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Nádia Simões

Nuno Crespo

Sandrina B. Moreira

Celeste A. Varum

ISCTE - Instituto Universitário de Lisboa
BRU-IUL (Unide-IUL)
Av. Forças Armadas
1649-126 Lisbon-Portugal
http://bru-unide.iscte.pt/

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Measurement and Determinants of Health Poverty and Richness – Evidence from Portugal

[(a),*] Nádia Simões, [(b)]Nuno Crespo, [(c)]Sandrina B. Moreira, and [(d)]Celeste A. Varum

[(a)] Instituto Universitário de Lisboa (ISCTE – IUL), ISCTE Business School Economics Department, BRU – IUL (Business Research Unit). E-mail: nadia.simoes@iscte.pt.

[(b)] Instituto Universitário de Lisboa (ISCTE – IUL), ISCTE Business School Economics Department, BRU – IUL (Business Research Unit). E-mail: nuno.crespo@iscte.pt.

[(c)] Instituto Politécnico de Setúbal (ESCE – IPS), Department of Economics and Management, Setúbal, Portugal and BRU – IUL (Business Research Unit), Lisboa, Portugal. E-mail: sandrina.moreira@esce.ips.pt.

[(d)] University of Aveiro, Department of Economics, Management and Industrial Engineering, GOVCOPP, Aveiro, Portugal. E-mail: camorim@ua.pt.

* Corresponding author

Abstract

The analysis of health inequalities is a critical topic for health policy. With data for Portugal, we propose a procedure to convert information provided by the official National Health Survey to EuroQol. Based on these data, we make two contributions. First, we extend measures and methods commonly applied in other fields of economic research in order to quantify the phenomena of health poverty, richness, and inequality. Second, using an ordered probit model, we evaluate the determinants of health inequalities in Portugal. The results show that there is a remarkable level of health inequality, with significant rates of poverty (11.64%) and richness (22.64%). The econometric study reveals that gender, age, education, region of residence, and eating habits are among the most critical determinant factors of health.

Keywords: health poverty, health richness, inequality, Portugal, EuroQol, determinant factors.

JEL Codes: I14, I32.

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1. Introduction

Health inequality has appeared more and more on the agenda of national and international organizations in recent years. OECD countries in general, and European regions in specific, have witnessed significant gains in health, although important inequalities still exist. Moreover, the current world economic crisis amplified the social and economic inequalities between and within countries, thereby giving high-priority to further efforts to reduce them.

Reducing inequality in health is a goal in itself since "achieving the various specific global health and development targets without at the same time ensuring equitable distribution across populations is of limited value" (Blas and Kurup, 2010, p. 4). Decreasing inequalities in health can thus be considered a matter of social justice (Jakab and Marmot, 2012; Marmot et al., 2012). Solving these inequalities is a challenge to healthcare planners and policymakers. Their causes are complex and intertwined with several factors, including biological, behavioral, and socioeconomic factors (Målqvist et al., 2012). A more accurate knowledge of the causes of variations in health outcomes is a crucial step toward designing effective actions to reduce inequalities and, as a result, improve general community health (Dulin et al., 2012).

This paper contributes to the literature: (a) in the measurement of health poverty, richness, and inequality; and (b) in the empirical analysis of the under-explored Portuguese case, covering not only the quantification of the phenomena referred to in (a), but also the determinants of health inequality in Portugal.

Regarding the first contribution, the paper belongs to a well-established line of research that although concentrating preferentially on the measurement of income poverty and inequality (Cowell, 2011), more recently also considers the evaluation of richness (Atkinson et al., 2011) and, simultaneously, has been expanding toward multidimensional analyses of these phenomena. In fact, economic literature has been recognizing that a correct evaluation of these concepts (poverty, richness, and inequality) cannot be achieved considering only income (Ferreira, 2011). The list of areas already covered is long, including education, time use, water, and nutrition, among others.

Obviously, given the importance of health for a multidimensional concept of well-being, these measures have also been applied taking health variables as the reference (Laudicella et al., 2009; Spinakis et al., 2011). The present study follows this line of research but takes as reference a summary measure of health status instead of a specific and partial health indicator, as is commonly done (for an exception, see Doorslaer and Jones, 2003). This is accomplished through a process of conversion that makes the bridge between a national health survey and

the well-known EuroQol (EQ-5D).[1] Following, we apply standard measures of poverty, richness, and inequality to the EQ-5D index.

At the econometric level we estimate an ordered probit model investigating what makes some people healthier than others. The fact that the analysis conducted in this study is based upon individual data is an advantage compared to cross-country data. Indeed, national-level statistics often mask unfair disparities within and between population groups in terms of health outcomes (Blas and Kurup, 2010).

Portugal is an interesting case study since it is one of the developed countries that, in the last decades, has made more remarkable improvements in several key health indicators. For example, the infant mortality rate has fallen by over 7% per year on average since 1970. This allowed the country to move from the highest rate in Europe to among the lowest in the OECD today. A similar improvement is seen with life expectancy at birth (66.7 years in 1970; 79.8 years in 2010, according to OECD, 2013). Despite these improvements, the country still has important inequalities at the individual and regional levels in variables that are critical to explain health outcomes (e.g., income per capita and education).

The remainder of the paper is structured as follows. Section 2 presents the health index that supports the empirical analysis conducted in the study. Section 3 discusses the measures of health poverty and richness. Section 4 presents the econometric model, and Section 5 analyzes the estimation results. Section 6 presents some final remarks.

2. The Health Index

2.1 Data

This study is based on data for Portugal drawn from the National Health Survey (*Inquérito Nacional de Saúde* - INS) provided by the National Statistics Office in cooperation with the National Health Institute Doutor Ricardo Jorge. We consider the last wave of the survey (2005-2006). INS contains a wide range of self-reported information on multiple health themes, namely: (a) health status, chronic diseases, and incapacities; (b) health care and prevention; (c) living styles (smoking, diet, alcoholic drinking, physical activity); and (d) quality of life. Specifically, we use data from the first quarter (the only one that includes all the questions necessary for the construction of our health index), covering a representative

[1] In this study, we map questions from the Portuguese NHS to obtain the EQ-5D index. In the economic literature, there are several exercises of mapping a health measure to another (for a survey see Brazier et al., 2011).

sample of the Portuguese population with 6,339 individuals ($i = 1, \ldots, 6{,}339$).[2][3] Descriptive statistics of the sample are provided in Table 3 below, where we present the list of explanatory variables used in the econometric exercise.

2.2 Building the Index

It is especially appealing to measure population health status through the use of multi-attribute surveys that allow gathering information on a number of health dimensions into an index representing the individuals (self-reported) overall health condition. EQ-5D is the most widely used multi-attribute utility instrument (Brazier et al., 2011; Richardson et al., 2011).[4,5] The survey defines health in terms of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. For each dimension, there are three possible answers (1, 2, 3) reflecting increasing levels of severity: no problems, some or moderate problems, and extreme problems. The combination of the answers leads to a 5-digit number describing the respondent's general health status. Each of these codes expresses a given health status (e.g., code 11111 represents full health).

The EQ-5D index score is computed through an algorithm that deducts from the maximum value of that index (score equal to 1.0) predetermined coefficients for each answer different from 1 on any dimension and also two constant values – one when there exists at least one answer different from 1 and another one if any dimension has a level 3 problem.[6] The health index of a given individual i will be designated as HI_i and results from the normalization, through the max-min method, of the EQ-5D score to the 0-1 range.

Obtaining a summary measure of health status such as that provided by EQ-5D (or other similar indexes) from national surveys, such as INS, is difficult (or in some cases virtually

[2] The survey includes groups of questions that were applied in all the quarters as well as some others that were answered only in a specific quarter.

[3] The empirical analysis presented below is based on non-weighted observations. Nevertheless, as referred in footnote 7 of Barros and Pereira (2010, p. 14), "the sample of the 4th Portuguese National Health Survey is stratifies, with a similar number of observations per region. Given that regions are different, the use of weights allows the extrapolation of the results for the whole country. In our analysis, we cannot use weights because they are aggregated. Nevertheless, because the stratification of the sample is based in variables also included in our analysis as explanatories, the non application of weights has small impact in the final outcomes".

[4] Other well-known multi-attribute utility instruments include: the Health Utilities Index (HUI), SF-6D, 15D, and the Assessment of Quality of Life instrument (AQoL).

[5] INS contains a question in which interviewed individuals have to provide an overall assessment of their health. However, in this study instead of using this information we base our empirical strategy on a multi-attribute index. This type of index provides a framework that can be used to characterize the health status of a given population with the additional advantage of facilitating comparisons between individuals in the sample and also comparisons with findings for other regions or countries.

[6] For a detailed presentation of the methodology, see Kind et al. (1999).

impossible) as they do not include the necessary questions. Fortunately, INS has information that allows inferring the answer that each respondent would give to a particular EQ-5D question. However, the process is neither easy nor immediate, demanding a complex conversion process which we propose in this study. Below, we present a detailed description of our strategy, which is complemented, for reasons of clarity, with several flowcharts (Figures 1 to 5). In each of them, the number of respondents that select each possible answer is reported between brackets.

Mobility: individuals who indicated that they could walk 200 meters or more on a flat road without resting or experiencing pain were classified as having no problems (level 1). In turn, those who reported being able to walk either a few steps or up to 200 meters were classified as having some mobility problems (level 2). Finally, level 3 was assigned to respondents who fulfilled one of the following conditions: (a) confined to bed; (b) though not confined to bed, spends the day on a chair, i.e., cannot walk even with help; (c) although in neither of the previous situations ((a) and (b)), has mobility only in a wheelchair (with or without help).

[Insert Figure 1]

Self-care: regarding this dimension, two questions were asked to those stating not being confined to bed and also not spending the day in a chair: (a) "can you get dressed and undressed on your own?" and (b) "can you wash yourself?". An answer "alone without difficulties" to both questions was coded as 1. The severest level in this dimension was attributed to respondents who: (a) are confined to bed; (b) though not confined to bed, spend the day in a chair; or (c) answer "only with help" to at least one of the above questions. The remaining cases were considered in an intermediate situation (level 2).

[Insert Figure 2]

Usual Activities: the conversion process of this health dimension is the most complex. Individuals who were not confined to home answered the following questions: (a) "can you use public transportation?"; (b) "can you go out for shopping?"; (c) "can you tidy and clean the house?". If those three activities were said to be accomplished without difficulty, level 1 was assigned. Level 3 was attributed to four situations: (a) confined to bed; (b) though not confined to bed, spend the day in a chair; (c) although in neither of the previous situations ((a)

and (b)), are confined to home; and (d) although in none of the previous situations ((a), (b), and (c)), answer "only with help" to at least one of the above questions. Level 2 was assumed in the remaining situations.

[Insert Figure 3]

Pain/Discomfort: respondents who reported not having stopped their usual daily activities for health reasons in the last two weeks and not feeling bad or ill in the same time period were classified has having no pain or discomfort (level 1). The lowest level of health in terms of pain/discomfort – level 3 – was attributed when in some days of the last two weeks usual daily activities were not done because of a health problem and the respondent was kept in bed the entire day or most of it. The intermediate level for this health dimension corresponds to the following two situations: (a) in at least one day of the last two weeks, usual things were not done because of a health problem, but the respondent was not kept in bed on those days; (b) even though the respondent did not stop doing usual things for health reasons in the last two weeks, he/she felt bad or ill in part of that time period.

[Insert Figure 4]

Anxiety/Depression: this dimension was captured through two questions: (a) "during the past four weeks, how often did you feel nervous?"; (b) "during the past four weeks, how often did you feel so depressed that nothing could cheer you up?". To each of these questions there are six possible answers: all of the time, most of the time, much of the time, some of the time, a little of the time, and none of the time. The reclassification into the three EQ-5D answers was done in the following way: (a) level 3 to respondents who gave at least one answer "much of the time" or more; (b) level 1 to those who answered both questions "none of the time" or one "none of the time" and the other "a little of the time"; (c) level 2 for the remainder.

[Insert Figure 5]

The column "overall sample" in Table 1 shows the distribution of individuals across the three possible answers for each of the five EuroQol dimensions.

[Insert Table 1]

From this evidence, it is clear that anxiety/depression and pain/discomfort are the two dimensions in which the self-rated health levels are worst, while the best results concern mobility. In this last case, for example, only 9.92% of the individuals report the existence of problems. The results concerning the dimensions in which individuals report more problems are in line with evidence from EQ-5D collected for other countries (e.g., Burström et al, 2007; Golicki et al., 2010; Klemenc-Ketiš et al., 2011; Sun et al., 2011).

3. Poverty, Richness, and Inequality in Health

Having taken the steps to build the summary index, HI_i, we now quantify health inequality, poverty, and richness. For measuring inequality, two commonly used indicators are applied: the Gini index and the $P90/P10$ index. Regarding the others phenomena, we first need to define poverty and richness lines. A health poverty line separates the poor from the non-poor, while a health richness line sets the limit above which individuals are classified as rich. The main methodological option here is between absolute or relative poverty/richness lines. In the first case, the thresholds are defined without reference to the pattern prevailing in society. In the second case, that reference is taken into account and thus the health poverty and richness lines correspond to a given percentage of the average or median level of health in society. Following the most common option, we adopt a relative poverty line (α) defining as poor an individual with a health index below 60% of the median of HI_i. The richness line (γ) is obtained in a symmetric way, a rich individual being one with a value for HI_i above that threshold. Summarizing, individuals are classified into one of three possible health states (y_i):

$$y_i = \begin{cases} 1 \; if \; HI_i < \alpha \; (poor) \\ 2 \; if \; \alpha \leq HI_i \leq \gamma \; (middle \; class) \\ 3 \; if \; HI_i > \gamma \; (rich) \end{cases}. \quad (1)$$

The next step is the selection of the indicators for measuring poverty and richness. The literature usually takes into account three fundamental dimensions – incidence, intensity and severity (Cowell, 2011). The present study adopts a similar perspective. We now start by considering the poverty measures.

The incidence of health poverty is measured through the headcount ratio (H_p), representing the proportion of the total number of poor (P) in total population (N):

$$H_p = \frac{P}{N} \times 100. \quad (2)$$

The most important weakness of H_p is the fact that it is only an accounting of the poor, with no sensibility to the heterogeneity among the poor. The evaluation of the intensity of health poverty overcomes this limitation. To that end, the poverty gap (PG) measures the mean deviation from the health poverty line for the poor individuals, being obtained as follows:

$$PG = \alpha - I_p \quad (3)$$

where I_p is the average value of the health index among the poor.

Finally, the evaluation of health poverty severity takes into account the inequality among the poor. It can be done through the use of the Gini index applied exclusively to the health poor population (G_p). Alternatively, we can consider a new poverty threshold reflecting a greater degree of privation in terms of health. With reference to this line of extreme poverty (θ), we can quantify, in a similar vein, the incidence and intensity of severe health poverty (H_p^+ and PG^+, respectively). To that end, we define the extreme poverty line at 60% of the poverty line (i.e., 36% of the median).

Regarding the evaluation of health richness, we can conceive, with the appropriate adaptations, indicators similar to those used in the analysis of poverty to measure the corresponding richness dimensions: incidence (H_r), intensity (RG), and depth (G_r, H_r^+, and RG^+).[7] The indicators H_r^+ and RG^+ are defined using an extreme richness line (φ). Table 2 reports the results.

[Insert Table 2]

Starting with inequality measures and more specifically with the $P90/P10$ index, we find that the average health level of the 10% richest individuals is 2.6 times higher than that of the 10% poorest. Focusing on the distribution of the individuals in accordance with their health state,

[7] Depth instead of severity is used merely for terminological reasons.

we conclude that 11.64% are poor, among which only a small fraction face a situation of extreme poverty (corresponding to 1.94% of the total population). On the other hand, 22.64% of the individuals exhibit a health richness condition, with most of them being extremely rich in health (22.27% of the total population). The remaining 65.72% of the respondents are classified as belonging to an intermediate situation in terms of health.

For poverty intensity the average deviation of the poor from the poverty line is equal to 0.1398. When taking into account a severe poverty line, the average intensity of extreme poverty in health is obviously lower (0.089). Concerning richness, on average, an individual classified as rich presents a health level that exceeds by 0.0756 the richness line. In turn, the health surplus of the extremely rich above the extreme richness line is 0.046.

Finally, the health inequality level among the poor and the rich population is 0.1293 and 0.0012, respectively. Thus, we find an expressive level of poverty inequality, reflecting poverty severity.

Let us now return to Table 1. The evidence presented in the last three columns makes clear the existence of a considerable gap between the poor and the remaining groups in all the EuroQol dimensions. In fact, considering the poor population, we see that 8.4% have severe mobility problems while the corresponding level 3 answers for the remaining dimensions are 23.44% (self-care), 36.05% (usual activities), 45.39% (pain/discomfort), and 68.16% (anxiety/depression). These results compare with very low values for middle class and rich groups, the only exception being the 28.83% found for middle class in the anxiety/depression dimension.

4. Econometric model

Complementing the descriptive analysis on health poverty, richness, and inequality, in this section we investigate the most important determinant factors of the individual health state (y_i). Since health state is classified into discrete categories that have an ordinal nature (1, 2, 3), the ordered probit model is a fairly used framework. This model is based on a latent measure of health (y_i^*) – a continuous and unobserved variable – which can be defined as a linear function of the observed explanatory variables (X) and a random error term (ε) normally distributed with zero mean and unit variance:

$$y_i^* = \beta' X_i + \varepsilon_i. \quad (4)$$

The value observed in y_i is determined by the value of y_i^*:

$$y_i = \begin{cases} 1 \text{ if } -\infty \leq y_i^* \leq \mu_1 \\ 2 \text{ if } \mu_1 < y_i^* \leq \mu_2 \\ 3 \text{ if } \mu_2 < y_i^* \leq \infty \end{cases} \quad (5)$$

where μ_1 and μ_2 represent thresholds to be estimated.

The probabilities associated with the possible values assumed by y_i are:

$$\begin{aligned} &\Pr(y_i = 1) = \Pr(y_i^* \leq \mu_1) = \Pr(\beta' X_i + \varepsilon_i \leq \mu_1) = \Phi(\mu_1 - \beta' X_i) \\ &\Pr(y_i = 2) = \Pr(\mu_1 < y_i^* \leq \mu_2) = \Pr(\beta' X_i + \varepsilon_i \leq \mu_2) - \Pr(\beta' X_i + \varepsilon_i \leq \mu_1) = \\ &\Phi(\mu_2 - \beta' X_i) - \Phi(\mu_1 - \beta' X_i) \\ &\Pr(y_i = 3) = \Pr(y_i^* > \mu_2) = \Pr(\beta' X_i + \varepsilon_i > \mu_2) = 1 - \Phi(\mu_2 - \beta' X_i) \end{aligned} \quad (6)$$

in which Φ is the standard normal cumulative distribution function (for more information on this model, see Greene, 2011).

The vector of explanatory variables (X) includes three groups of factors that, according to the literature, are likely to affect an individual's health: (a) biological factors - gender and age; (b) socioeconomic factors - marital status, nationality, education, labor market state, region of residence, net monthly income of the household, and the health system/subsystem; and (c) behavioral factors - weight, drinking, smoking, and eating habits. In Table 3, the explanatory variables are defined in detail.

[Insert Table 3]

Due to missing data concerning the explanatory variables, the sample used in the estimation drops to 6,244 individuals. Next, we present an overview of the relevance and expected impact of each of these variables.

Biological Factors: for many years, gender was neglected as an explaining factor of health. However, more recently its influence has been recognized. The evidence obtained so far supports that men have, on average, better health levels than women (Rivera, 2001; Ferreira et al., 2012; Marmot et al., 2012; Sun et al., 2011; WHO, 2013). A recent study suggests that the main factors affecting the health of men are connected to income and lifestyle, while

education and the use of healthcare services are critical determinants in the case of women (Poças and Soukiazis, 2010).

Age is a variable usually considered in models to explain health (e.g., Grossman, 1972). A negative influence of age on the health state is a consensual and well-documented outcome (e.g., Albert and Davia, 2011; Bassani, 2008; Girón, 2012; Karlsson et al., 2010).

Socioeconomic Factors: within the social conditions, earlier work considered health differences according to marital status, pointing for the most part to a positive effect of marriage. Lindström (2009) found a huge significant difference between the health state of married couples (or living together) and single/divorced individuals, being higher in the first case. This evidence can be explained, for example, by the fact that close relationships lead to health behavior changes, implying a shift from a person-centered to a relationship-centered motivation (Lewis et al., 2006). However, the influence of marriage on health may also depend on marital quality (Kiecolt-Glaser and Newton, 2001).

Following a different approach, Wilson (2002) emphasizes that spouses tend to have similar health states because they share living conditions and risk factors and may suffer from infectious diseases and stress due to a disease of the partner. Moreover, Marcus (2013) highlights the existence of spillover effects in situations of unemployment, concluding that the unemployment of one spouse affects the mental health of both spouses.

The comparison between health levels of immigrants and natives is a complex issue. At the arrival, depending on the destination and origin country being analyzed, it is possible to find a positive as well as a negative gap between these two groups. Over time, there are factors that can influence either positively or negatively the health state of immigrants (Antecol and Bedard, 2006). On the positive side, the integration process is expected to increase income levels and to provide access to better health care services and a more developed socio-economic context than in the origin country. Nevertheless, immigrants are a vulnerable group because of their immigration status, socioeconomic background, integration in labor market (often in low skilled and even illegal jobs), lower access to health care and health insurance, and marginalization, among other aspects (Derose et al., 2007). In addition, the access to improved health care may reveal previously unknown pre-existing health conditions (McDonald and Kennedy, 2004). The fact that migrants are not a homogeneous group, having characteristics which vary with their origin country, increases the degree of complexity of this question (Barros and Pereira, 2010).

Education is strongly associated with better health (Albert and Davia, 2011; Becker, 2007; Grossman, 2008; Hosseinpoor et al., 2012; Verropoulou, 2012). This link operates through three main channels (Albert and Davia, 2011; Braveman et al., 2011; Cutler and Lleras-Muney, 2010; Grossman and Kaestner, 1997; Park and Kang, 2008). First, education increases the capacity to access and interpret information, leading to better health decisions. Second, it improves the chances of obtaining jobs with safer working conditions and higher wages, thereby supporting healthier lifestyles. Third, more education allows access to more sophisticated social contexts, in which the propensity toward more healthy behaviors is greater.

Another important aspect is the labor market state. Unemployment and inactivity substantially increase the probability of being poor in health (Kasl and Jones, 2000; Theodossiou, 1998). In contrast, work is associated with better health, despite the vital role of the specific working conditions that characterize the job (Ales et al., 2012; Braveman et al., 2011; Marmot et al., 2012; Rivera, 2001). As suggested by Benoit et al. (2009), employment is a determinant of health linked to income, thereby increasing the capacity to purchase health-enhancing resources. Reinforcing this idea, Brand et al. (2007) and Albert and Davia (2011) support the idea that wages are positively correlated with health.

Since differences within countries are significant, research on a more specific level has been conducted, and the empirical evidence tends to confirm the influence of the residence area on health. Important aspects at this level include differences between rural and urban areas, neighborhoods, among other constraints that affect the access to healthcare services, infrastructures, and the environment itself (Bernard et al., 2007; Braveman et al., 2011; Chandola, 2012; Franzini and Giannoni, 2010; Santana, 2000; Sun et al., 2011). Moreover, Trogdon et al. (2008) and Bilger and Carrieri (2013) conclude that socioeconomic factors (e.g., income and education) predominantly represented in the area of residence are crucial to gauge health status, given their influence on lifestyles.

As mentioned above, theoretical and empirical research usually assumes the existence of a causal link from income to health (Deaton, 2003), which is confirmed by a vast number of studies, including Cutler et al. (2006), Karlsson et al. (2010), Torre and Myrskylä (2011), Hosseinpoor et al. (2012), and Karlsdotter et al. (2012). Both the access to and the quality of health services obviously affect health. For example, individuals without health insurance tend to participate less in preventive care and are more likely to delay medical treatment. Examining the Greek case, Tountas et al. (2011) found that private insurance and the

existence of a family doctor critically depend on social status, suggesting the existence of inequalities in the access and use of primary health services.

Behavior Factors: recently, the studies from Ovrum and Rickertsen (2011), Girón (2012), and Verropoulou (2012) confirm that lifestyle variables are linked to good self-rated health. In general, people who sleep enough hours, practice physical exercise, have good eating habits, consume alcohol just in leisure time, and do not smoke have better health. Additionally, Khaw et al. (2008) indicate that the combined effect of four behaviors – no smoking, exercise, high intakes of fruit and vegetables, and moderate alcohol intake – reduces mortality by a factor of four.

Weight is also an important variable to consider when assessing health. Often evaluated through the body mass index (BMI), the general result is that the increase of the BMI deteriorates the health state (e.g., Molarius et al., 2006). Renzaho et al. (2010) and Oliva-Moreno and Gil-Lacruz (2013) stress that inappropriate weight levels have a negative impact on health. The second study concludes that this overall impact is mainly felt in two of the EQ-5D dimensions – mobility and pain/discomfort.

5. Estimation Results

The parameters of the ordered probit model were estimated by the method of maximum likelihood. Estimation results are shown in Table 4.

[Insert Table 4]

The changes in the probability levels of the dependent variable are also estimated, providing an interpretation of the impact of the independent variables (Table 5). These are measured relative to a reference case in which all the dummy variables are set equal to 0. This allows one to interpret changes in the probability of the health states for a change in a given parameter, relative to the reference case. Since all the independent variables are dummy variables, the marginal effects correspond to a discrete change from 0 to 1 in the dummy variable. In this baseline scenario, the estimated probabilities of being poor, middle class, and rich are 19.46%, 71.18%, and 9.36%, respectively.

[Insert Table 5]

As shown in the last columns of Table 5, the probability of poverty is 44.07% lower for men than for women while the probability of richness is 83.50% greater for men. This is consistent with the so-called "iceberg of morbidity" argument according to which, due to social and biological factors, despite women's greater longevity they experience higher rates of morbidity and psychological distress (Bird and Rieker, 1999; Verbrugge and Wingard, 1987). Concerning age, the evidence makes it clear that it is one of the most important determinants of health state. Moreover, the influence is monotonic, with a more remarkable impact in the two highest categories, showing that individuals aged 75 or more (AGE75-84 and AGE>84) reveal, on average, a much worse health condition. The probability of being poor in health is 48.51% and 50.21%, respectively, in these categories, which compares with a probability of 19.46% in the reference scenario. To sum up, the evidence for Portugal regarding biological factors seems to align with the dominant perspective at the theoretical level and also with most of the empirical results already reported.

The second group of determinants relates to socioeconomic aspects. Despite the evidence suggesting the importance of marital status, this factor does not reveal statistical significance in the Portuguese case. The same conclusion is true for nationality (for further discussion see Barros and Pereira, 2010). The evidence documented in Table 5 indicates that natives and migrants have similar probabilities associated with all the health states, suggesting that the opposite arguments discussed in Section 4 tend to cancel out.

Education emerges as a critical variable to explain health condition, with monotonic influence and the expected sign. The individuals with the highest level of education considered in this study (TERTIARY) benefit from a reduction in the likelihood of poverty of 40.76% and an increase of 74.44% in the probability of being rich in terms of health when compared with the reference case.

Focusing now our attention on the labor market state of the individual, we find that retired individuals have a higher probability of poverty and a lower probability of richness. The results for unemployed individuals follow a similar qualitative pattern but the quantitative influence is less in this case, with an increase of 29.69% in the probability of poverty and a reduction of 30.40% in the probability of richness, while similar effects for the case of retires are 43.69% and 40.97%, respectively.

An interesting and important conclusion emerging from the results presented in Tables 4 and 5 is the existence of spatial differences in terms of health. This conclusion is not surprising since regional inequality is a fundamental characteristic of the Portuguese economy, as

documented, for instance, by Hoeller et al. (2012). More specifically, the results allow us to conclude that this variable is one of the most important determinants of health inequality. In fact, an individual living in *Madeira*, *Algarve*, *Açores,* and *Alentejo* has a much lower likelihood of health poverty and higher of richness.

In line with the nearly consensual perspective, the positive association between income and health is confirmed in our model. The individuals that belong to high-income households show a probability of poverty of 15.50% which is 20.33% lower than in the reference case.

Let us consider finally the behavior determinants of health. An inappropriate weight increases the probability of being poor in health by 17.28% and reduces the probability of richness by 19.22%. Additionally, the evidence suggests that poor diet (low diversity of food groups) also has a negative impact on health status.

The evidence regarding drinking shows that it reduces the probability of being poor in 22.50% while increasing the probability of richness by 34.28%. This counter-intuitive result may be explained by the fact that the negative consequences of drinking only appear some years later. As stressed by Verropoulou (2012, p. 306) "risky health behaviors such as smoking and drinking though associated with higher mortality are not necessarily related to worse self-rated health". Additionally, Girón (2012) emphasizes that a moderate consumption of alcohol can be associated with social and leisure activities that improve healthier rather than risk behaviors.

The impact of smoking is not significant in our model, corroborating earlier-reported non-conclusive results (e.g., Rivera, 2001). A possible explanation for this fact is advanced by Guindon and Contoyannis (2012), who suggest that the negative consequences of smoking habits may occur with a lag of 20-30 years.

6. Final Remarks

Some years ago the Director-General of the World Health Organization, Jong-wook Lee, argued for a need to gather and review evidence on what needed to be done in order to reduce health inequalities and provide guidance for governments on how to reduce the differences between population groups, both within and among countries (WHO, 2004). Indeed, since then much work has been undertaken to accurately measure the factors that explain health inequalities. Recently, WHO (2013) concluded that social determinants are mostly responsible for the persistent evidence of high-levels of health inequality. Nevertheless, it is

also clear that further evidence is necessary from different groups and countries, as the determinants of health may well be context-specific.

The present study is a contribution to this line of research by providing evidence for the Portuguese case, which, despite its importance and specificities, has not received sufficient attention so far. This study also emerges from a different strand of research that has been extending the evaluation of poverty, richness, and inequality to other critical variables beyond income.

Several important conclusions can be taken away from the analysis conducted. We verify the existence, in the case of Portugal, of significant levels of health inequality, with high proportions of the population being classified as poor or rich in health terms. For policy, our study highlights the dual purpose of promoting health gains and reducing health inequalities. Health poverty is, of course, critical for policy purposes, seeking the definition of guidelines to minimize these deprivation situations. Different ways of addressing social inequalities in health have been debated (Dahlgren and Whitehead, 2006; Whitehead, 2007; Whitehead and Dahlgren, 2006), and governments should define their perspective. Recent studies that start providing evidence about best practices and the impact of policy interventions at the international level are very inspiring and create opportunities for policy learning and, therefore, for more efficient policy interventions.[8]

Within the policy setting, interventions should tackle the determinants of inequalities in health. In order to clarify the conditions that promote or inhibit health in the Portuguese case, we estimate an ordered probit model, with data obtained from the National Health Survey, considering biological, socioeconomic, and behavior factors as independent variables. The results point to the importance of biological determinants, namely age and gender. This is a well-established conclusion emerging from the vast majority of analogous studies for other countries and regions. However, the evidence obtained allows us to emphasize the importance of some other features with closer links with more active policy interventions. Let us explore three of them.

First, there is undoubtedly a strong case for highlighting education as a major determinant of health and health inequalities. In fact, education has traditionally been an important route out of poverty for disadvantaged groups in many countries. In general terms, qualifications improve people's chances of getting a job and of having better pay prospects, with the

[8] The recently launched DRIVERS project brings together leading organizations to review existing scientific evidence, develop guidelines for effective advocacy on health inequalities, and test the newly developed knowledge in real-life situations on the ground across Europe (http://eurohealthnet.eu/organisation/driversyes-we-can-reduce-health-inequali).

consequent increase in general well-being. This, in turn, improves opportunities to obtain the prerequisites for health (nutritious food, safe housing, a good working environment, and social participation, among other things). The extreme importance of education as a determinant of health is confirmed by our results, giving high priority therefore to the development of measures devoted to improve education outcomes. This is crucial for a country where, despite a recent positive trend, educational levels still lag behind the European average, posing an obstacle to stronger economic growth. Critical at this level is to foster the efficiency of public expenditure in order to increase the results derived from the significant investment already in place (Cunha and Braz, 2006). From this, several benefits certainly emerge, including the improvement of health levels and the reduction of the associated inequalities.

Another remarkable result emerging from the analysis of the Portuguese case is that the spatial dimension really matters. We concluded that there are significant differences across regions, which reinforces the idea that Portugal exhibits strong economic and social asymmetries that effective cohesion programs could help to reduce. With this is mind, it seems necessary to amplify the actions taken under the context of the regional European policy. A suggestion at this level is the substitution of per capita income as exclusive reference variable by a more comprehensive development measure that takes into account other crucial dimensions, including health disparities. The spatial asymmetries are not a specificity of the Portuguese economy, indeed they seem quite significant at the European wide level, as recognized by the WHO Regional Office for Europe. In this sphere, the need has been recognized for strengthening local-level governance, and the key role of local governments in creating conditions that support health and well-being.

Finally, our results also suggest the importance of good eating habits for better overall health. Nevertheless, the measures implemented in the last years in Portugal are especially directed to reduce smoking and drinking. Not neglecting the importance of such measures, it appears useful to adopt complementary interventions. These could include direct measures, for example, by making more campaigns and workshops about healthful eating habits. From a medium and long-term perspective, educational interventions during childhood can be a key strategy. Eating habits are acquired at an early age and the diversity of foods introduced in youth is a predictive factor of the variety of food in adult life (Nicklaus, 2009).

To address health inequalities that are deeply rooted in social and behavioral determinants, concerted actions are required, mostly outside the health sector. Also called for are greater roles for the for-profit and not-for-profit sectors and civil society. In order to manage these

stakeholders, health ministries have to increasingly take a leadership role. Finally, interventions at different levels and in different sectors should be evaluated in terms of their health equity impact.

The efficacy of such policy actions critically depends, obviously, on the financial envelope but also on how it is used. More general development policies, targeting economic growth and a fair distribution of these resources, are indispensable conditions to improve health.

A few studies reveal the direct and indirect economic burden of health disparities (e.g., LaVeist et al., 2009). It appears that eliminating health inequality can provide an important source of savings and can have a direct impact on productivity and wages. Hence, focusing on the goal of health equity is a goal that is not only consistent with the promise of opportunity and social justice, but for our long-term economic interest as well.

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Figure 1: Flowchart for Dimension "Mobility"

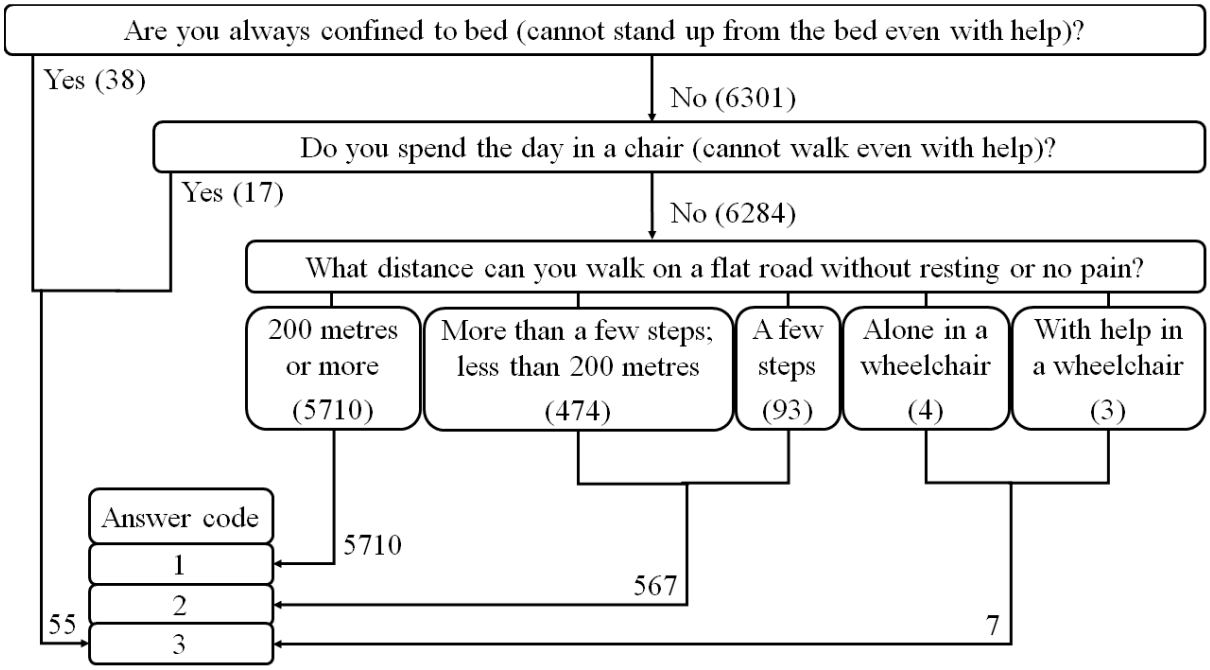
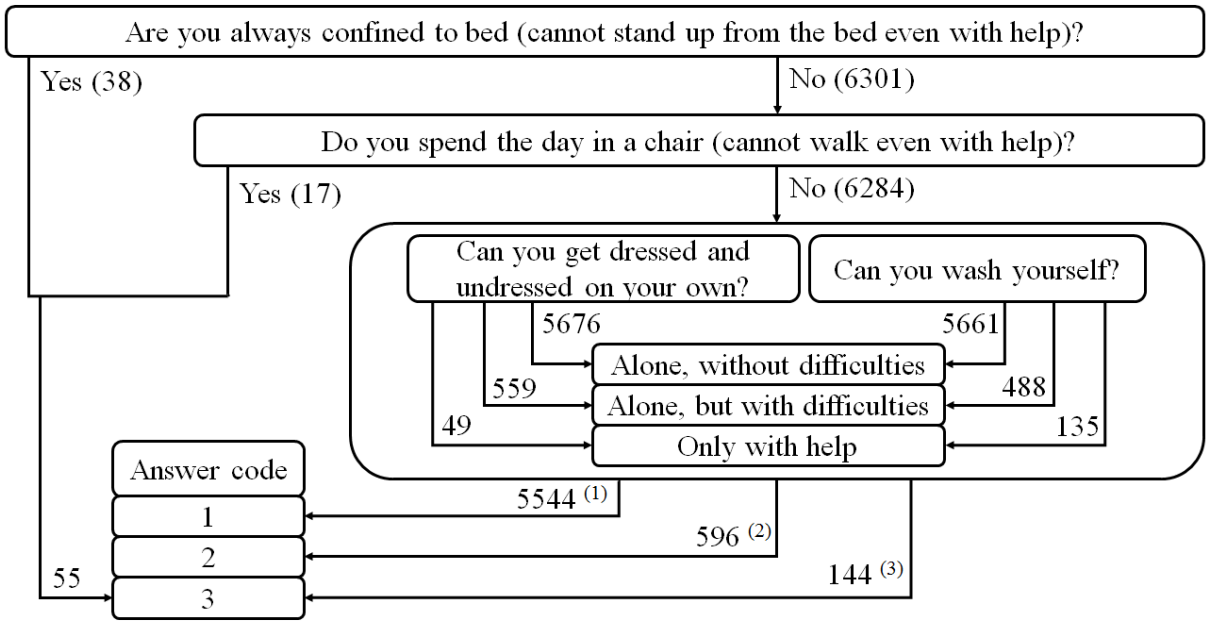


Figure 2: Flowchart for Dimension "Self-care"



(1) "Alone, without difficulties" in all the answers; (2) Other cases; (3) At least one answer "Only with help".

Figure 3: Flowchart for Dimension "Usual activities"

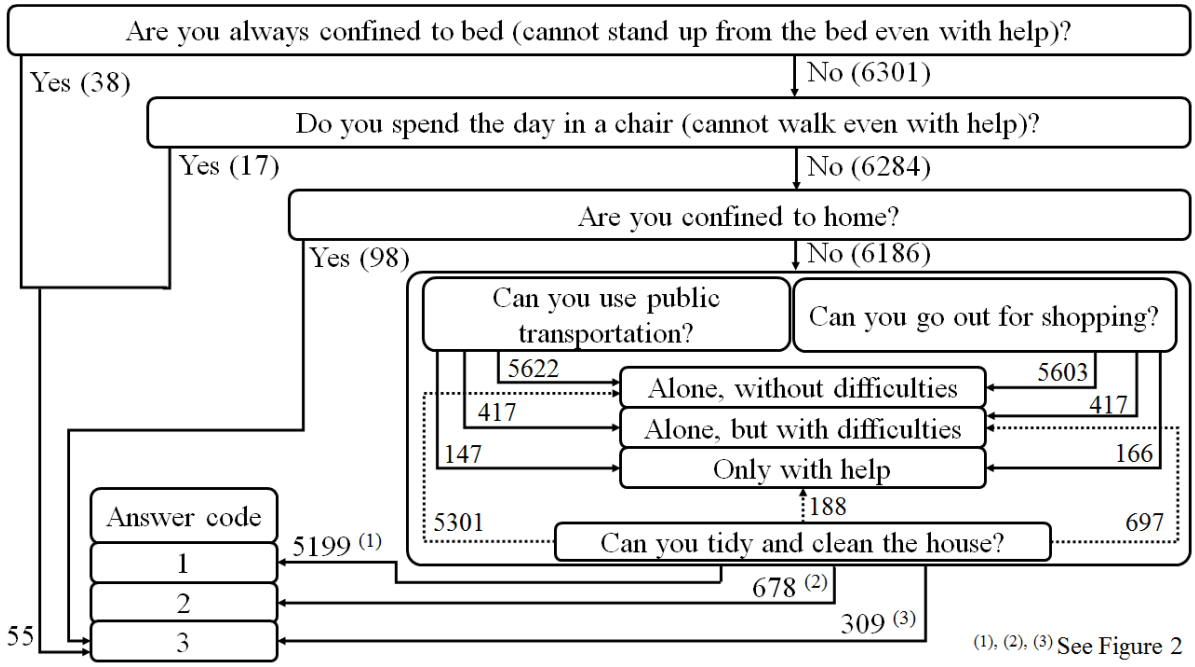


Figure 4: Flowchart for Dimension "Pain/Discomfort"

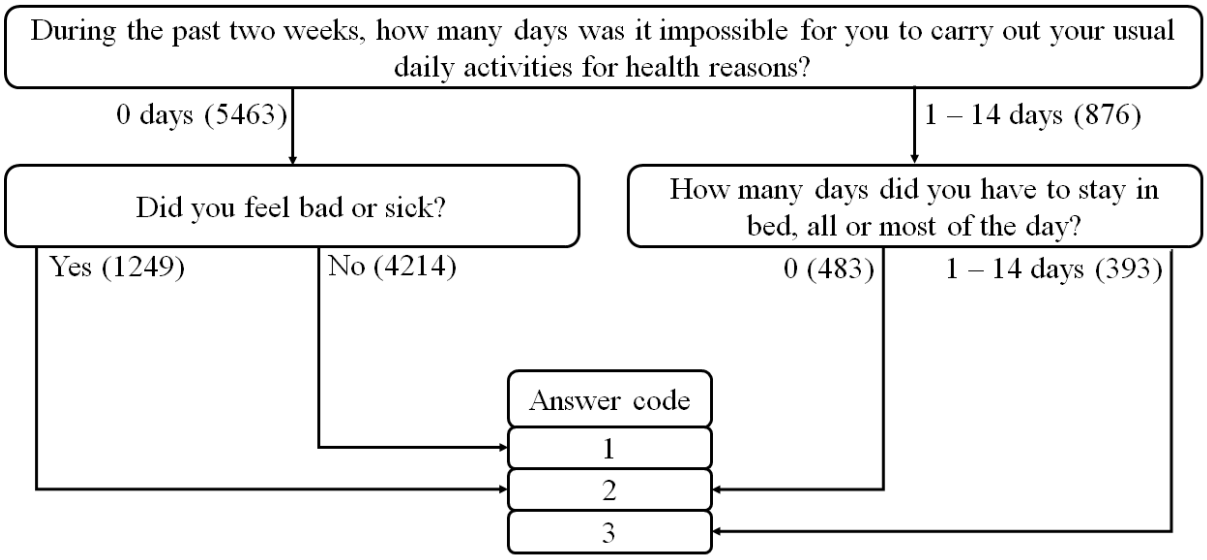
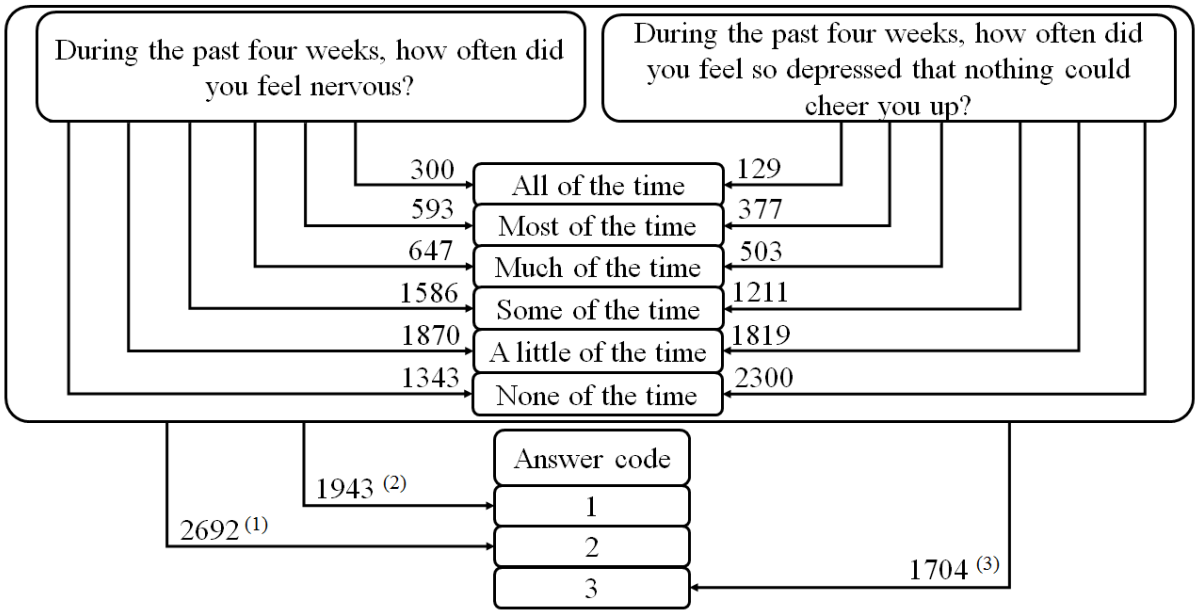


Figure 5: Flowchart for Dimension "Anxiety/Depression"



(1) Other cases; (2) Two answers "None of the time" or one "None of the time" and the other "A little of the time"; (3) At least one answer "Much of the time" or more.

Table 1: Proportion of Respondents with Differing Levels of Problem for EuroQol Dimensions (%)

Health dimensions (EQ-5D)	Answer levels	Overall Sample	Health State		
			Poor	Middle Class	Rich
Mobility	1	90.08	46.61	94.36	100
	2	8.94	44.99	5.64	0
	3	0.98	8.40	0	0
Self-care	1	87.46	34.42	92.53	100
	2	9.40	42.14	6.84	0
	3	3.14	23.44	0.63	0
Usual activities	1	82.02	26.42	86.22	98.40
	2	11.80	37.53	10.75	1.60
	3	6.18	36.05	3.03	0
Pain/Discomfort	1	66.48	13.28	64.35	100
	2	27.32	41.33	34.25	0
	3	6.20	45.39	1.40	0
Anxiety/Depression	1	30.65	4.47	11.40	100
	2	42.47	27.37	59.77	0
	3	26.88	68.16	28.83	0

Table 2: Health Poverty and Richness Indicators for Portugal

Dimensions	Indicators	Value	Relevant thresholds
Health Inequality	Gini index	0.1395	
	$P90/P10$	2.60	
Health Poverty	H_p	11.64%	α =0.5232
	PG	0.1398	θ =0.3139
	H_p^+	1.94%	
	PG^+	0.089	
	G_p	0.1293	
Health Richness	H_r	22.64%	γ =0.9232
	RG	0.0756	φ = 0.9359
	H_r^+	22.27%	
	RG^+	0.046	
	G_r	0.0012	

Table 3: Variable definitions

Variable type	Variable title	Definition	Mean	S.D.
Dependent var.	HI	Three categories: poor (1), middle class (2) , and rich (3)	2.11	0.57
Biological Factors	MALE	1 if male, 0 otherwise	0.42	0.49
	AGE16-24	1 if aged 16-24, 0 otherwise	0.09	0.28
	AGE25-39	1 if aged 25-39, 0 otherwise	0.20	0.40
	AGE40-54	1 if aged 40-54, 0 otherwise	0.25	0.43
	AGE55-64	1 if aged 55-64, 0 otherwise	0.18	0.38
	AGE65-74	1 if aged 65-74, 0 otherwise	0.17	0.38
	AGE75-84	1 if aged 75-84, 0 otherwise	0.09	0.29
	AGE>84	1 if aged over 84, 0 otherwise	0.01	0.12
Socioeconomic Factors	SINGLE	1 if not married, 0 otherwise	0.30	0.46
	MIGRANT	1 if migrant, 0 otherwise	0.02	0.14
	NOEDUC	1 if has no education, 0 otherwise	0.17	0.38
	PRIMARY	1 if highest educational level is primary education, 0 otherwise	0.63	0.48
	SECOND	1 if highest educational level is secondary education, 0 otherwise	0.11	0.32
	TERTIARY	1 if highest educational level is tertiary education, 0 otherwise	0.08	0.28
	WORKER	1 if working, 0 otherwise	0.50	0.50
	UNEMP	1 if unemployed, 0 otherwise	0.05	0.21
	RETIRED	1 if retired, 0 otherwise	0.27	0.44
	INACTIVE	1 if another inactive, 0 otherwise	0.19	0.39
	NORTE	1 if lives in *Norte*, 0 otherwise	0.16	0.37
	CENTRO	1 if lives in *Centro*, 0 otherwise	0.14	0.35
	LISBOA	1 if lives in *Lisboa*, 0 otherwise	0.15	0.36
	ALENTEJO	1 if lives in *Alentejo*, 0 otherwise	0.15	0.35
	ALGARVE	1 if lives in *Algarve*, 0 otherwise	0.15	0.36
	AÇORES	1 if lives in *Açores*, 0 otherwise	0.16	0.37
	MADEIRA	1 if lives in *Madeira*, 0 otherwise	0.09	0.29
	INCOME1	1 if household net monthly income is 0€-351€, 0 otherwise	0.14	0.35
	INCOME2	1 if household net monthly income is 351€-1200€, 0 otherwise	0.58	0.49
	INCOME3	1 if household net monthly income is above 1200€, 0 otherwise	0.28	0.44
	NHS	1 if uses the National Health System, 0 otherwise	0.63	0.48
	RHS	1 if uses the Regional Health System, 0 otherwise	0.18	0.39
	ADSE	1 if uses the Health Subsystem for Civil Servants, 0 otherwise	0.12	0.33
	OSYS	1 if uses other health subsystem, 0 otherwise	0.06	0.06
Behavior Factors	WEIGHT	1 if BMI is below 16 or above 30, 0 otherwise	0.18	0.38
	ALCOHOL	1 if drinks alcoholic beverages, 0 otherwise	0.46	0.50
	SMOKING	1 if smokes (daily), 0 otherwise	0.17	0.37
	FOOD1	1 if eats less than 4 food groups (daily), 0 otherwise	0.10	0.30
	FOOD2	1 if eats between 5 to 7 food groups (daily), 0 otherwise	0.64	0.48
	FOOD3	1 if eats more than 7 food groups (daily), 0 otherwise	0.27	0.44

Table 4: Estimation Results - Ordered Probit Model

Variables	*Coef.*	*z-statistic*
Biological Factors		
MALE	0.372***	(10.41)
AGE25-39	-0.145**	(-2.09)
AGE40-54	-0.311***	(-4.48)
AGE55-64	-0.429***	(-5.91)
AGE65-74	-0.464***	(-5.75)
AGE75-84	-0.824***	(-9.12)
AGE>84	-0.866***	(-5.80)
Socioeconomic Factors		
SINGLE	0.015	(0.39)
MIGRANT	0.019	(0.18)
PRIMARY	0.190***	(3.91)
SECOND	0.258***	(3.63)
TERTIARY	0.338***	(4.22)
UNEMP	-0.194***	(-2.63)
RETIRED	-0.277***	(-5.20)
INACTIVE	-0.151***	(-3.21)
CENTRO	0.105*	(1.88)
LISBOA	0.169***	(3.04)
ALENTEJO	0.390***	(6.97)
ALGARVE	0.416***	(7.46)
AÇORES	0.406***	(5.32)
MADEIRA	0.988***	(10.68)
INCOME2	0.064	(1.33)
INCOME3	0.154***	(2.64)
RHS	-0.308***	(-3.96)
ADSE	-0.090	(-1.59)
OSYS	0.073	(1.08)
Behavior Factors		
WEIGHT	-0.116***	(-2.87)
ALCOHOL	0.172***	(4.95)
SMOKING	0.029	(0.66)
FOOD2	0.220***	(4.16)
FOOD3	0.262***	(4.49)
Ancillary parameters		
μ_1	-0.861***	(-7.72)
μ_2	1.319***	(11.78)
Number of observations	6244	
Log likelihood	-4877.93	
Pseudo R-squared	0.0938	

Notes: the reference group includes individuals from the female gender, younger than 25, married, native, with no education, employed, living in north, in a household with a net monthly income below 352€, users of the National Health System, with adequate BMI, no smoking and no drinking habits, eating less than 5 food groups per day. *, **, *** Significant at 10%, 5%, and 1%, respectively.

Table 5: Marginal Effects of the Health States

	Marginal effects			*Change relative to the reference case (%)*		
	Poor	***Middle class***	***Rich***	***Poor***	***Middle class***	***Rich***
			Biological Factors			
MALE	-0.086 (-6.88)	0.008 (0.39)	0.078 (6.26)	-44.07	1.07	83.50
AGE25-39	0.042 (2.16)	-0.020 (-2.04)	-0.022 (-1.88)	21.79	-2.86	-23.50
AGE40-54	0.097 (4.73)	-0.054 (-3.80)	-0.042 (-3.34)	49.60	-7.65	-44.91
AGE55-64	0.138 (6.15)	-0.085 (-4.60)	-0.053 (-3.96)	71.02	-11.92	-57.00
AGE65-74	0.151 (5.89)	-0.095 (-4.53)	-0.056 (-3.97)	77.65	-13.31	-60.16
AGE75-84	0.291 (9.25)	-0.213 (-6.98)	-0.078 (-4.77)	149.34	-29.93	-82.84
AGE>84	0.307 (5.41)	-0.228 (-4.32)	-0.079 (-4.65)	158.03	-32.07	-84.58
			Socioeconomic Factors			
SINGLE	-0.004 (-0.39)	0.002 (0.37)	0.003 (0.40)	-2.12	0.22	2.72
MIGRANT	-0.005 (-0.18)	0.002 (0.18)	0.003 (0.17)	-2.69	0.28	3.46
PRIMARY	-0.048 (-3.50)	0.012 (1.18)	0.036 (3.68)	-24.61	1.70	38.22
SECOND	-0.063 (-3.42)	0.012 (0.93)	0.051 (3.29)	-32.36	1.72	54.16
TERTIARY	-0.079 (-4.05)	0.010 (0.56)	0.070 (3.54)	-40.76	1.35	74.44
UNEMP	0.058 (2.47)	-0.029 (-1.84)	-0.028 (-2.62)	29.69	-4.12	-30.40
RETIRED	0.085 (4.63)	-0.047 (-2.83)	-0.038 (-4.23)	43.69	-6.55	-40.97
INACTIVE	0.044 (3.18)	-0.021 (-2.32)	-0.023 (-2.80)	22.78	-3.02	-24.41
CENTRO	-0.028 (-1.85)	0.009 (1.26)	0.019 (1.82)	-14.19	1.24	20.08
LISBOA	-0.043 (-2.95)	0.012 (1.26)	0.031 (2.77)	-22.13	1.63	33.60
ALENTEJO	-0.089 (-5.56)	0.006 (0.32)	0.083 (5.29)	-45.78	0.88	88.45
ALGARVE	-0.094 (-5.81)	0.004 (0.19)	0.090 (5.46)	-48.19	0.58	95.75
AÇORES	-0.092 (-4.93)	0.005 (0.24)	0.087 (4.12)	-47.27	0.70	92.92
MADEIRA	-0.162 (-6.68)	-0.114 (-2.25)	0.277 (7.03)	-83.43	-16.06	295.58
INCOME2	-0.017 (-1.29)	0.006 (1.01)	0.011 (1.35)	-8.85	0.84	11.99
INCOME3	-0.040 (-2.52)	0.011 (1.25)	0.028 (2.53)	-20.33	1.56	30.36
RHS	0.095 (3.48)	-0.054 (-2.35)	-0.042 (-3.85)	49.02	-7.54	-44.53
ADSE	0.026 (1.51)	-0.012 (-1.20)	-0.014 (-1.64)	13.19	-1.62	-15.10
OSYS	-0.019 (-1.11)	0.007 (1.09)	0.013 (1.01)	-9.94	0.93	13.58
			Behavior Factors			
WEIGHT	0.034 (2.71)	-0.016 (-1.87)	-0.018 (-2.75)	17.28	-2.19	-19.22
ALCOHOL	-0.044 (-4.51)	0.012 (1.29)	0.032 (4.00)	-22.50	1.64	34.28
SMOKING	-0.008 (-0.67)	0.003 (0.66)	0.005 (0.65)	-4.07	0.42	5.30
FOOD2	-0.055 (-3.67)	0.012 (1.07)	0.042 (3.91)	-28.17	1.75	45.25
FOOD3	-0.064 (-3.98)	0.012 (0.91)	0.052 (4.03)	-32.86	1.71	55.26

Note: z-statistics are reported between parentheses.