European Review, Vol. 32, No. 2, 150–176

doi:10.1017/S1062798724000097

The Role of Individual Income in Modulating the Impact of Health Determinants: Exploring the Interplay between Socioeconomic Factors and Health Outcomes

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This article analyses the self-perceived health of the population surveyed by the European Health Interview Survey (EHIS), with 316,277 observations. The main novelties of this research are: first, we use the econometric technique of quantile regression, which will allow us to distinguish the respondent's income level. Second, the personal, social, lifestyle and macroeconomic context dimensions of the respondents are considered simultaneously as determinants of self-perceived health. In this way, we will be able to see what the determinants of health are, and whether they vary with income. Finally, it is evident that there are indeed different responses to the same stimulus depending on the level of income, especially in the elasticity of the response, seeing how the higher the income, the more or less the same stimulus influences a person. In addition, it is established that age, nationality and employment status are the most influential variables in self-perceived health.

Introduction

In some cases, self-perceived health is more important than the actual health of an individual, as evidenced by the Placebo Effect, which can improve the health status

of the subject if they perceive that they are being treated, and also the relevance of the attitude of the cancer patient in their healing process, as attested by Vidhya *et al.* (2022). For this reason, we believe it is important to understand the determinants of the self-perceived health of the population, as well as to consider whether it varies substantially according to the individual's income level. In this way, we hope to be able to point out where the focus of attention should be placed with a view to implementing policies that increase the self-perceived health status of the population so that it actually ends up being healthier, and thus improve the country's health system by being able to focus on those people who suffer from ailments that need to be attended to by a professional. And to find out whether these policies would reach the whole population equally or whether those with high income levels would not be influenced by such measures.

The starting questions of this research are the following: (1) what determines the self-perceived health of the European population? As well as (2) does income influence how the different variables affect the individual's self-perceived health status? And, in addition to the determinants established in previous research, the question is posed from a macroeconomic perspective: (3) could we include macro magnitudes as relevant variables of self-perceived health?

In order to answer these questions, we will introduce the issue in context by referring to previous studies. The empirical section will then explain the data we have collected for the research and the analytical techniques employed. Next, the results and discussion will be presented. Finally, the article will conclude with the limitations presented and some brief conclusions.

Background

Since the 1980s, the interest of researchers in studying health inequality has increased. But perhaps the work that best reflects the importance of socioeconomic determinants of health is the one conducted by Stringhini *et al.* (2017). According to these authors, poverty and socioeconomic inequality shorten life more than hypertension, obesity, and excessive alcohol consumption, and they criticize the fact that the World Health Organization (WHO) does not include in its agenda those determinants of health that are as important or more important than others that do form part of its objectives and recommendations.

One of the important issues when conducting this type of study is the choice of the health measure to be analysed (Clarke *et al.* 2002; Ziebarth 2010; Amate-Fortes *et al.* 2020). In this sense, we have decided to use self-perceived health as a measure of health. The reliability of these self-assessments has been found to be as good or better than measures such as functional capacity, chronic diseases, and psychological well-being (Shields and Shooshtari, 2001).

Based on the model developed by Dahlgren and Whitehead (1991), which shows the determinants of health in concentric layers, from structural determinants (external layer) to individual lifestyles (internal layer), with at the centre the

https://doi.org/10.1017/S1062798724000097 Published online by Cambridge University Press

characteristics of individuals that cannot be modified, such as sex, age or constitutional factors, many authors have tried to explain differences in health using socioeconomic factors. Complementarily, Link and Phelan (1995) and Phelan *et al.* (2010) show that social conditions are a fundamental cause of health inequalities. Thus, Nolan and Layte (2014) point out that there is extensive empirical evidence linking socioeconomic status and health outcomes in both children and adults. For adults, the observed socioeconomic status gradient in health status has been found to be robust to the definition of socioeconomic status (income, wealth, education, social class, etc.) and health (mortality, morbidity) (Palloni *et al.* 2009; Stowasser *et al.*, 2011). Data for adults are also consistent within and between countries, at all ages and at all points in the distribution of socioeconomic status (Case and Paxson 2010). Therefore, the economic literature has demonstrated the relationship between socioeconomic status and health, and it is often argued that inequalities in physical health are due to direct or indirect material disadvantages (e.g., chronic environmental stress, health resources, etc.). However, as Garrison and Rodgers (2019) argue, such explanations do not describe finely stratified health differences across the full range of the socioeconomic status gradient. Still, socioeconomic status gradients across the lifespan are crucial to understanding health inequalities in older adults (Harber-Aschan *et al.* 2020).

Shields and Shooshtari (2001) laid the definitive foundations for what are considered to be the fundamental determinants of self-perceived health, these being age, gender, physical determinants such as mobility, pain or chronic conditions as well as socioeconomic factors such as educational level, income and marital status. In later years, these determinants were refined, as is evident in work such as that of Cornelisse-Vermaat *et al.* (2006) where body mass index, being unemployed and smoking, among others, are already included. In this context, we take these variables traditionally understood as determinants of health and apply them to the different quantiles of the sample in order to contrast whether they differ in their effects on different individuals. In general terms, as might be expected, there are relationships contrasted by these and subsequent authors that indicate that as BMI increases, age, and this whole group of variables associated with negative or limiting factors have negative impacts on self-perceived health, while factors such as being married, being employed and having high levels of education are associated with better results on self-perceived health. The topicality of these variables is evidenced in studies such as Tadiri *et al.* (2021) and Su *et al.* (2022).

Likewise, authors such as Fleury-Bahi *et al.* (2015) and Goldberg *et al.* (2015) point out how self-perceived health is influenced by conditioning factors such as exposure to air pollution. In addition, the work of Huang (2020) points out that not only does the situation itself, such as air pollution in this case, have an influence, but also the coverage and treatment given to it in the media. Based on this evidence, this article incorporates macro-magnitudes such as CO_2 emissions as possible determinants of self-perceived health status, in accordance with previous work, as well as the HDI, which reflects the country's level of development, and the Gini index, which indicates the country's level of inequality. With these variables, we aim

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to contrast whether the country's environment influences the individual's self-perceived health through emotions such as empathy in line with studies such as Kirman and Teschl (2010) and Riess (2017).

Another important issue, perhaps less addressed by the economic literature, is the methodology of the empirical analysis. In this article we use quantile regression. This technique is a valuable tool for analysing data that may not fit the assumptions of mean regression and allow the conditional distribution of the outcome variable to be examined across different quantiles, providing a more complete understanding of the relationship between variables.

Considering that most of the works applying this methodology in health study the determinants of health costs (Hu *et al*. 2020; Li *et al*. 2022) and the factors affecting child malnutrition (Sharaf *et al*. 2019; Aheto 2020; Rahman and Hossain 2020), our work aims to further deepen the analysis of the socioeconomic determinants of differences in health, measured through self-perceived health, and using the methodology of quantile regression, which will allow us to study how the effects on health of the analysed socioeconomic determinants vary according to the different income deciles.

Empirical Analysis

Details of where the data were obtained from, and the analysis technique used will be given below to clarify any doubts about the data.

Data

The data used in this article are drawn from The European Health Interview Survey (EHIS). This compact database surveys the population aged 15 years and older in European countries. This article uses EHIS 2, the second wave of the survey, which was conducted during 2013 and 2015 and includes the EU member states as well as Switzerland and Turkey. EHIS 3 was planned to be published in 2021, with surveys starting to be conducted in 2019, however, this was not possible due to the global pandemic caused by COVID-19. Moreover, it is conceivable that the surveys obtained for this latest wave would be contaminated by the health situation, which undoubtedly affects self-perceived health status. For both reasons, because of both unavailability and the intention to study health in a normal context, we consider it appropriate to work with EHIS 2, a version that includes more countries, more variables and is more up to date than EHIS 1, which was conducted between 2003 and 2006.

Macro-magnitudes such as carbon dioxide (CO_2) emissions, the human development index (HDI) and the Gini index have also been included in the analysis. These variables have been extracted, respectively, from the World Bank, UNDP and the Standardized World Income Inequality Database (SWIID) reports published by Solt (2020). It is noteworthy that the data used in this cross-sectional

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Table 1. Descriptive statistics for the first quartile (Q_1).

Variable	Mean	Std. Dev.	Min	Max
SPHS	3.495	1.175	1.000	5.000
Age25-34	0.114	0.317	0.000	1.000
Age35-44	0.139	0.346	0.000	1.000
Age45-54	0.154	0.361	0.000	1.000
Age55-64	0.154	0.361	0.000	1.000
Age65-74	0.154	0.361	0.000	1.000
Age75-84	0.117	0.322	0.000	1.000
Age85	0.033	0.179	0.000	1.000
PeopleHousehold	2.758	1.509	1.000	7.000
CardioDays	1.180	2.021	0.000	7.000
Male	0.424	0.494	0.000	1.000
BMI	26.102	4.955	12.272	81.139
Ncigarette	1.350	7.215	0.000	90.000
EuropeanBorn	0.926	0.262	0.000	1.000
URBANzone	0.592	0.492	0.000	1.000
Spouse	0.473	0.499	0.000	1.000
Education	2.681	1.584	0.000	8.000
Employee	0.322	0.467	0.000	1.000
FluVaccine	2.691	0.545	1.000	3.000
UnitsFrutVeg	4.045	2.617	2.000	160.000
FreqAlcohol	2.485	2.284	0.000	7.000
CO_2	6.408	2.223	3.587	17.346
HDI	0.785	0.155	0.430	0.945
Gini	30.395	3.171	24.700	36.300

Note: All data provided are unweighted averages.

study refer to the mean value of the macro-magnitude for the period 2013–2015, which is the year to which the survey refers. In doing so, we aim to capture the macroeconomic environment in which the individuals find themselves. The absence of GDP per capita is due to the fact that it is included in the HDI, as well as being found indirectly in the survey itself, since one question indicates the respondent's income in relation to the median income of the country and this variable is what classifies the sample into the different quantiles.

Based on the EHIS 2, several variables have been developed that will form the basis of this analysis. Tables 1, 2, 3 and 4 show the descriptive statistics for each of the quartiles into which the sample has been divided. Furthermore, examining these data, we can see that the mean of the *Education* variable (the individual's level of education) is higher as we move from one quantile to the next, i.e., the higher the income, the more educated the individuals. This is intended as a sign that the data show expected results; it does not claim that they have more income because they have a higher level of education, nor that the reason they have a higher level of education is because they have a higher income. In addition, the constructed variables will be specified below.

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Table 2. Descriptive statistics for the second quartile (Q_2).

Variable	Mean	Std. Dev.	Min	Max
SPHS	3.654	1.102	1.000	5.000
Age25-34	0.120	0.324	0.000	1.000
Age35-44	0.155	0.362	0.000	1.000
Age45-54	0.166	0.372	0.000	1.000
Age55-64	0.160	0.367	0.000	1.000
Age65-74	0.169	0.375	0.000	1.000
Age75-84	0.106	0.307	0.000	1.000
Age85	0.027	0.163	0.000	1.000
PeopleHousehold	2.683	1.307	1.000	7.000
CardioDays	1.342	2.061	0.000	7.000
Male	0.454	0.498	0.000	1.000
BMI	26.042	4.629	14.355	81.139
Ncigarette	0.933	6.642	0.000	99.000
EuropeanBorn	0.951	0.216	0.000	1.000
URBANzone	0.643	0.479	0.000	1.000
Spouse	0.560	0.496	0.000	1.000
Education	3.123	1.732	0.000	8.000
Employee	0.463	0.499	0.000	1.000
FluVaccine	2.679	0.561	1.000	3.000
UnitsFrutVeg	4.120	3.041	2.000	170.000
FreqAlcohol	2.746	2.265	0.000	7.000
CO_2	6.449	2.243	3.587	17.346
HDI	0.790	0.153	0.430	0.945
Gini	30.351	3.167	24.700	36.300

Note: All data provided are unweighted averages.

In order to take into account some particular aspects of the individual, the following physical health variables have been designed:

- *Age range*: These variables take the value 1 if the respondent in the household has an age in the range given next to the variable in brackets and 0 otherwise. the age ranges given by EHIS are:
  - Age25-34 (25–34 years old)
  - Age35-44 (35–44 years old)
  - Age45-54 (45–54 years old)
  - Age55-64 (55–64 years old)
  - Age65-74 (65–74 years old)
  - Age75-84 (75–84 years old)
  - Age85 (85 years old and older)

The variable Age15-24 (15–24 years old) is omitted from the analysis to use the youngest segment of the population as a reference when interpreting the results.

- *Male* which will indicate the gender of the respondent, with 1 indicating that the subject is male and 0 otherwise.

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Table 3. Descriptive statistics for the third quartile (Q_3).

Variable	Mean	Std. Dev.	Min	Max
SPHS	3.792	1.065	1.000	5.000
Age25-34	0.138	0.345	0.000	1.000
Age35-44	0.179	0.383	0.000	1.000
Age45-54	0.194	0.395	0.000	1.000
Age55-64	0.182	0.386	0.000	1.000
Age65-74	0.137	0.344	0.000	1.000
Age75-84	0.066	0.249	0.000	1.000
Age85	0.017	0.128	0.000	1.000
PeopleHousehold	2.730	1.226	1.000	7.000
CardioDays	1.496	2.072	0.000	7.000
Male	0.482	0.500	0.000	1.000
BMI	25.852	4.467	12.742	78.367
Ncigarette	0.903	6.546	0.000	80.000
EuropeanBorn	0.959	0.199	0.000	1.000
URBANzone	0.684	0.465	0.000	1.000
Spouse	0.602	0.489	0.000	1.000
Education	3.624	1.849	0.000	8.000
Employee	0.583	0.493	0.000	1.000
FluVaccine	2.697	0.557	1.000	3.000
UnitsFrutVeg	4.121	2.100	2.000	81.000
FreqAlcohol	3.022	2.202	0.000	7.000
CO_2	6.451	2.160	3.587	17.346
HDI	0.794	0.151	0.430	0.945
Gini	30.348	3.184	24.700	36.300

Note: All data provided are unweighted averages.

- *BMI* will inform us of the ratio between the respondent's weight and height, which will give us an approximation of his physical health with respect to his body mass.

In order to situate each individual in the social context, we will take into account the variables:

- *EuropeanBorn* which will take the value 1 if the respondent was born in an EU country, and 0 otherwise.
- *URBANzone* which will take the value 1 if they live in an urban area, and 0 otherwise.
- *Spouse* which will take the value 1 if they live with their partner, and 0 otherwise.
- *Employee* which will take value 1 if the respondent is employed, and 0 otherwise.
- *PeopleHousehold* which will indicate how many people live in the household.
- *Education* which will indicate the level of education and can take the value 0 (kindergarten) up to 8 (doctorate). The intermediate values correspond to having primary education (2), having lower secondary education (3), having upper secondary education (4), having a higher than secondary but not tertiary

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Table 4. Descriptive statistics for the maximum values.

Variable	Mean	Std. Dev.	Min	Max
SPHS	3.938	1.020	1.000	5.000
Age25-34	0.144	0.351	0.000	1.000
Age35-44	0.190	0.392	0.000	1.000
Age45-54	0.212	0.409	0.000	1.000
Age55-64	0.210	0.407	0.000	1.000
Age65-74	0.116	0.321	0.000	1.000
Age75-84	0.046	0.209	0.000	1.000
Age85	0.012	0.109	0.000	1.000
PeopleHousehold	2.621	1.166	1.000	7.000
CardioDays	1.692	2.101	0.000	7.000
Male	0.509	0.500	0.000	1.000
BMI	25.515	4.305	14.041	69.204
Ncigarette	0.708	6.403	0.000	80.000
EuropeanBorn	0.959	0.198	0.000	1.000
URBANzone	0.746	0.435	0.000	1.000
Spouse	0.619	0.486	0.000	1.000
Education	4.435	1.988	0.000	8.000
Employee	0.676	0.468	0.000	1.000
FluVaccine	2.688	0.568	1.000	3.000
UnitsFrutVeg	4.207	2.408	2.000	198.000
FreqAlcohol	3.292	2.153	0.000	7.000
CO_2	6.423	2.189	3.587	17.346
HDI	0.792	0.153	0.430	0.945
Gini	30.368	3.198	24.700	36.300

Note: All data provided are unweighted averages.

education (4), having short-cycle tertiary education (5), having a degree or equivalent (6) and finally the remaining value corresponds to having a master's degree (7).

On the other hand, to find out about the respondent's lifestyle habits, we have:

- *Ncigarette* which counts the number of cigarettes smoked on a regular basis.
- *CardioDays* which counts the number of days in a typical week on which physical sports, fitness or recreational activities that cause at least a small increase in breathing or heart rate for at least 10 minutes continuously are performed.
- *FreqAlcohol* counts the amount of alcoholic beverages consumed in the past 12 months.
- *UnitsFrutVeg* counts the units of fruit and vegetables consumed regularly.
- *FluVaccine* indicates how long it has been since the last flu vaccination, the values being 1 if vaccinated less than 12 months ago; 2 if more than 12 months ago; and 3 if never vaccinated for flu.

Finally, to know the self-perceived health status of the respondent, we have the variable *SPHS* (Self-Perceived Health Status), which takes the following values depending on the self-perceived health status of the respondent: 1 for very bad, 2 for

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bad, 3 for fair, 4 for good and 5 for very good. On the other hand, the variable that will order the quantiles to run the technique will be income. While income is only one dimension of socioeconomic status, we can use it as a good proxy as, according to Shavers (2007), income signifies the consistent influx of financial resources throughout a specific timeframe. Individuals with higher income levels are more inclined to possess the financial capacity to cover healthcare expenses and access superior nutrition, such as a wider assortment of fresh fruits and vegetables. Additionally, they have the means to secure better housing, education, and recreational opportunities. Advocacy of income as a valid measure of socio-economic status can also be found in Galobardes *et al*. (2006), Do (2009), Kim (2011) and Hoff and Laursen (2019).

Once all the variables have been presented, it is clarified that there are no problems of missing data in the regression because only data from those respondents who have provided complete information have been used for the estimation of the EHIS. There are some missing data with respect to the BMI variable, but since it is a control variable rather than a fundamental variable in the analysis and there is still enough information available for the results to be efficient, no additional actions have been taken.

Estimation Technique

The analysis technique used in this paper will be quantile regression, also known as least-absolute-value models (LAV or MAD) and minimum L1-norm models. This technique was introduced in the statistical community mainly by Koenker and Hallock (2001) and allows us to analyse how the effects of the explanatory variables change on the dependent variable as we move through the different percentiles into which the analysed sample is divided. Although there are few studies, quantile regression has been used successfully in medical research (Arenz *et al*. 2004; Harder *et al*. 2005; Owen *et al*. 2005; Beyerlein *et al*. 2008). In all these cases, the authors showed the importance of performing the analyses through percentiles rather than through mean values (Beyerlein 2014). Likewise, tests have been run to verify that the results will be efficient and have been adequately passed. Table 5 shows the VIF of the variables that show that the results will be valid because they are less than 5, and therefore, it is assumed that there are no collinearity problems that could perturb the estimates.

The objective of quantile regression is the same as ordinary least squares (OLS) linear regression, i.e., to model the relationship between the variables analysed. However, unlike OLS estimation, quantile regression allows the possibility of estimating different regression lines for different quantiles of the endogenous variable. The quantiles we will estimate are $\theta = 0.25$; $\theta = 0.5$; and $\theta = 0.75$. Thus, the model specification is presented in equation (1):

$$Y_i = X_i \beta_\theta + u_{\theta i} \tag{1}$$

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Table 5. Variance Inflation Factors (VIFs).

Variable	VIF	1/VIF
Age55-64	4.69	0.213
Age45-54	4.34	0.230
Age65-74	4.30	0.232
Age35-44	4.00	0.250
Age25-34	3.07	0.326
Age75-84	2.65	0.378
Employee	1.79	0.559
PeopleHousehold	1.51	0.662
Spouse	1.40	0.713
Age85	1.33	0.752
Gini	1.26	0.795
Education	1.23	0.810
CO_2	1.18	0.849
FluVaccine	1.17	0.854
HDI	1.16	0.863
FreqAlcohol	1.15	0.872
BMI	1.14	0.874
Male	1.14	0.876
CardioDays	1.13	0.886
Ncigar	1.06	0.941
UnitsFrutVeg	1.04	0.958
URBANzone	1.03	0.969
EuropeanBorn	1.01	0.987
Mean VIF	1.9	

where, Y_i is the endogenous variable, X_i represents the matrix of exogenous variables, β_θ is the parameter to estimate corresponding to the quantile θ and $u_{\theta i}$ is the random disturbance corresponding to the quantile θ. Analogous to the OLS estimation technique, which states that $E(y_i|x_i) = X_i\,\hat{\beta}_{\mathrm{OLS}}$ and hence that $E(u_i|X_i) = 0$, in quantile regression it is assumed that $Quant_\theta(y_i|x_i) = X_i\,\beta_\theta$ which implies that $Quant_\theta(u_{\theta i}|x_i) = 0$, this being the only assumption made about the random perturbation in this technique. In parallel to the way quantile regression is approached from the OLS technique, its problem can be posed from the same technique. After its development, the parameter estimation problem in quantile regression is expressed as in (2):

$$\text{Min } \beta_\theta \in \mathbb{R}\left[\sum_{Y_i \geq X_{i\beta_\theta}} \theta|Y_i - X_i\,\beta_\theta| + \sum_{Y_i \geq X_{i\beta_\theta}} (1-\theta)|Y_i - X_i\,\beta_\theta|\right] \qquad (2)$$

In this way, it is easy to see how what is done is a minimization of the absolute deviations weighted with asymmetric weights, i.e., each deviation corresponding to observation *i* is given more or less weight depending on the quantile whose regression line is being estimated. The advantage of using absolute values instead of squared deviations is that outliers do not alter the estimation so much, since it penalizes the

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errors linearly, whereas other techniques such as OLS increase the importance of outliers that increase the errors quadratically by squaring the errors. This characteristic of quantile regression makes it especially useful when the data have some kind of censoring, as in this case of the income variable, since what is really relevant is whether the estimated value is above ($y_i < X_i \beta_\theta$) or below ($y_i \geq X_i \beta_\theta$) the real data, not its magnitude. With reference to the introduction of asymmetric weights, taking into account that several regression lines passing through different points of the distribution will be estimated, the function of the asymmetric weights is precisely to place these different lines by weighting differently the positive and the negative residuals.

The equation to be estimated is as follows:

$$\begin{aligned} SPHS_i = {} & \alpha + \beta_1^\theta Age25-34_i + \beta_2^\theta Age35-44_i + \beta_3^\theta Age45-54_i + \beta_4^\theta Age55-64_i \\ & + \beta_5^\theta Age65-74_i + \beta_6^\theta Age75-84_i + \beta_7^\theta Age85_i + \beta_8^\theta Male_i + \beta_9^\theta BMI_i \\ & + \beta_{10}^\theta EuropeanBorn_i + \beta_{11}^\theta URBANzone_i + \beta_{12}^\theta Spouse_i + \beta_{13}^\theta Employee_i \\ & + \beta_{14}^\theta PeopleHousehold_i + \beta_{15}^\theta Education_i + \beta_{16}^\theta Ncigarette_i + \beta_{17}^\theta CardioDays_i \\ & + \beta_{18}^\theta FreqAlcohol_i + \beta_{19}^\theta UnitsFrutVeg_i + \beta_{20}^\theta FluVaccine_i + \beta_{21}^\theta CO_{2i} \\ & + \beta_{22}^\theta HDI_i + \beta_{23}^\theta Gini_i + \varepsilon_i^\theta \end{aligned}$$

where θ defines the quantile for which the estimation is being performed; i denotes the individual to which the data belong and ε_i^θ is the model error term of the same quantile.

This equation will then be estimated using the logistic regression conditional on each quantile. This regression will allow us to perform a robustness analysis on the data obtained previously in the quantile regression, although it will be less powerful because it will not use all the data available in the quantile regression, which uses all the data even if it is only providing results for one of the quantiles. Likewise, for logistic regression a binary variable is needed. For this reason, for the logistic regressions, the variable *SPHSbi* will be used, which will be a binary version of *SPHS*. This binary version of *SPHS* (*SPHSbi*) will take the value 1 if the original *SPHS* variable takes the value 4 (good) or 5 (very good) and zero otherwise.

Results

The results shown in Table 6 are notable for being consistent with what is expected for each variable and the quartile to which it refers. That said, it should be noted that the coefficient of determination is low, which implies that there are effects that are not captured by all the variables included in the model. Nevertheless, the individual variables are significant, so that we can affirm that there is a relationship between them and self-perceived health and therefore serve as a basis for drawing conclusions. In addition, the constant term of the regression shows positive results and is considerably higher than the other coefficients, which indicates that individuals tend

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Table 6. Estimation results for each quartile.

	Estimation	0.25-quantile		0.5-quantile		0.75-quantile	
	SPHS	Estimates	*t*	Estimates	*t*	Estimates	*t*
Physical Health	*Age25-34*	–0.443***	– 7.18	–0.551***	–6.74	–0.250***	–2.48
	Age35-44	–0.697***	11.45	–0.857***	–10.62	–0.797***	–8.01
	Age45-54	–1.061***	17.31	–1.327***	–16.33	–1.394***	–13.93
	Age55-64	–1.150***	18.16	–1.541***	–18.35	–1.645***	–15.90
	Age65-74	–1.105***	15.37	–1.560***	–16.37	–1.628***	–13.88
	Age75-84	–1.178***	11.72	–1.622***	–12.18	–1.957***	–11.93
	Age85	–1.031***	–3.60	–1.776***	–4.68	–1.935***	–4.14
	Male	0.052**	1.85	0.088**	2.35	0.087**	1.88
	BMI	–0.017***	–5.72	–0.032***	–8.09	–0.044***	–9.07
Social context	*EuropeanBorn*	0.192***	3.12	0.294***	3.59	0.303***	3.02
	URBANzone	0.033	1.22	0.042	1.15	0.024	0.55
	Spouse	0.031	1.04	0.087**	2.21	0.119**	2.46
	Employee	0.293***	9.63	0.388***	9.64	0.380***	7.66
	PeopleHousehold	0.027**	2.42	0.031**	2.12	0.002	0.12
	Education	0.056***	6.79	0.087***	8.01	0.089***	6.62
Lifestyle habits	*Ncigarette*	–0.003*	–1.70	0.000	–0.14	0.003	0.97
	CardioDays	0.041***	6.40	0.078***	9.26	0.098***	9.35
	FreqAlcohol	0.041***	6.61	0.054***	6.56	0.057***	5.61
	UnitsFrutVeg	0.016**	2.28	0.000	0.04	0.017	1.50
	FluVaccine	0.014	0.32	0.024	0.42	0.067	0.95
Macroeconomic environment	CO_2	0.006	0.98	–0.005	–0.63	–0.013*	–1.36
	HDI	0.005	0.06	0.063	0.53	0.412***	2.81
	Gini	0.000	0.03	–0.009	–1.50	–0.011*	–1.63
	Intercept	6.045***	24.75	7.222***	22.30	8.316***	20.86
	R^2	0.0733		0.0963		0.1031	

Note: * Significant at 10%; ** significant at 5%; *** significant at 1%.

to claim that they have very good levels of self-perceived health. This can also be seen in Tables 1, 2, 3 and 4 of descriptive statistics, where the mean of the SPHS variable ranges from 3.49 to 3.9 in a variable that ranges between 0 and 5. Likewise, the frequency of the variable *SPHS* has been calculated and by adding the percentages of categories 4 and 5 (42.61% and 21.93% respectively) we can affirm that 64.54% of the population believe they have a good level of self-perceived health or higher. On the other hand, 11.91% say they have a poor state of health. And the rest, 23.55%, remain in a state of neutrality.

Table 6 also shows the results of the robustness analysis in which the same equation used in the quantile regression is estimated, but this time using a logistic regression conditional on the data belonging to individuals of a certain quantile. Although these estimates also show significant results, they use only the data resulting from segmenting the data by quartiles, in contrast to what occurs in quantile regression where, although only one quantile is being calculated, all the data are taken into consideration. These regressions will be used to contrast the results obtained through quantile regression.

https://doi.org/10.1017/S1062798724000097 Published online by Cambridge University Press

Discussion

From Shields and Shooshtari (2001) to Cohen and Flood (2022) there is a consensus that people tend to feel less healthy as they get older. This perception is captured by the variables: *Age25-34*, *Age35-44*, …, *Age85*. This set of variables, which is significant in all the quantiles, includes the age brackets of the sample, omitting *Age15-24*, which corresponds to the youngest bracket. In this way, it is interpreted that the older the subject is, the less self-perceived health they report in the survey in general terms. This is mainly due to the following reasons: accumulation of health problems (Idler and Benyamini 1997), increased awareness of health limitations (Jylhä 2009) and shifting comparative standards, i.e. older adults may compare their health status with that of younger, healthier people, leading them to perceive a deterioration in their health (Schnittker and Bacak 2014). Finally, taking into account the coefficients obtained for the age variables, which are among the highest in absolute value, it can be seen that age is one of the most important determinants for approximating the self-perceived health of a subject.

The variable *Male* is significant in the whole sample, concluding that as a rule men report higher levels of self-perceived health than women. This occurs because women tend to value aspects related to their physique more than men, generating complexes and fears that men develop less or do not suffer from. This fact has been evidenced in other studies such as that of Godoy-Bermúdez *et al.* (2022) in which they also point out that women, unlike men, do not feel disadvantaged by being unemployed. Furthermore, according to Danylova (2020), and linking this variable to the next one, exposure to visual media presents an idealized concept of beauty that can have a detrimental impact on one's self-perception. The beauty industry's emphasis on youth and thinness contributes to a negative body image, leading to increased dissatisfaction among both women and men, albeit with a greater impact on women. Danylova (2020) argues that the internalization of modern standards of female beauty, centred on youthful appearance, hampers women's psychological development and creates internal conflicts that disrupt the harmony of the psyche. This disintegration of self-image gives rise to profound contradictions. In addition, the *Male* variable also has a coefficient that is not negligible compared with the others, which shows that age and sex, factors that are given to us and that we cannot confront, such as the passage of time, have a great impact on our self-perceived health, according to pioneering studies such as those by Shields and Shooshtari (2001) and Cornelisse-Vermaat *et al.* (2006) or the more recent studies by Tadiri *et al.* (2021) and Su *et al.* (2022). Finally, it can be seen that for the 0.25-quantile the coefficient is 0.052 while for the 0.5-quantile and 0.75-quantile it is 0.088 and 0.087 respectively. Showing that men with more income feel healthier than their lower-income counterparts, therefore, it is beginning to be intuited that people with more income show better levels of self-perceived health. Furthermore, although our results highlight these differences, it is worth noting that the issue of gender differences in health is truly complex. Studies such as Schmitz and Lazarevič (2020) assert that, in general, the presence of a health gap between men and women cannot be considered

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a universal finding, as the gap tends to widen, shrink, or even reverse with age, depending on the indicator and the country. Additionally, decades ago, Macintyre *et al*. (1996) concluded that sex differences in morbidity were not a generic issue either; it was important to differentiate between psychological disorders and physical conditions, as these influenced females differently. Finally, Bambra *et al*. (2021), in relation to COVID-19, once again reaffirm that although women are more likely to be diagnosed with COVID-19, it is men who have a higher mortality rate. In conclusion, this variable in this study aims to be a control variable rather than a study focused on gender differences, as the issue of gender differences in health deserves its own investigation.

As can be foreseen before starting the analysis, the *BMI* variable reports negative and significant results in the whole sample, i.e., the more obese a person is, the less self-perceived health they report in the surveys. This validates that society knows and feels that obesity is a problem for the health of the individual, as well as a risk factor for a multitude of diseases as attested by Samadoulougou *et al*. (2022), who highlight that obesity is often associated with disorders related to depression and anxiety. This is also influenced by Danylova's (2020) beauty industry, in which people with higher BMIs are those furthest removed from modern standards of beauty. Finally, the coefficient associated with BMI increases as the wealth quantile increases, with coefficients –0.017, –0.032 and –0.044 from the lowest to the highest income. Therefore, it is shown that the penalty on self-perceived health with respect to BMI is greater as income increases. Thus, being overweight or obese is more stigmatizing for people with high income.

The variable *EuropeanBorn* shows positive results across the whole sample, showing evidence in favour of respondents born in an EU country, regardless of whether they reside in their country of birth or in another European country, feeling healthier than respondents who were not born in an EU country. Moreover, the difference in self-perceived health increases as income increases. Thus, in the first quantile, Europeans report 0.19 more points than non-Europeans, while in the third quantile, the difference is 0.30. This division between Europeans and non-Europeans in self-perceived health that is reaffirmed in this article was already exposed a decade ago by Nielsen and Krasnik (2010). In the Nielsen and Krasnik (2010) study it was also found that immigrants and minority ethnic groups had systematically lower self-perceived health regardless of age, gender and other socioeconomic factors. It should also be noted that this variable is the second most relevant variable in terms of magnitude in determining the respondent's self-perceived health. Finally, Nappo (2022) points out that this is based on job security, which reduces the likelihood of claiming good health, assuming that immigrants have less job security than natives of European countries. Also, immigrants in particular are the most exposed to discrimination owing to possible cultural clashes and language barriers to communication, in addition to the fact that these immigrants have other unfavourable conditions compared with natives, such as not living with their whole family and not feeling the social support of their environment.

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Despite what was expected, the variable *URBANzone* has turned out to be non-significant, so we cannot draw any conclusions. However, this variable has not been omitted from the regression because it is useful to control for where the population lives to improve the explanatory power of the other variables in the model.

Contrary to the findings of Shields and Shooshtari (2001) in their study, the *Spouse* variable shows that those who live with their partner perceive greater self-perceived health, except for those in the first wealth quantile, who do not show significance in this variable. These results also reaffirm the work of Saravanakumar *et al.* (2022) and build on the evidence shown by Su *et al.* (2022) that married individuals generally report higher satisfaction than single individuals. This is because, as postulated by Umberson *et al.* (2010), marriage often provides social support and a sense of emotional well-being, which can positively influence a person's overall health and well-being. This study expanded on the work of Williams and Umberson (2004) in which they argued that married people may also have access to shared resources and greater economic stability, which may contribute to improved health outcomes. Moreover, as with the previous variables, income amplifies the effect of the variable, with a coefficient of 0.087 for 0.5-quantile and 0.119 for 0.75-quantile. Thus, there is a higher correlation between living with a partner and self-perceived health among people with higher income.

Similarly, *Employee* also shows positive coefficients, i.e., individuals who are employed report higher self-perceived health. This is explained by the fact that it is more socially acceptable to have a job, and that it can be a source of motivation and self-improvement. Thus, those who work are in better health than those who are not at work, who may feel useless and depressed, as well as burdened by economic problems and survival methods. These results are supported by previous studies such as Godoy-Bermudez *et al.* (2022) or Tattarini and Grotti (2022). In addition, this is the most important variable due to its magnitude in determining the self-perceived health of the individual for the reasons given above. This variable is one of the most relevant in determining self-perceived health in our regression because it shows the highest coefficient in absolute value, even higher than the coefficients for age and gender. For the 0.25-quantile the coefficient is 0.29 while for the 0.5-quantile and 0.75-quantile the coefficient is 0.38. Thus, being employed is associated with higher levels of self-perceived health for those with higher levels of income, probably due to the economic stability it provides, among other factors.

Next, we have the variable *PeopleHousehold* which captures how many individuals the respondent shares the household with. This variable is significant for the first (with a coefficient of 0.027) and second (with a coefficient of 0.031) quartiles, so it can be deduced that people with high purchasing power do not feel their health is increased by living with more people. This effect, which is found in people with less wealth, may be justified by the security and support provided by having support people nearby. According to Shields (2008) people who are socially isolated or have few connections are more likely to suffer from physical and mental ailments, and therefore to die prematurely. For this reason, this ratio could be a case of self-perceived health being enhanced by social interaction since, remember,

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humanity is social by nature, and this helps us to feel better, as recently reaffirmed by Saravanakumar *et al.* (2022).

Education shows standard results that those with higher levels of education are expected to report higher levels of self-perceived health to the extent that they are likely to feel more well-being than those with lower levels of education. We find that for the 0.25-quantile the coefficient is 0.056 while for the 0.5-quantile and 0.75-quantile the coefficients are 0.087 and 0.089, respectively, i.e. again we find the amplifying effect of income on the determinants of self-perceived health. These results are supported by Kaleta *et al.* (2006) who specifically found that women with primary education are 2.5 times more likely to have a poor self-perceived health status than women with a university education. Recently, Wärnberg *et al.* (2021) have generalized for both men and women that lower levels of education are associated with poorer self-perceived health status. It should be noted that this variable, more than any other, should be taken with caution, since causality is bidirectional, not only are those who have a higher level of education more likely to obtain highly paid jobs, but also those who belong to families with high purchasing power are more likely to offer a high level of education to their descendants, so this variable would require a study of its own that covers it in greater depth with other techniques that allow this relationship to be better clarified.

With respect to the variable *Ncigarette*, as expected, it shows negative results on self-perceived health as Axon *et al.* (2022) point out. This result is evident from the fact that the harmful effects of smoking on health are well known, as medical studies have shown, as pioneered by Fielding (1985) and more recently claimed by Schäfer *et al.* (2022). However, this coefficient is significant only for individuals in the first quantile, perhaps because they do not have sufficient income to afford a better diet to subtly mitigate its effects. Even so, the coefficient that is significant has the smallest value of all of Table 6, this value being –0.003. So, a priori, although smoking is a factor to be taken into account in self-perceived health, its impact is less than that of other determinants.

Likewise, *CardioDays* shows that, except for individuals in the third quantile, those who engage in physical sporting activities feel healthier, and this feeling increases the more days they practise these activities, as Lamb *et al.* (1990) pointed out and has been contrasted by later authors such as Piko (2000) and Alić *et al.* (2021). Thus, we find that for the 0.25-quantile the coefficient is 0.041 and for the 0.5-quantile the coefficient is 0.78, so that for middle-income individuals sporting activity seems to offer better results in terms of self-perceived health, and this difference may be due to the fact that those with higher incomes practise this sport activity with better equipment, which improves their perception. Based on the value of the coefficients of this variable when compared with the others, it is evident that doing physical activities that increase the heart rate has a great influence on the self-perceived health status of the individual, since the coefficients are among the highest in the 0.25-quantile and 0.5-quantile. In quantile three, where the coefficient is not significant, we could think that less sporting activities are practised at a general level and for this reason this effect is not included.

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The alcohol consumption variable *FreqAlcohol* is certainly unexpected according to common sense, since it significantly indicates that the higher the frequency of drinking alcohol, the higher the self-perceived health, with this effect increasing as the individual's wealth increases (from the lowest to the highest income level, the coefficients obtained are 0.041, 0.054, 0.057, 0.058, 0.058 and 0.059). This observation can also be found in Olsson *et al.* (2022) where they find that alcohol consumption is associated with an improvement in self-perceived health. However, as Samadoulougou *et al.* (2022) point out, alcohol consumption is a risk factor for obesity, i.e., for having a high body mass index, which has been shown to have a detrimental effect on self-perceived health. It may be the case that alcohol consumption, discounting its effects on the individual's weight, does report health satisfaction, especially among higher-income individuals, who can afford higher-priced alcoholic beverages, which may lead them to believe that they are healthier than their cheaper analogues.

With respect to diet, the *UnitsFrutVeg* variable indicates that those who eat more units of fruit and vegetables feel healthier, as Martins *et al.* (2022) report in the first quantile of wealth (with a coefficient of 0.016). This observation is to be expected were it not for the fact that in the second and third quantile the result is not significant, perhaps because the diets of wealthier people are more varied and they not only feel healthier for eating fruit and vegetables, but also other foods such as fish, and other foods that are not considered fruit or vegetables, such as chia or oats. This would be in line with Jayawardena *et al.* (2020) who argue that self-perceived health will increase with all foods contributing to a balanced nutritional status. In order to incorporate dietary issues into self-perceived health in a more accurate way, a study focused on these issues would be required, as food will undoubtedly influence our perception of our health, and considering only fruit and vegetables is an approximation given by the database used.

The *FluVaccine* variable, indicating how long it has been since the last dose of flu vaccine, was positive but not significant, so we cannot be sure that those who are vaccinated against flu report higher levels of self-perceived health, the most we can surmise is that the vaccinated group are more actively concerned about their health than those who are not vaccinated, either willingly or because of a need arising from a personal condition such as diabetes or asthma. The study by Davis and Geneus (2016) shows that those with physical limitations or non-mental health conditions are more likely to be vaccinated against influenza.

Finally, the variables CO_2, *Gini* and *HDI* only show significant results in the third quantile, i.e., it can be stated that only individuals with higher income are affected by the macroeconomic situation of their country on their self-perceived health. That said, as expected, CO_2 emissions with a coefficient of –0.013 and economic inequality with a coefficient of –0.011 will be felt as a loss of self-perceived health. while living in a country with high levels of human development (i.e., the HDI results with a coefficient of 0.412) is linked to higher levels of self-perceived health. Similar evidence can be found in Prędkiewicz *et al.* (2022) where they point out that there is indeed a relationship between macroeconomic conditions and population health.

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Thus, if we assume that individuals with higher incomes are the owners of businesses, a good economic situation with high levels of development in a stable welfare state will have a positive impact on their entrepreneurial activity, and this will be reflected positively in their self-perceived health status. For this reason, we believe that in particular for the 0.75-quantile regression, the coefficient associated with HDI is higher than that of being employed, because the income of this group is more related to the macroeconomic environment, either because they are the owners or top managers of the companies that provide them with income, hence the link between macrovariables and self-perceived health is greater, and in particular with the country's level of development.

In addition to the above, which attempts to explain the results obtained from the quantile regressions shown in Table 6, Figure 1 shows the individual plots of each of the estimated coefficients of the regression variables along the different quantiles ordered with respect to wealth. In other words, instead of showing the coefficient for one point of income, the whole progression of the same coefficient with respect to income is shown. Since the results have been discussed and contrasted with previous studies in the paragraphs above, some observations that are provided by Figure 1 and cannot be gleaned from the interpretation of the coefficients alone will be highlighted below.

From these graphs, the shape of the coefficients for the *age* variables is striking. They all have convex shapes whose inflection point shifts further to the right, i.e. they show higher levels of wealth in order to be able to take off in terms of self-perceived health. We think that this is due to the stress factor, because the older the person, the greater the amount of income needed to satisfy basic needs such as the household, support the family, especially if the family is made up of children, etc.

With the variable *Male* in general terms, men report greater self-perceived health than women, especially at higher income levels, which could be due to the fact that women with higher income levels probably feel that they sacrifice motherhood in order to be able to fulfil their working hours effectively. It is also noteworthy that at higher income levels, the levels of self-perceived health of men and women seem to converge.

With respect to the BMI variable, a sinusoidal shape is found which indicates that those with lower income levels are more penalized by suffering from obesity problems than their higher income counterparts, who do not seem to feel as disadvantaged by having a high body mass index.

The variables *EuropeanBorn*, *URBANzone*, *PeopleHousehold* and *FluVaccine* seem to show the same behaviour regardless of income, all of them having a large margin of error.

The *Spouse* and *Employee* variables have the same behaviour, people with low-income levels report very high self-perceived health and then the level decreases, stagnates and remains constant. Both confirm that people with lower income levels are more vulnerable and require social support and economic stability to feel secure compared with those with higher incomes, who are less dependent on their jobs or have more stable jobs and feel more secure.

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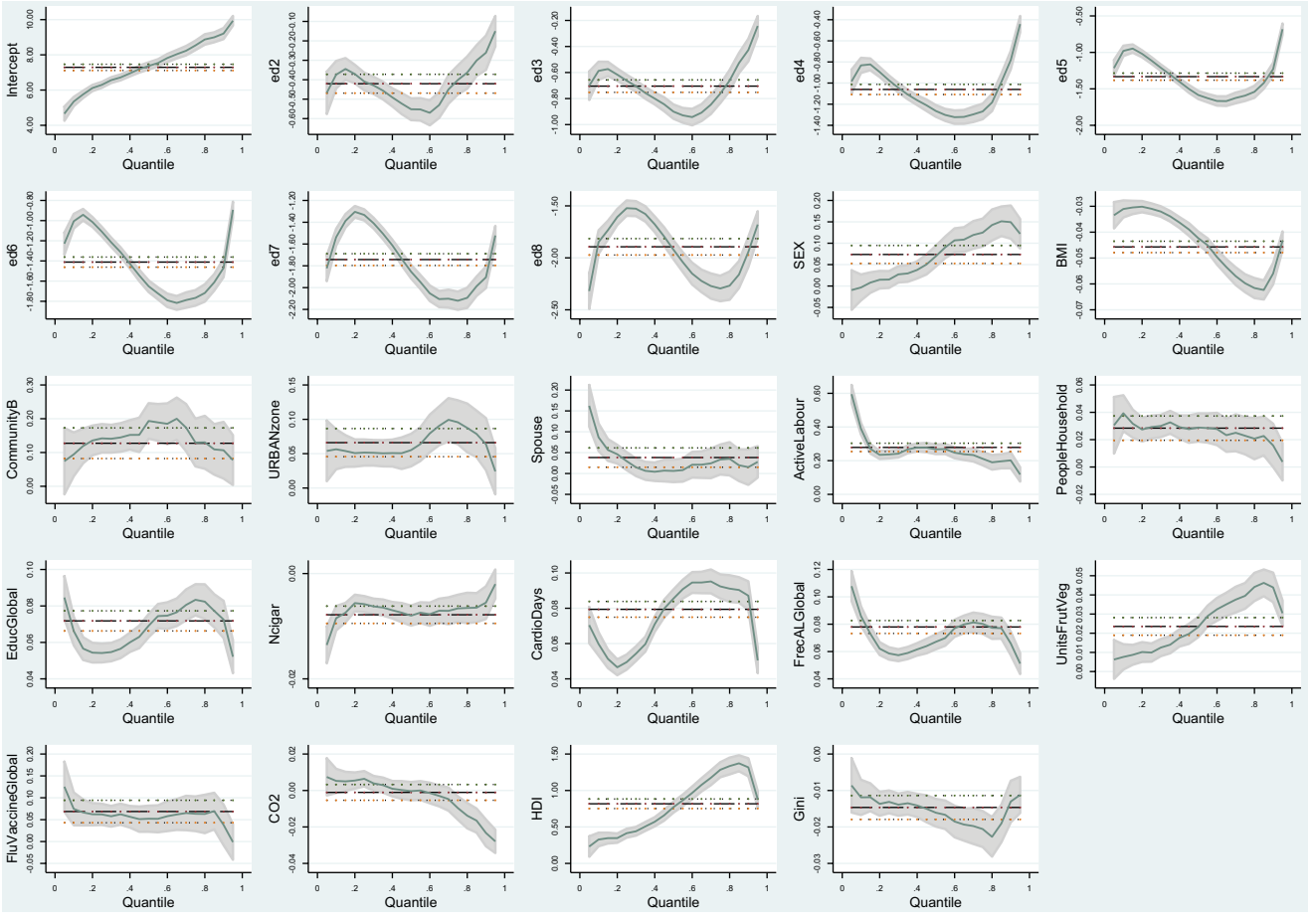

Figure 1. Graphs of the quantile regression coefficients.

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Table 7. Logistic regression for each quartile.

	Estimation	0.25-quantile		0.5-quantile		0.75-quantile	
	SPHSbi	AME	$P > z$	AME	$P > z$	AME	$P > z$
Physical Health	*Age25-34*	–0.093***	–6.46	–0.087***	–3.96	–0.095***	–4.26
	Age35-44	–0.169***	–12.45	–0.172***	–8.33	–0.170***	–7.96
	Age45-54	–0.277***	–21.02	–0.273***	–13.45	–0.233***	–10.99
	Age55-64	–0.352***	–26.92	–0.349***	–17.5	–0.312***	–14.9
	Age65-74	–0.356***	–26.68	–0.356***	–17.72	–0.333***	–15.53
	Age75-84	–0.417***	–29.85	–0.442***	–21.15	–0.424***	–18.62
	Age85	–0.436***	–22.12	–0.518***	–17.4	–0.472***	–14.31
	Male	0.015**	2.53	0.014*	1.83	0.009	1.27
	BMI	–0.010***	–17.38	–0.012***	–15.09	–0.012***	–16.08
Social context	*EuropeanBorn*	0.032***	2.8	0.058***	3.47	0.061***	3.64
	URBANzone	0.021***	3.73	0.019***	2.68	0.018**	2.51
	Spouse	0.012***	1.85	0.005	0.57	–0.010	–1.23
	Employee	0.082***	12.37	0.075***	8.35	0.051***	5.92
	PeopleHousehold	0.014***	5.76	0.008***	2.38	0.015***	4.5
	Education	0.016***	8.83	0.014***	6.65	0.016***	8.27
Lifestyle habits	*Ncigarette*	–0.002***	–5.32	–0.001**	–2.07	–0.002***	–3.32
	CardioDays	0.019***	15.62	0.016***	10.23	0.016***	10.39
	FreqAlcohol	0.019***	15.12	0.020***	12.18	0.019***	12.04
	UnitsFrutVeg	0.006***	4.35	0.008***	4.29	0.008***	4.45
	FluVaccine	0.018***	2.59	0.003	0.35	0.028***	3.27
Macroeconomic environment	CO_2	0.005***	3.79	0.000	0.27	0.004**	2.54
	HDI	0.249***	13.77	0.209***	8.91	0.244***	10.93
	Gini	–0.005***	–5.32	–0.007***	–5.56	–0.007***	–5.99
	Count R^2	70.10%		70.47%		72.50%	
	Pearson	0.1455		0.0429		0.0093	
	ROC Curve	0.7651		0.7605		0.7546	

The *Education*, *CardioDays* and *UnitsFrutVeg* variables also show similar behaviours, showing that those with low purchasing power do not show good levels of self-perceived health due to these factors, i.e., if you have a low-income level, having an education, practising sport and eating healthy will not give you high levels of self-perceived health, perhaps because you long for a better economic situation. The opposite is true for those on middle and high incomes, who do enjoy high levels of self-perceived health due to these factors. This is until they reach the highest incomes, who again stop valuing these variables to assess their self-perceived health.

Finally, the macroeconomic variables: CO_2, *HDI* and *Gini* report levels close to 0 for low incomes and their effects are clearly perceived for high income levels, reaffirming what was previously stated in Table 6.

Robustness Analysis

The results of the robustness analysis are shown in Table 7. As evidenced by the tests performed (Count R^2, Pearson test, ROC curve) the results of the logistic regression are suitable, since the Pearson test is significant, and both the count R^2 and ROC curve show that the model fit is good.

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With respect to the coefficients obtained for each of the variables, once again the same results were found as those shown above using quantile regression. In this way, the results obtained by changing the study technique are seconded, being able to offer greater plausibility in the results discussed above. In other words, our conclusions would not change in spite of changing the study technique, once the pertinent tests have been carried out and it has been shown that both techniques offer appropriate results.

Limitations

This study is based on surveys collected in The European Health Interview Survey (EHIS), which is undoubtedly a large sample to work with, and is based on interviews, which guarantees reliable information and reasonable results. However, precisely because the data are obtained through surveys and are not directly observable, it must be recognized that there is a certain margin of error in that the answer given by the survey may differ somewhat from reality. However, it is assumed that respondents have been rational and sincere, so this bias should be minimal considering that we have worked with 316,277 observations.

Another limitation of the data is that there are no questions in the EHIS that collect information on whether the individual suffers or has suffered from stress or anxiety. These two disorders are very frequent in today's society and undoubtedly have consequences on health and, of course, on self-perceived health as attested by authors such as Chen *et al.* (2016), Mangrio *et al.* (2020), Buneviciene *et al.* (2022). Therefore, not having these variables in our study is a limitation that we hope will be solved in the future by adding this type of question to the surveys.

On the other hand, limitations can be found in the approach taken in the analysis. Our analysis focuses on universal patterns at the European level, which is why we have taken the 'inside–outside' approach to the population, so we do not take into account the country of residence of the individual, only whether they are European or not (living in the same country of birth or in another European country). This limitation opens the way to future lines of research focused on studying patterns in more limited geographical areas or centred on a single country. In addition, the analysis technique, i.e. quantile regression, like other statistical methods, cannot establish causal relationships on its own. It is a very powerful technique for exploring associations between variables and identifying how they vary across different quantiles of the outcome variable but does not intrinsically establish causality.

Finally, the last limitation is that this study is based on surveys that have been carried out exclusively in European countries, and these results could be different if the surveys had been obtained from countries in Africa, Asia, or the Americas.

Conclusions and Policy Implications

Our results show that the main determinants of an individual's self-perceived health are age, nationality, and employment status, with those having the highest

self-perceived health being young people born in EU countries who are part of the country's working population. In addition, although less relevant, it is evidenced that women, as a general rule, tend to feel less healthy. However, this general interpretation would require its own in-depth study because, as the cited studies indicate, gender differences in health are a truly complex issue, and simplifying these differences under the statement 'women are less healthy' would unquestionably be naive and simplistic. Where there is some consensus, however, is that women are more prone to morbidity than men, as indicated by Bambra *et al*. (2021) regarding COVID-19. In addition, as might be expected, those individuals with poor habits such as not engaging in activities that increase heart rate, smoking or having high body mass indexes will undoubtedly report lower levels of self-perceived health than those with healthy habits.

Furthermore, in response to one of the starting hypotheses of this study, whether the macroeconomic context affects self-perceived health, we can affirm that there is evidence that only people with a high level of wealth show sensitivity of their self-perceived health status to the socioeconomic situation of their country, as evidenced by quantile regression. However, the robustness analysis using logistic regression does provide evidence that anyone, regardless of their income, could have their self-perceived health status affected by macro magnitudes.

The policy implications of this study lie in two fundamental aspects: there is a need to incorporate questions on anxiety and stress in population surveys because of their great importance for population health and their increasing frequency, as evidenced by the growing attention paid to these issues and highlighted by studies such as those of Mahmud *et al*. (2023) and Schulz *et al*. (2023). The lack of questions that directly cover both disorders is, we believe, a limitation for the study of self-perceived health, and perhaps other issues. Furthermore, based on the results obtained, we can point out that it would be desirable to invest more in the promotion of healthy habits among the population and to make the labour market more flexible, which would reduce unemployment among the population. It is clear that the variables of being employed and performing activities that increase heart rate are of great importance in self-perceived health status.

Funding

This study was funded by the European Union, Junta de Andalucia and University of Almeria, with reference number UAL-FEDER 2020, UAL2020-SEJ-D1999.

Acknowledgements

The authors Almudena Guarnido-Rueda and Ignacio Amate-Fortes are grateful for all the suggestions received during the research stay at the Economics Department of UC Santa Barbara.

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