1–2.6	1.0	0.7–1.6				
Previous use of hospital services								
No	1		1		NS		NS	
Yes	2.7*	1.8–4.2	1.9*	1.2–2.9				
Country of birth								
Other country	No cases		No cases		NS		NS	
Spain								
Women								
Age (years)								
21–44	1		–		1		1	
45–64	2.3	0.7–7.6			1.7	0.5–5.9	1.3	0.4–1.6
65–84	26.3*	10.1–68.4			13.5*	4.9–37.1	12.1*	4.4–33.0
≥85	144.3*	54.1–384.6			44.4*	14.6–134.9	57.8*	20.3–164.8
Self-rated health								
Good	1		1		1			
Poor	4.3*	2.8–6.7	1.3	0.8–2.1	2.7*	1.1–6.3		
Chronic disease								
No	1		1		NS		NS	
Yes	6.6*	2.9–14.9	2.4*	1.1–5.4				
Disability								
No	1		1		1		1	
Yes	7.2*	4.8–11.1	2.1*	1.3–3.2	2.1*	1.3–3.6	2.0*	1.3–3.1
Employment status								
Working	1		1		NS		NS	
Not working	11.8*	4.6–29.8	1.3	0.4–4.2				
Educational level								
Higher	1		1		NS		1	
Primary	24.1*	6.0–97.5	5.6*	1.3–24.0			5.3*	1.2–22.8
Income level								
Medium–high	1		1		1		NS	
Low	2.9*	1.8–4.7	1.3	0.8–2.2	2.7*	1.1–6.4		

(continued on next page)

Table 3 – (continued)

	Simple analysis		Age adjusted		Analysis adjusting for all variables, including SRH ^a		Analysis adjusting for all variables, except SRH ^a	
	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Previous use of hospital services								
No	1		1		NS		NS	
Yes	1.5	0.9–2.3	1.3	0.9–2.1				
Country of birth								
Other country	1		1		NS		NS	
Spain	2.1	0.8–5.6	1.2	0.5–3.3				
Interactions								
High income		–		–				–
Good health					1			
Poor health					2.7*	1.1–6.4		
Low income								
Good health					1			
Poor health					0.8	0.4–1.4		

SRH, self-rated health.
 *Statistically significant RR (95% CI) with $P < 0.05$.
^a The final model only included variables with significant adjusted effects.

For men, only the presence of disability provided additional predictive ability of mortality, although it is important to note that the presence of any chronic disease retained its effect until the introduction of SRH to the model. An association between SRH and income level was found for women; poor SRH was significantly predictive of mortality in high-income women but not in low-income women. These results do not agree with those obtained by Huisman et al.³⁴ in a Dutch cohort study, who found an association between SRH and educational level in men, whereby the predictive effect of SRH on mortality was higher in men with a higher education; this was not found in women. In Spain, Regidor et al.³⁷ also found an association between SRH and education in men but not in women.

The authors believe that the present results are consistent, in general, with a model in which SRH can be identified as a mediator between socio-economic, demographic and health conditions and mortality, remaining strongly predictive of mortality although the information provided by other variables, especially disability and chronic disease, can increase predictive ability.

Limitations and strengths of this study

The process of linking the subjects with the VC Mortality Register could be a limitation, as it may have led to loss of information; however, given that the encoding team had over 20 years of experience in the role, the process was considered trustworthy. Another issue would be loss of subjects during the follow-up period, as subjects may have moved from the region, moved to another community or died. However, this outcome is considered to be unlikely as the sample was selected from legal residents in the community with effective health documentation, and the follow-up period was relatively short. Moreover, deaths outside the community are incorporated into the VC Mortality Register, and would have

been identified during linking. As such, it is considered that any losses during follow-up would have been minor and would have had minimal effect on the results. Another limitation of the study may have been due to the inability to study various explanatory variables that have previously been reported to be associated with SRH, such as measures of social support,^{10,12} psychosocial problems,^{15,45,46} neighbourhood characteristics⁴⁷ and lifestyle.¹⁵

A strength of this study is the sample size and representativeness of the sample for the general population. Moreover, the study population consisted of a non-institutionalized population aged ≥ 21 years with a wide age range. Most previous studies have been conducted among people aged >65 years, and few studies have included such a wide age range. Idler and Benyamini^{7,8} showed that only nine of 56 studies reviewed were performed in a general adult population, while a meta-analysis by DeSalvo et al.,⁹ conducted from 1966 to 2003, showed that only four of 22 cohorts were based on adult populations. Another strength of the present study is the use of HISVC data. This survey was designed and validated to obtain population estimates on the variables studied and had a low non-response rate.

For Spain, it is of concern that the negative assessment of health is increasing over time. This fact, combined with the ageing population, can predict a change in the results of some objective health indicators (mortality, use of services, burden of disease, disability, etc.). Therefore, it is necessary to continue researching the determinants and factors that modify or constrain these associations in order to focus and plan actions to improve the health of different groups of the Spanish population. Likewise, further research on specific causes of death, type and number of chronic diseases, the role of disability and other underlying components that may modify SRH is necessary.

Finally, despite the many advantages of using SRH, the limitations described in the literature about the lack of

knowledge of the mechanisms and ways in which an individual evaluates their health should be highlighted. In this sense, some authors have reported the need to focus future research on better understanding the cognitive and cultural processes by which someone evaluates their health status.^{2,3,7,48,49} Regarding the relationship between SRH and mortality, the scientific community is starting to recognize the contribution of other disciplines in the current discussion (e.g. neurobiology, immunology, neuropsychology, psychoendocrinology, etc.) on the role of body state information, the route of transmission (not conscious) and their inclusion in SRH. This could explain and capture certain information relevant to mortality outcomes that is not captured by other indicators. This process, described in the literature as ‘interoception’, could contribute to the creation of a new information body that is able to avoid ‘conceptual and theoretical vagueness and poor integration of knowledge’.³

In conclusion, by monitoring the HISVC cohort, this study found that SRH is a strong predictor of mortality in a general Spanish population, and should be considered as a mediator between socio-economic, demographic and health conditions and health outcomes. The consideration of other variables such as presence of chronic disease, disability, income, employment status or education should improve the predictive capacity of SRH for mortality. The association between income and SRH in women may indicate a model in which economic level plays a more important role in changing SRH and its effect on mortality than other variables, such as educational level, compared with studies in other countries.

Author statements

Ethical approval

Not required as this study used secondary data derived from a survey undertaken by the Office of Health Plan (Conselleria de Sanitat of the Valencian Autonomous Government) which is the highest authority on health statistics in this region. Ethical considerations were taken into account by this authority.

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Competing interests

None declared.

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