Working Paper Series

No. 28

Income-related health inequality in Portugal

Paula Veiga

July 2005

Núcleo de Investigação em Microeconomia Aplicada
Universidade do Minho

Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA E DA TECNOLOGIA

INCOME-RELATED HEALTH INEQUALITY IN PORTUGAL

Paula Veiga*

ABSTRACT

The Portuguese health care system is based on principles of equity and efficiency. Despite that, it appears that equality has not been fully realized owing to differences in access [Dixon and Massialos (2000)] or self-assessed health [Van Doorslaer and Koolman (2004)]. The purpose of this study is to evaluate the degree of income-related inequality in self-reported health in Portugal using different database and methods than those used by Van Doorslaer and Koolman (2004). This study applies the methods developed by Wagstaff and Van Doorslaer (1994) to measure the degree of income-related inequality in self-reported health by means of concentration indices. The results show that significant inequalities in self-reported ill-health exist and favour groups with higher income. Nonetheless, when compared with a similar study [Van Doorslaer *et al.* (1997)], the estimates for income related inequality suggest that Portugal in 1998/1999 ranks in the middle of the European countries. The most important contributors to health inequality are income, activity status and education. Regional differences, by contrast, do not exert any systematic influence. Reductions in pro-rich health inequality can be achieved by reducing the effect of income on health or reducing income inequality, or both.

JEL Code: D16, I12, I18

Keywords: Self-rated health; Income Inequality, Health Inequality; Portugal

---

* University of Minho and NIMA

1. Introduction

Regardless of the socio-economic measure or the health outcome employed, there is evidence of persistent association in every country between low socio-economic status (SES) and poor health [Humphries and Van Doorslaer (2000)]. Across the countries, a strong connection was also found between inequalities in health and inequalities in income, albeit there are wide variations between countries [see Cavelaars *et al.* (1998), Van Doorslaer *et al.* (1997), Van Doorslaer and Koolman (2004)].

A number of World Health Organization (WHO) statements strongly stress the need to reduce the differences in income related health status between countries and between groups within countries [see WHO (1985), WHO (1986)]. Reducing the disparities in health by socio-economic status, has also been a serious issue in Europe and has been put at the forefront of European Union National action plans at the Lisbon European council. In the 2002 Atkinson Report's on *Indicators for Social Inclusion in the European Union*, a less unequal distribution of self-reported health by income quintiles is seen as an intrinsic part of the broad goals of social inclusion and cohesion endorsed by the European Union. Income inequalities in health are therefore on the agenda of international organizations and countries authorities. In parallel, a great deal of academic effort has focused on measuring and identifying the nature of inequalities in health, as well as on the evaluation of different policy initiatives that needs to be taken to help reduce such inequalities.

Over the last twenty years Portugal has enjoyed increased economic prosperity, but there remain striking inequalities in health between socio-economic groups within society [Dixon and Massialos (2000), Van Doorslaer and Koolman (2004)]. Despite the considerable importance, relatively little work has been reported on the situation in Portugal. Van Doorslaer and Koolman (2004) study confirms previous evidence showing that Portugal has the highest income inequality amongst the western European Union countries [see Garcia *et al*. (2001)] and reveals that Portugal has the highest income related inequalities in health amongst 13 of the OECD countries.

The aim of this study is to investigate the income-related health inequalities in Portugal using a different dataset and different methods than the ones used by Van

Doorslaer and Koolman (2004). Our measure of income related health inequalities, the ill-health concentration index is applied to the self assessed health indicator.

The paper is organised as follows. In the next section two I set up the methods used. Section three describes the data. Section four presents the main results. Section five concludes and gives some insights on policy implications.

2. Methods

2.1 Measurement of income-health related inequalities

Health concentration index was the chosen measure of relative income-related health inequality. This method was first proposed by Wagstaff *et al.* (1989, 1991) and has been widely applied in income related health inequality studies. As noted by the authors, the methodological choice of this measure has the advantage of meeting three basic requirements for an index in inequality; (i) it reflects the socio-economic dimension in health (ii) it reflects the experience of the entire population and (iii) it is sensitive to changes in the distribution of the population across socioeconomic groups. Bommier and Stecklov (2002) argue that concentration curves and by implication the concentration index is the most appropriate way to measure socioeconomic inequality in health if equity is defined according to a social justice approach.

Consider a continuous cardinal measure of health (utility), *Hi*. The ill-concentration curve *L*(*s*) plots the cumulative proportion of the population ranked by socioeconomic status (e.g. income) against the cumulative proportion of ill-health. The ill-concentration index, *CI*, is defined as twice the area between *L*(*s*) and the diagonal. When *L*(*s*) coincides with the diagonal, all socio-economic group report the same relative share of ill-health, the concentration index is null meaning that there is no income related health inequality If *L*(*s*) lies *above* the diagonal the concentration index is negative, meaning that inequalities in health exist favouring the richer members of society. If, by contrast, *L*(*s*) lies *below* the diagonal the ill-concentration index is positive meaning that inequalities in health exist favouring the poorest members of society. The further *L*(*s*) lay from the diagonal the greater the degree of inequality. The minimum and maximum values of *CI* using individual-level data are -1 and +1.

The concentration index (CI) can be easily computed [Kakwani *et al*.(1997)] as:

$$CI = \frac{2}{\mu}\operatorname{cov}(H_i, R_i)\,, \quad (1)$$

The concentration index is equal to the covariance between individual health (H_i) and the individual's relative rank (R_i) scaled by the mean of health in the population (μ). The whole expression is multiplied by 2, to ensure the concentration index lies between -1 and +1. Writing the concentration index in this way emphasises that it is an indicator of the degree of association between an individual's level of health and their relative position in the income distribution.

Kakwani *et al.* (1997) show that CI can alternatively be derived as the estimate of γ in the following convenient regression

$$2\sigma_R^2\left[\frac{H_i}{\mu}\right] = \alpha + \gamma R_i + u_i\,, \quad (2)$$

where σ_{R}^2 is the variance of Ri, α is the constant term and u_i is the eror term. The estimate for γ is given by

$$\hat{\gamma} = \frac{2}{n\mu}\sum_{i=1}^{N} (H_i - u)(R_i - \frac{1}{2})\,, \text{ I é } \hat{\gamma} = \text{CI} . \ (3)$$

The standard error for CI can be obtained by estimating the regression using the Newey-West regression estimator that corrects for autocorrelation in presence of relative ranking as well as for potential heteroskedasticity.[1] This will be the method employed in our study.

Concentration indices are sometimes criticised for being hard to interpret. A recent contribution by Koolman and Van Doorslear (2004) show that if the concentration index is interpreted in terms of a hypothetical linear redistribution from rich to poor: 75 times the concentration index is the percentage of total H that would have to be redistributed from individuals in the richest half to individuals in the poorest half of the population to achieve an equal distribution

[1] The commands are implemented in Stata. Kakwani *et al.*(1997) proposed an alternative method

2.2 Measure of health

The concentration index is derived from information on the distribution of health across income groups. Clearly, no single indicator or even a narrow group of indicators captures health in all its dimensions. In this paper, the respondent's self-assessments are used as the measure of general health status that provides a ranking of individuals' self-assessment of their health status (SAH). Although some drawbacks of this measure have been explained [see Strauss and Thomas (1998)] this subjective measure of health has been shown to be a powerful predictor of objective measures of health such as subsequent mortality [for a review, see Idler and Benyamini (1997)]. More importantly, Burström and Fredlund (2001) showed that its predictive power do not appear to vary systematically by SES. Nevertheless, one may expect that deprivation may cause people to report lower health status. In this case the estimate of the effect of income inequality on health may be exaggerated by the use of reported health status as a measure of individual health.

One problem with using a SAH ranking variable is that it basically provides an ordinal ranking, while the CI requires continuous or dichotomous variables. Dichotomising it by setting a cut-off point above which people are said to be in good or bad health is not recommended since the choice of cut-off point can completely change the ranking of countries or periods [Wagstaff and Van Doorslaer (1994)].

The obvious alternative is to assign to the categories a score. The approach in the present study follows the one outline by Wagstaff and Van Doorslaer (1994). It assumes that underlying the responses is a latent self-assessed health variable with a skewed standard lognormal distribution. Each observed SAH category is assign the mid-point of the intervals of a standard log normal as defined by the cumulative distribution of observed SAH categories

To illustrate the method, let 1= Very poor heath, 2= Poor health, 3 = fair health, 4= good health, 5= very good health. This five point categorical variable health variable is assumed to be related to the latent heath variable H* as follows:

$H = 1 \text{ if } -\infty < \mathrm{H}^* \leq \alpha_1$

$$H = 2 \text{ if } \alpha_1 < \mathrm{H}^* \le \alpha_2$$

$$H = 3 \text{ if } \alpha_2 < \mathrm{H}^* \le \alpha_3 \qquad (4)$$

$$H = 4 \text{ if } \alpha_3 < \mathrm{H}^* \le \alpha_4$$

$$H = 5 \text{ if } \alpha_4 < \mathrm{H}^* \le +\infty$$

Where α_j is a threshold. Assuming that the health status has a standard normal distribution the values of H* can easily be computed for each individual as follows. The five thresholds are estimated as:

$$\hat{\alpha}_j = \Phi^{-1}\left(\sum_{i=1}^{j} n_j / N\right), \mathrm{j} = 1,2,\ldots.\mathrm{j}-1 \qquad (5)$$

where $\Phi^{-1}(.)$ is the inverse standard normal cumulative density function, n_j the number of individuals in the category j and N the total number of individuals. This means that the area under the normal distribution s divided in proportion to the number in each category. Then the mean values of H*, in each of the j intervals can be estimated as normal scores using the formula:

$$\hat{Z}_j = (N / n_j)\left[\Phi(\hat{\alpha}_{j-1}) - (\hat{\alpha}_j)\right] \qquad (6)$$

Where $\hat{Z}_j$ is the normal score in question, and $\Phi\ (.)$ is the standard normal density function. Since for most health distributions it is assumed a standard lognormal distribution rather than a standard normal distribution, i. é

$\hat{Z}_j = -\ln H^*$, so that H*= exp($\hat{Z}_j$) (7)

This approach has earlier been applied [see Van Doorslaer *et al.* (1997), Wagstaff *et al.* (2001)] to analyze income health inequality. Furthermore, the method is supported by results from a validation study conducted on Swedish data [Gerdtham *et al*. (1999)].

An alternative method is to estimate ordered probit regressions using the SAH categories as dependent variable and to rescale the underlying latent variable of this model to compute 'quality weights' for health between 0 and 1 [see Groot (2000), Van Doorslaer and Jones (2003)]. The shortcoming of this method is the probit and logit functions are inadequate to model health due to the significant degree of skewness in the health distribution (i.e., the majority of a general population sample report themselves to be in good to excellent health). Interval regression are more efficient when the values of the boundaries of the intervals are known [Van Doorslaer and Jones (2003)]. Some authors have been using external information in the means of SAH category of a more generic health measure from another survey to score the SAH categories in a survey not containing such generic measure, and then use interval regression estimation. This method was applied by Van Doorslaer and Koolman (2004) in their study to explain the differences in income-related health inequalities across 13 OECD Countries. As external data, they used the empirical distribution function of the HUI scores of Canada from 1994. Therefore, they have to assume that this HUI also hold for all the European countries and not only for Canada, which is probably not always true.

2.3 Causes for inequality

One of the attractive features of the concentration index as a measure of income-related inequalities in health is the possibility to incorporate an econometric model for health and subsequently proceed to the decomposition of inequality into the contributions of each of the regressors. Wagstaff *et al.* (2003) concluded that if health can be specified as a linear additive model of the form:

$$H_i = \alpha + \sum_k \beta_k x_{ki} + \varepsilon_i , \qquad (7)$$

where x_k variables are the health determinants and ε is the disturbance term the concentration index for H can be written as :

$$C = \sum_k (\frac{\beta_k \bar{x}_k}{\mu}) C_k + \frac{GC\varepsilon}{\mu} \qquad (8)$$

where $\bar{x}_k$ is the mean of x_k , C_k is the concentration index for x_k , and $GC\varepsilon$ is the generalized concentration index for the disturbance term.

The decomposition clarifies how each health determinant separate contributes to total income-related health inequality. Each contribution is the result of (i) the impact of the variable on health measured by health elasticity, and (ii) its degree of unequal distribution over income. Moreover, this equation shows that C*I* can be thought of as being made up of two components. The first is the deterministic or "explained" component and the second is the residual or unexplained component. The "explained" component is equal to the weight sum of the concentration indices of the regressors, where the weights are simply the elasticity of H with respect to each variable evaluated at sample means. The "unexplained" component reflects the inequality in health that cannot be explained by systematic variation in the x_k across income groups in the regressors (x_k).

Following the terminology by Kakwani *et al.* (1997), total inequality can also be portioned into avoidable and unavoidable components. Epidemiology indicates that the unavoidable part is the income-related health inequalities due to demographics. Variations in health that are attributable to age and gender may be seen as unavoidable and hence legitimate sources of inequality. Therefore, deviations of L(S) from the diagonal can be in part due to an association between income and demographic factors The potentially avoidable inequality can be computed by subtracting CI from the standardized CI (CI*), using the indirect method of standardisation [Kakwani *et al.* (1997)]. We (re)estimate equation (2) including control variables for age and sex. Then we compute the age-sex avoidable inequality as I*= CI-CI*. An alternative to indirect standardization is to use the full model and to estimate the health inequality *not* due to demographics by subtracting the contributions of age and gender from the total inequality. The results are comparable.

3. Data

The data used in this paper are taken from the mainland Portuguese representative cross sectional health data set, the survey "Inquérito Nacional de Saúde" collected in 1998/1999. The survey includes questions on demography, socioeconomic conditions, health status, health risks and health care utilization, and costs of health care. The target population of the survey includes household residents in all regions of mainland Portugal. A total of 21.808 household unities were selected for the survey. In each household all individuals were interviewed which resulted in 48.606 individual observations. The sample is representative and the relative sample error is lower than 5%. All the individuals that lacked health status report were omitted and therefore the final sample included 30.597 observations.

The information on self assessed health in "Inquérito Nacional de Saúde" is presented in a categorical variable resulting from the following question: "In general, how would you say your health is? i) very good, ii) good, iii) normal, iv) bad, v) very bad".

There are several alternatives to the measurement of socioeconomic status.[2] The chosen ranking variable was the total net monthly income earned by the household divided by the number of members of the household. Income is a broad measure for socio-economic conditions, not evenly distributed, and strongly associated with health [Van Doorslaer *et al.* (1997)]. Moreover, using the income as ranking variable allows for comparison with other studies.

In the INS 98/99, the monthly net income earned by the household includes all sources of income and is measured as a categorical variable with 6 response categories. The midpoint of each income group was attributed to all households in the category and this is subsequently divided by the number of household members. By using midpoints rather than the actual amounts, and then to reduce the variation on income, it is likely that the income inequality is underestimated and that the association between health and income is attenuated.

The health determinants included in the self-assessed health determinant model are 1) the logarithm of per-capita household income to allow for the non-linearity between health and income 2) six age-sex categories corresponding to age groups from men and women, iii)educational levels, measured by the number of years completed in school, 4) marital status that distinguishes between married and no married, 5) economic activity status, including employed, student, unemployed and "other economically inactive" and 6) region of residence. Table 2 presents a description of the variables.

---

[2] Wagstaff and Watanabe (2002) investigate the choice of the SES indicator in order to know whether there is a difference in the measured degree of socioeconomic inequality in health. They conclude that, for the most part, there is not a significant difference in the estimated socio-economic inequalities in health by indicator.

4. Empirical Results

Table 1 provides the data on the SAH report and the latent self-assessed ill-health scores. It illustrates that almost 80% of the interviewed report lower than good health. This is a staggeringly high percentage, when compared to other developed countries. For example, on the 1996 European Community Household Panel (ECHP) less than 35% of the European adults classify their health as less than good Moreover, SAH in Portugal are remarkably different to the relative frequencies for the response categories (Poor, Fair Good, Very Good and Excellent) in Canada 1994 which were 2.4%, 6.6%, 27%, 37.2% and 24,8%, respectively [see Van Doorslaer and Koolman (2004) for details].

Looking at table 1, it can be seen, that our estimated ill-health score increases as the SAH becomes worst.

(Insert Table 1 here)

Table 2 presents the descriptive statistics for the estimation sample. The sample is mainly constituted by women (59.8%) and married people (54%). The mean age of the sample is 41.7 years. A closer look shows that the age pyramids are different for men and women in the sample. While man are on average younger, having a high representation of individuals aging less than 18 years old, among women there is a higher percentage of middle aged women, and therefore the women are on average older. In terms of education, the average years of schooling are 5.4 years. Almost 30% of the sample lives in the Northern region of Portugal. Lisboa and Vale do Tejo is the second most represented region in the sample.

(Insert Table 2 here)

We find evidence of strong income inequality in mainland Portugal. Our estimated Gini coefficient on income is 0,34.[3] Similar estimates for income inequality have been also reported elsewhere [Farinha (1999), García *et al.* (2001), Van Doorslaer and Koolman (2004)]. Household per capita income averages 52.592,58 (+- 38.045, 8) escudos monthly, which corresponds to approximately 263 euros. Looking at the quintile distribution of family income per-capita (Table 3) shows that more than 60% of the sample lies below the average per-capita income.

(Insert Table 3 here)

The association between household per-capita income and SAH can be inspected by comparing the means of the ill-scores for each of 5 income deciles. The data is presented in table 4. As can be observed, there is a general tendency towards better health status with increasing income. An exception is when moving from the first quintile to the second quintile.[4] Moreover, the pair-wise comparisons of means, indicate that mean differences are statistically significant (alfa = 0.05), except between 4 quintile to 5 quintile.

(Insert Table 4 here)

Table 5 presents the CI and the standardized CI for age-sex, computed using the indirect method of standardization. The estimated CI is statistically significant lower than zero, indicating that income-related inequalities exist and favour the higher income groups. This result is consistent with the findings of Van Doorslaer and Koolman (2004).

(Insert Table 5 here)

Comparing with a similar study by of Van Doorslaer *et al.* (1997) of eight European countries and the United States, not including Portugal, the degree of inequality in Portugal would appear to be in the middle range of the countries studied. The estimated

[3] The Gini coefficient estimate is close than the one presented by Farinha (1999), but is smaller than the one estimated by Van Doorslaer and Koolman (2004).
[4] Remark that our health variable is ill-health increasing

concentration index it is higher than those estimated in Sweden, East Germany, Finland, West Germany and Netherlands but lower than the estimated inequality in Switzerland, Spain, UK, Canada and United States. This relative position of Portugal was not confirmed by a more recent study by Van Doorslaer and Koolman (2004). In their study, using a different method to cardinalise SAH, Portugal presents the highest health inequality amongst the studied 13 OECD countries. The differences in the results are difficult to explain at this point. Besides the differences in the methods, the recent evolution of Portuguese economy may have contributed to the apparent difference.

Turning to the standardized CI, surprisingly the age-sex structure of the population actually contributes to an increase of the concentration index. The estimated standardized CI suggests that if there were no "natural" differences in the average self-reported health status by age and gender, the concentration index would be even bigger. This result was not expected, and was also not found in Van Doorslaer and Koolman (2004).

Table 6 contains the parameter estimates for the linear estimation of health on its determinants. The omitted references are Mage1, Fage1, "Other economic inactive", and "LVT region". Some cautions are required when interpreting the result of the regression analysis; this is not a structural model for health and therefore its estimates cannot be given a causal interpretation. This should be taken as one limitation of the study. The partial cross association between income and health as measured in the regression may to some extent also reflect reverse causality or joint determination. That is also true for other variables in the regression, such as education or economic activity status.

(Insert Table 6 here)

As expected, the log (income) has a strong and significant partial association with income inequality. Again, the causality of the relation it is not clear. It is likely to work in both directions, that is, richer individuals report better health, and unhealthy people earn less income.

Consistent with findings reported in other studies, as well as with what theory would suggests, self-reported health decreases substantially with age. Nonetheless, apparently the age-effect is stronger among the women. As for the activity status, full time working and student are those who report the highest scores. Being unemployed, on the other hand, it is associated with low level health, but generally better than the reference group of “Other economically inactive” individuals. Regarding the region of living, the Center and Algarve regions are worse-off in terms of health, in contrast with the other regions.

As expected, the number of years of schooling appears to have a positively effect on self reported health, that is more educated people tend to report better health.

The contributions of the variables to the degree of income related health inequalities are presented in table 7. A positive (negative) sign of the concentration coefficients for the regressors (column 3), means an income (dis)advantage for those individuals having that particular characteristic. For example, being married has a total concentration index of 0,067, therefore married individuals appear to be more concentrated among the richest group. A positive (negative) x% contribution of variable X on *CI* (column 4) is to be interpreted as follows: income-related health inequality would, *ceteris paribus*, be x% lower if variable X were equally distributed across the income range, or if variable X had a zero health elasticity.

(Insert table 7)

Obviously, the income itself appears to be the largest single contributor to explain the health inequality by income. The contribution of income to the explained concentration index is 91%. The estimated strong effect of income is due to both the strong negative effect of income on ill-health score, and the high level of inequality in the household per-capita income. The income elasticity of ill-health is around -1.8, meaning that reported health is quite responsive to variations in household per capita log income. The estimate contribution of income (and income distribution) in the present study is much higher than the one reported by Van Doorslaer and Koolman (2004).

The second most important contributor is the (economic) activity status. As expected, having a job appear to contribute to a pro-rich distribution of health. The CI of having a job is approximately 0,169 and being employed decreases the ill-health score. The estimated contribution of being employed for the total income health inequality is around 41%.

We can also see that being married is relatively more advantageous than being single. Nonetheless, the contribution for CI is not relevant because the estimated impact of the married status on reported health is small and it is not statistically significant at conventional levels. Consistent with findings from other studies the individuals with the lowest education are concentrated amongst the poorest. Moreover, an increase in education level tends to decrease the ill-health score. Altogether education contributes with 40% of the income related health inequality. Regional differences do not seem to systematically add to income related health inequalities in Portugal. People in the North and Center regions are more concentrated among the lower incomes, but the marginal effects of residence are fairly small or not statistically significant (at conventional levels). This contradicts the previous results by Van Doorslaer and Koolman (2004) showing that the regions contribute to the estimated income related health inequality in Portugal.

As noted before, the age-sex structure of the population actually contributes to an increase of the concentration index. This increase appears to be mainly driven by the fact that while women and man between 45 and 64 report high ill-health score, they are concentrated among high incomes. We can also standardize the concentration index by age and gender by subtracting the contributions of age and gender from the raw concentration index. The resulting figure (-0,0956) is obviously similar to the indirect standardization, presented in table 5.

5. Conclusions and discussion

Our primary aim was to investigate the existence of income–related inequalities in Portugal using data from 1998 Inquérito Nacional de Saúde and the methods developed by Wagstaff and Van Doorslaer (1994). As expected the analysis of the date indicated relatively high income related inequalities in Portugal, favouring the richer part of the population. We were surprised to find that our estimate standardized CI is higher than CI. This is apparently is due to the fact that, the middle age man and woman who report a relative lower health, are concentrated among higher income groups

While the paper does not tell us what can be done to reduce income related inequality in health it shows where the greatest potentialities are. The evidence suggests that, income, employment status, as well as education are the most important drivers of the observed differences in income related health status in Portugal. The contributions of each of these factors have two components: first its effects on health status, as measured by the elasticities, and second its degree of income related inequality. Reducing income inequality would significantly reduce the health income inequalities, but it is not the only path to reduce inequalities. What appears also crucial is the strong relationship between income and health. Measures that help to reduce the impact on health due to income loses as well as the income consequences of ill-health will definitely help. As Van Doorslaer and Koolman (2004) suggested, policies aimed at eliminating the gradient between health and income can potentially lead to greater reductions in socio-economic health inequalities than policies aimed at redistributing income. Nonetheless, before being able to formulate these types of policies, however, it is necessary to obtain more evidence on the causal pathways between health and income.

6. References

Atkinson A, Cantillon B., Marlier E. and Nolan B.; Social indicators: the EU and social inclusion*,* Oxford University Press, 2002, Oxford.

Bommier A. and Stecklov G.; Defining health inequality: why Rawls succeeds where social welfare theory fails *Journal of Health Economics, May 2002,21(3): 497-513.*

Burström B. and Fredlund P.; Self-rated health: is it as good a predictor of subsequent mortality among adults in lower as well as in higher social classes? *Journal of Epidemiology and Community Health,* 2001, 55 (11): 836-840.

Cavelaars A, Kunst A, Geurts J, Crialesi R, Grotvedt L, Helmert U, Lahelma E, Lundberg O, Matheson J, Mielck A, Mizrahi A, Mizrahi A, Rasmussen N, Regidor E, Spuhler T, Mackenbach J.; Differences in self reported morbidity by educational level: A comparison of 11 western European countries. *Journal of Epidemiology and Community Health, 1998* 52: 219–27.

Dixon A., Massialos E.; Has the Portuguese NHS achieved its objectives of equity and efficiency?, *International Social Security Review*, 2000, 53, 49-78.

Farinha C.; Income distribution and poverty in Portugal (1994/95), Available on 1999http://pascal.iseg.utl.pt/~depteco/wp/wp41999.pdf

García S, Rodriguez J., and Salas R.; The evolution of income inequality in the European Union, *Instituto de Estudios Fiscales P. T.* N.o 10/02, 2001 Available on http://econwpa.wustl.edu:8089/eps/pe/papers/0309/0309003.pdf

Gerdtham U., Johannesson M., Lundberg L., Isacsson D.; A note on validating Wagstaff and Van Doorslaer's health measure in the analysis of inequalities in health, *Journal of Health Economics*, 1999, 18: 117–124.

Groot W., Adaptation and scale of reference bias in self-assessments of quality of life. *Journal of Health Economics*, 2000, 19 3, 403-420.

Humphries K. and Van Doorslaer E.; Income related health inequalities in Canada, *Social Science & Medicine* 50(2000) 663-671.

Idler E. and Benyamini Y.; Self-rated health and mortality: a review of twenty-seven community studies, *Journal of Health and Social Behavior,* 1997, 38(1): 21-37.

Kakwani N., Wagstaff A. and Van Doorslaer E.; Socioeconomic inequalities in health: measurement, computation and statistical inference. *Journal of Econometrics*, 1997, 77(1): 87-103.

Koolman X. and Van Doorslear E.; On the interpretation of a concentration index of inequality, *Health Economics*, 2004, 13: 649-656.

Strauss J. and Thomas D.; Health, nutrition and economic development, *Journal of Economic Literature*, 1998, 36, 766-817.

Van Doorslaer E. and Jones A.; Inequalities in self-reported health: validation of a new approach to measurement, *Journal of Health Economics*, 2003, 22: 61-87.

Van Doorslaer E. and Koolman X.; Explaining the differences in income-related health inequalities across European countries, *Health Economics*, 2004, 13: 609-628.

Van Doorslaer E., Wagstaff A., Bleichrodt H., Calonge S.; Gerdtham U.;Gerfin, M.; Geurts J.; Gross L.; Hakkinen U., Leu, R.; Income-related inequalities in health: some international comparisons, *Journal of Health Economics*, 1997, 16: 93-112.

Van Doorslaer E., and Jones A.;. Inequalities in self-reported health: validation of a new approach to measurement, *Journal of Health Economics,* 2003, 22: 61-87.

Wagstaff A. and Watanabe N.; What difference does the choice of SES make in health inequality measurement?, November 2002, 9 p, Available on: http://poverty.worldbank.org/files/13971_ses.pdf

Wagstaff A., Paci P. and Joshi H.; Causes of inequality in health: who you are? Where you live? Or who your parents were?, November 2001, *Policy Research Woking Paper* 2713, November 2001World Bank.

Wagstaff A. and Van Doorslaer E.; Measuring inequalities in health in the presence of multiple-category morbidity indicators, *Health Economics,* 1994, *3*, 281-291.

Wagstaff, A., Van Doorslaer E.,Watanabe N.; On decomposing the causes of health sector inequalities with an application to malnutrition inequalities in Vietnam, *Journal of Econometrics*, 2003, 112 (1), 207-223.

Wagstaff, A., Paci P. and Van Doorslaer E.; Equity in the finance and delivery of health care: some tentative cross-country comparisons. *Oxford Review of Economic Policy*, 1989, 5, 89-112.

Wagstaff, A., Paci P. and Van Doorslaer E.; On the measurement of inequalities in health, *Social Science and Medicine,* 1991, 33, 545-557.

World Health Organization Regional Office for Europe. Targets for Health For All. *European Health for All Series* 1, 1985.

World Health Organization, Social Justice and Equity in Health.; *Report on a WHO Meeting* (Leeds, United Kingdom, 1985), Regional Office for Europe. (ICP/HSR 804/m02), Copenhagen, 1986.

Graph 1 - ill-Concentration Curve

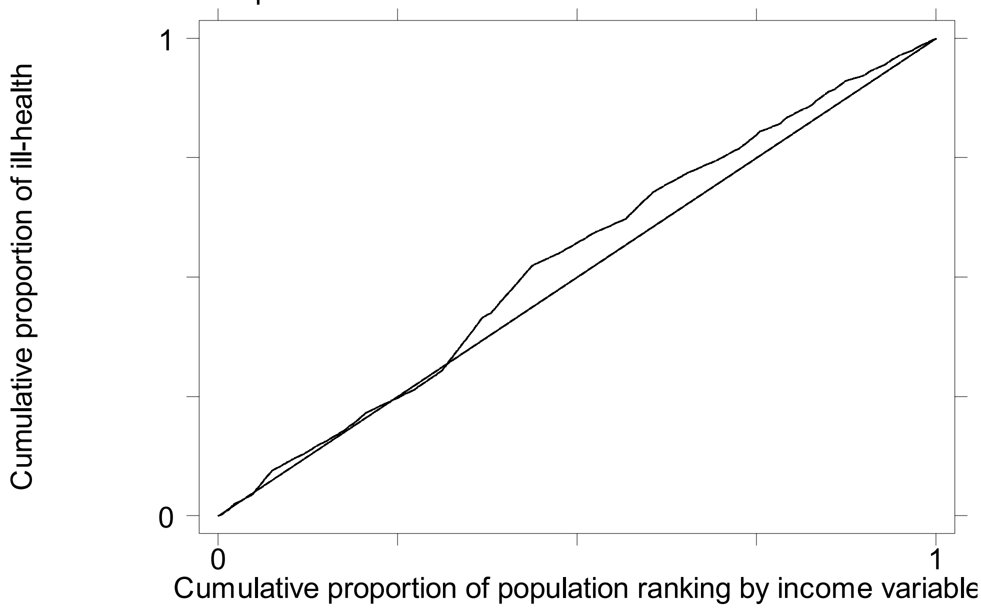

Table 1 – Sample distribution and ill-health score of self-assessed health

In general, my health is	Sample (%)	Latent ill health variable
Very Good	4.32	0.12
Good	16.35	0.45
Fair	37.41	1.33
Poor	37.69	3.29
Very Poor	4.32	8.42

Table 2 - Description and Means (and standard deviations) of the variables

	Descrition	Mean (standard deviation)
Lincome	Logarithm of per-capita household monthly income	10.6719 (0.6246)
Mage 1	=1 if male and age≤18	0.1254 (0.3312)
Mage 2	=1 if male and age ≥19 & age ≤24	0.0459 (0.2091)
Mage3	=1 if male and age ≥25 & age ≤35	0.0469 (0.2115)
Mage4	=1 if male and age ≥36 & age ≤ 45	0.0940 (0.2918)
Mage5	=1 if male and age ≥46 & age ≤ 64	0.0578 (0.2333)
Mag6	=1 if male and age ≥65 & age ≤ 74	0.0328 (0.1780)
Fage1	=1 if female and age≤18	0.1265 (0.3324)
Fage2	=1 if female and age ≥19 & age ≤24	0.0875 (0.2825)
Fage3	=1 if female and age ≥25 & age ≤35	0.0895 (0.2855)
Fage4	=1 if female and age ≥36 & age ≤ 45	0.1590 (0,3657)
Fage5	=1 if female and age ≥46 & age ≤ 64	0.0823 (0.2749)
Fage6	=1 if female and age ≥65 & age ≤ 74	0.0524 (0.2228)
Married	=1 if married	0.5400 (0.4984)
Unemployment	=1 if looking unemployed	0.0300 (0.1707)
Student	= 1 if is full time student	0.1794 (0.3837)
Job	= 1 if worked in the last two weeks	0.3460 (0.4760)
Yr school	Number of years of school completed	5.8922 (3.899)
North	=1 if Lives in the north region	0.2910 (0.4542)
Center	=1 if Lives in the center region	0.2070 (0.4051)
Alentejo	=1 if Lives in the Alentejo region	0.1286 (0.3348)
Algarve	=1 if Lives in the Algarve region	0.1134 (0.3171)
LVT	=1 if Lives in the Lisboa e Vale do Tejo region	0.2600 (0.4386)

Table 3 - Income per-capita distribution (in escudos)

	Percentage	Mean	Standard deviation	Minimum	Maximum
1 Quintile	20.63	19224.13	3395.55	3395.55	24566.5
2 Quintile	23.07	33393.76	2717.51	24777.72	36849.75
3 Quintile	16.95	42847.37	4158.43	37166.58	48499.75
4 Quintile	21.94	61819.6	8974.92	48716.67	74333.16
5 Quintile	17.40	115469.3	46872.21	74749.75	381900

Table 4- Average ill-health score and average ill-health score by income quintile (standard deviations)

	Portugal
Average	1.478 (1.746)
1 Q	1.550 (1.737)
2 Q	1.971 (2.025)
3 Q	1.351 (1.511)
4 Q	1.221 (1.388)
5 Q	1.188 (1.376)

Table 5 - Concentration Indices **(**(Newey-West Std. Er)

CI	CI*(a)
-0.064	-.0903
(0.003))***	(0.003)***

(a) Demographic variables: Fage2, Fage3, Fage4, Fage5, Fage6 (Fage1 omitted), Mage2 Mage3, Mage4, Mage5, Mage 6 (Fage1 omitted)

*** significant at 1%

Table 6 – OLS regression (Robust t-statistics in parentheses)

Variable	Coefficient
lincome	-0.232 (13.38)***
mage2	0.282 (7.02)***
mage3	0.480 (9.80)***
mage4	0.877 (16.62)***
mage5	1.035 (14.62)***
mage6	1.106 (11.52)***
fage2	0.401 (9.98)***
fage3	0.629 (12.93)***
fage4	1.208 (23.35)***
fage5	1.582 (20.20)***
fage6	1.720 (15.82)***
married	-0.020 (0.66)
unemployed	-0.332 (5.69)***
Student	-0.542 (10.81)***
Job	-0.526 (16.28)***
Yrschool	-0.042 (17.31)***
North	0.000 (0.00)
Center	0.139 (4.50)***
Alentejo	-0.193 (6.56)***
Algarve	-0.043 (1.32)
Constant	3.816 (19.99)***
Observations	21034
R-squared	0.23

** *significant at 1%

Table 7 – Decomposition and contributions to concentration Indices of income –related inequality, by source

	Elasticity	C	Contributions to C	% do c
Log Incfamilia	-1,7872***	0,0326	-0,0582	0,9101
Mage2	0,0121***	0,1646	0,0020	-0,0312
Mage3	0,0211***	0,0899	0,0019	-0,0297
Mage4	0,0691***	0,1846	0,0128	-0,1994
Mage5	0,0388***	0,0873	0,0034	-0,0529
Mage6	0,0190***	0,0223	0,0004	-0,0066
Fage2	0,0325***	0,0287	0,0009	-0,0145
Fage3	0,0491***	-0,0031	-0,0002	0,00234
Fage4	0,1474***	0,0997	0,0147	-0,2298
Fage5	0,0631***	-0,0097	-0,0006	0,0096
Fage6	0,0337***	-0,1079	-0,0036	0,0568
Married	-0,0085	0,0670	-0,0006	0,0089
unemployed	-0,0083***	-0,1793	0,0015	-0,0234
Student	-0,0879***	-0,1780	0,0156	-0,2446
Job	-0,1593***	0,1686	-0,0269	0,4202
yrschool	-0,1823***	0,1425	-0,0260	0,4061
North	0,00004	-0,1366	-0,0000	8,8E-05
Center	0,01960***	-0,0809	-0,0016	0,0248
Alentejo	-0,0171***	0,0300	-0,0005	0,0081
Algarve	-0,0033	-0,0179	0,00006	-0,0009