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Income-related inequalities in self-assessed health: comparisons of alternative measurements of health

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Abstract

This study analyses income-related inequalities in health in France in 2004, using a decomposed concentration index and alternative refined measurements of health. Interval regression method is used to cardinalise self-assessed health. Results are offered at two levels. Firstly, this analysis shows income-related inequalities in health favouring socially advantaged groups. The strongest contributions to inequalities come from income level, education level and social status. Secondly, the analysis being carried out with alternative measurements of health, inequalities in health appear to vary quantitatively with both the number of categories of self-assessed health and the distribution of health used to cardinalise self-assessed health.

JEL codes : C13, C43, D63, I12

Keywords : concentration index - France - health measurement - HUI - SF6D

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1 Introduction

In France, studies on disparities in mortality, specific health problems and disabilities caused by socioeconomic status are particularly well-documented (Leclerc *et al.*, 2000; Jusot, 2003; Boissonnat & Mormiche, 2007). They emphasise very large inequalities in mortality in France: lower socioeconomic groups have higher rates of mortality than higher socioeconomic groups (Girard *et al.*, 2000). Moreover, inequalities in health between social groups seem to have increased over time and would be higher in France than in other European countries (Kunst *et al.*, 2000). While over the period 1976-1984 the mortality rate of French blue collar workers aged 35-80 years old was 1.8 times higher than the mortality rate of their white collar counterparts, the ratio increased to 1.9 between 1983 and 1991 and reached 2.1 between 1991 and 1999 (Monteil & Robert-Bobée, 2005). Nevertheless, few French studies concern inequalities in health as measured by indicators of general health (Chauvin & Lebas, 2007). Lack of this became particularly noticeable when income-related inequalities in health have been widely explained in Europe using more global health indicators: e.g Gravelle and Sutton (2003) in Great Britain, Lecluyse (2007) in Belgium, Leu and Schellhorn (2006) in Switzerland or Garcia and Lopez (2007) in Spain.

One of the challenges in measuring inequalities in health is to have a usable measurement of health. Besides mortality or life expectancy, health status does not have a cardinal nature. In this context, the field of the measurement of health status has had an increasing interest, with recent propositions for sophisticated channels to transform an ordinal health measure, such as self-assessed health (SAH) into a continuous variable. To our knowledge, this sophisticated technique has not been applied to French data[1]. In this article, we carry out an analysis of inequalities in health with different measurements of health. Firstly, we replicate the new approach of measurement proposed by van Doorslaer and Jones (2003), which cardinalises self-assessed health (SAH) using estimated thresholds from the Canadian Health Utility Index. Besides the HUI questionnaire not being available in France, the universality of this index can be called into question, and so we consider alternative measurements. The second measurement of health is an adaptation of the previous approach but relies on a generic distribution of health in the French population. Then, we consider the innovative

[1]The only study of income-related inequalities in health which involves France is the comparative analysis carried out by Van Doorslaer and Koolman (2004) using the 1994 European Community Household Panel.

continuous health index generated in Tubeuf & Perronnin (2008) as a third measurement of health and test its reliability in an empirical study. Moreover, because the French SAH is reported on both a verbal and a numerical responses scales in our data[2], we also consider the effect of this feature on the subjacent analysis of inequalities. The three previous measurements of health are applied to SAH reported over five verbal response categories, and the last two measurements of health also consider SAH reported in eleven numerical categories. As a result, the second aim of this study is to give a comprehensive understanding on the measurement of health within the analysis of inequalities in health.

The second section presents the French health care system. The third section describes data. The fourth section concerns the measurements of health which are involved in the analysis. The fifth section focuses on the measurement of income-related inequalities in health in 2004. The sixth section describes these inequalities in health in 2004 in detail by decomposing them into contributing factors. Conclusions are presented in the last section.

2 The French health care system over the last decade

The French health care system is based on the principle of horizontal equity, according to which individuals with equal needs should have identical access to care regardless of their socioeconomic status. A series of changes in the French health care system over the last ten years have given rise to a new concern for inequalities in health. The great majority of the French population, namely 98%, is covered by the Social Security system. Nevertheless, the compulsory national health insurance fund only covers between 70% and 80% of total health care cost. Patients face user charges when they visit general practitioners as well as specialists and when they stay at the hospital or buy drugs, optical or dental prostheses (Couffinhal & Paris, 2003). Therefore, individuals can purchase voluntarily a supplementary medical health insurance to cover these charges. These private insurance policies are usually funded through flat-rate premiums, which are sometimes subsidised by employers. The poorest individuals such as unemployed people with no social benefits or homeless people or other socially-disadvantaged people are less often covered by a private insurance. Consequently, one of the most striking policy changes has been the extension by law of free access to

[2] Individuals are asked to report their health status in five categories from “very poor” to “very good” and they are also asked to evaluate their health status on a scale from 0 to 10.

medical care to a larger number of individuals with low income through a universal health care coverage, called the *Couverture Maladie Universelle* (CMU). Besides granting access to compulsory medical insurance, this reform has provided the poorest 4.5 million individuals with a free supplementary health insurance and has also exempted them from out-of-pocket payments (Boisguérin, 2005). Almost 4 million people were automatically enrolled when the plan began in January 2000.

Since its introduction, effects of CMU on health care utilisation have been analysed. In particular, it has been shown that CMU beneficiaries use more health care *ceteris paribus* than any other people having a supplementary health insurance (Raynaud, 2003; Grignon & Perronnin, 2003). This impact on health care utilisation is explained by poorer health status among socially disadvantaged groups. Nevertheless, this impact can also be explained by a moral hazard in the behaviour of CMU beneficiaries: those who enrolled on the plan may be those who expect to use health care more (Grignon *et al.*, 2007). Concerning inequity aspects, Huber (2006) shows that the introduction of the CMU explains most of the reduction of the horizontal inequity index of health consumption between 1998 and 2002. However, the efficacy of this programme in reducing social inequalities in health has not yet been fully assessed. The only outcome measure is that by the end of 2000, CMU beneficiaries declared that their health status had improved during that year more frequently than non-beneficiaries (Raynaud, 2003). As regard to effects of CMU on inequalities in health care utilisation, we can intuitively foresee effects on inequalities in health: a selection bias of CMU beneficiaries according to which those who enrolled the plan are also those in poorer health.

3 The data

We rely on data coming from 2004 IRDES-HHIS (Health and Health Insurance Survey). Whereas it is widespread in the literature to study inequalities in health status on the population aged 16 and over (Gakidou *et al.*, 2000; Gravelle & Sutton, 2003; Humphries & van Doorslaer, 2000), we point out the relevance of analyses according to age groups in order to take into account changes in individuals' health preferences due to age. We restrict our analysis to the working-age population, i.e. individuals aged 16 to 65 years old. The particular relationship between health and ageing justifies this restricted sample. Indeed, health status worsens with age and so is less influenced by income after 65 years old old. For instance, needs for health care is shown as less unequal among elderly people than among young age classes (Huber, 2006). Similarly, there seems to be no or limited income-related inequality in ill-health among persons aged more than 65 years old and inequality differences are highly significant between persons aged more than 65 years and persons aged less than 65 years old. According to van Ourti (2003), another reason for this difference in inequalities in health according to age is the income concept. A ranking based on permanent income is different from a ranking based on current income and, as a result, it potentially leads to a different degree of socioeconomic inequalities in health. As many surveys on health, IRDES-HHIS does not give a very detailed income information. As a consequence, in order to distinguish between permanent and current income, we would have to rely on arbitrary assumptions. For these reasons, we restrict our study to individuals who are under 65 years old. Our analysis relies on $8,235$ individuals in 2004.

We use household income as the measurement of income. In the dataset, households are asked whether each of them has different income and other financial resources. If so, these incomes are either detailed or at least reported as a global amount. From these answers the amount of current total disposable monthly income (everything included) is generated within IRDES. Furthermore, households have to point out a category for their income. In this manner, if households do not know their global or detailed income, they only give a category. This is the case for $18,56\%$ of the whole sample. We use this information to generate a continuous income. Indeed, we calculate the income median per income category and replace unknown monthly incomes by the median. Income is considered in inflation-adjusted euros and then, transformed into a household income per consumption units using the modified OECD scale, which gives a weight of 1 to the first adult, 0.5 to the second and subsequent adults, and 0.3 to each dependent.

4 Three alternative measurements of health

Our analysis relies on a measurement of general health, namely SAH. The main disadvantage of this variable in the context of the measurement of inequalities in health is its ordinal categorical aspect. Its subjective aspect as widely been shown correlated to other health variables (Idler & Benyamini, 1997). To analyse income-related inequalities in health, we need to cardinalise the information contained in SAH. Several methods have been proposed in the literature. The more recent and more promising method is the method proposed by van Doorslaer and Jones (2003) which relies on a mapping from a generic health measure to the latent variable subjacent to SAH. We propose five alternative mappings for SAH based on this methodology. The first mapping is produced by applying the estimated thresholds of HUI to our SAH variable as proposed in van Doorslaer and Jones (2003). Nevertheless, we put forward the reliability of HUI thresholds for the French SAH and look for a generic health measure available for the French population. The second indicator thus relies on SAH cardinalised on SF6D generated from the French SF36. Finally, the third indicator is the health index generated in Tubeuf & Perronnin (2008). Considering that SAH in 2004 IRDES-HHIS is available on two different scales, i.e a 5-points scale and an 11-points scale, the two latter indicators are also generated on the second scale.

4.1 New approach to measurement of health: an application to French data

4.1.1 Methodological strategy

Van Doorslaer and Jones (2003) propose to use the HUI predicted thresholds of each SAH level to compute an interval regression on SAH, even if the survey does not contain any generic health distribution similar to the HUI. Therefore, the same predicted thresholds have been used in some European studies and it has been assumed that distributions of health in any European country were comparable to the Canadian distribution of health. We follow this suggestion and assume that there is a stable mapping from HUI that determines SAH. This stable mapping applies not only to Canadian but also to French people. The actual thresholds are 0, 0.428, 0.756, 0.897, 0.947 and 1 for the best possible health status. In concrete terms, we compute these estimated thresholds in an interval regression model on the French SAH in five categories. The interval regression model also includes a vector of individual characteristics such as equivalent income, activity status, and education level. In this context, this is the level of HUI that is predicted considering that an individual has some particular characteristics Z_i.

4.1.2 Discussion

Although the Canadian distribution of health status is likely to be similar to the distribution of health in Europe and *a fortiori* in France, the authors' hypotheses need to be firstly discussed from a general point of view and then as regard to the French context.

Firstly, there are cultural differences in the way people report less than "good" health (Mackenbach, 2005). Using SHARE data, large differences in general indicators of physical health such as SAH, long-standing health problems, and activity limitations have been emphasised between countries (Börsch-Supan *et al.*, 2005). For instance, when it comes to SAH, German people are likely to rate their health more negatively than Dutch or Danish people, and the same applies to Italian and Spanish people as compared to French and Greek people. Furthermore, perceptions of "*excellent*" and "*very good*" health are varying with the cultural context and cannot be assumed to be identical, even in terms of frequencies. Indeed, when comparing the same sample of people answering both wordings[3], we clearly observe that the distribution of answer frequencies moves on the right when "excellent" is the highest category instead of "very good". In the French context, the spelling of SAH in 2004 is different than the spelling used in the Canadian NPHS. In the Canadian version, SAH is based on the simple question "*In general, how would you say your health is?*" and on a choice among five possible answers: "*excellent, very good, good, fair*" and "*poor*". However, in the French questionnaire, for analogous question: "*How is your general health status?*" the five proposed answers are "*very good, good, fair, poor* and "*very poor*". In this context, the Canadian "*very good*" category corresponds to the French "*good*" category, the "*good*" to the "*fair*" and the "*fair*" to the "*bad*". Thus, percentages[4] of each previous couple (Canadian SAH category/French SAH category) are very different: 37.1% versus 47.3%; 27.1% versus 21.8% and 4% versus 8.6%. We believe that this dissimilarity between the two questionnaires could lead to a misleading measurement of health and therefore, to misleading results on inequalities in health.

Secondly, France has historically experienced an important debate on the way to ask SAH in health questionnaires, especially on the number of response categories to propose. A

[3]In SHARE 2004, both wordings are included in the questionnaire. Differences between the two wordings were analysed. The following simple reproduction of the frequencies of both wordings confirms our comment. Wording 1 spreads out over *very good*, 13.8%; *good*, 48.2%; *fair*, 28.5%; *bad*, 7.3%; *very bad*, 2.2% whereas wording 2 is *excellent*, 7.8%; *very good* 14.9%; *good*, 43.9%; *fair*, 24.35%; *bad*, 9%.

[4]From the sake of comparability with the Canadian NPHS, percentages concern a sample of individuals aged 16 and more.

scale in five categories was particularly criticised because individuals making a choice among an odd number of categories would be more likely to choose the medium category. Finally the IRDES-HHIS questionnaire propose respondents to evaluate their health status on a scale from 0 to 10 since 1988. Nevertheless, the 5-points question has been added to the usual questionnaire for the first time in 2004. This means that the implementation of the new approach of measurement of van Doorslaer and Jones (2003) on French health surveys cannot be used in years prior to 2004.

Nevertheless, the interval regression on which this method relies, presents several advantages. Firstly, this method avoids the inappropriate use of ordinary least squares (OLS) to model an ordinal categorical variable. Secondly, it considers a vector of individual characteristics which leads to greater individual-level variations in the measurement of health. Finally, it considers external individual information to scale the categories of SAH, which outperforms a construction based on arbitrary rescaling that could predict health status values out of the $[0; 1]$ interval. Indeed, if a health distribution such as HUI is available for the sample, then the range of average values of this distribution for various age groups could be used. The same model is thus carried out with the distribution as the explained variable. The minimum and maximum predictions from this new model then define the observable range of the distribution conditional on the set of regressors. A similar extensive comparison of cardinalisation methods has been conducted using the 15D score from a Finnish sample (Lauridsen *et al.*, 2004). This study confirms that the interval regression is superior to ordinary least squares and ordered Probit. It is thus advisable to use a health distribution coming from the same context of the ordinal categorical health variable like it has been done in Belgium. They use the same method but scale SAH on another continuous health measure, namely EQ-5D (Lecluyse & Cleemput, 2006).

As a result, there is a great interest in finding a generic health measure analogous to the HUI available for France: it will allow us to use an innovative cardinalisation method. Moreover, as 2004 IRDES-HHIS allows the use of the HUI thresholds with a 5-categories SAH, then we will be able to compare alternative mappings.

4.2 Cardinalisation of SAH: a reliable health distribution in France?

In France, SF36 is the only generic health measure with an empirical distribution which is available at a general population level. It is included in the 2003 French National Health

Survey (Leplège *et al.*, 1998; Leplège *et al.*, 2001).

4.2.1 A preference-based measure derived from SF36

The Sheffield Health Economics Groups (Brazier *et al.*, 1998; Brazier *et al.*, 2002, Brazier *et al.*, 2004) has recently empirically bridged SF36 and utility in order to provide an alternative to existing preference-based measures of health for use in economic evaluation studies such as EQ-5D (The EuroQol Group, 1990) and HUI (Feeny *et al.*, 1996). The derivation of SF6D relies on an algorithm based on six of the eight dimensions of SF36. It has been done for 249 health states valued by 836 respondents from a UK sample. O'Brien *et al.* (2003) have analysed differences between SF6D and the established and widely used utility measure that is HUI. They conclude that it is difficult to disentangle whether differences are due to differences in underlying concepts of health being measured or different utility-theoretic measurement approach. However, SF6D is a valuable addition that permits transforming SF36 into a utility-based measure.

4.2.2 Methodological strategy

On one hand, SF6D has not been applied in any other population except British population, and on the other hand, SF36 is a standardised questionnaire at European level (Noble *et al.*, 1998). This is the reason for assuming that we can apply the British SF6D utility algorithm to the French SF36 available in the 2003 National Health Survey. We use the algorithm[5] based on a consistent version of the model 10 in Brazier *et al.* (2002). This French version of SF6D will represent a reliable cardinal health distribution that can be used to describe the latent variable that determines SAH. The empirical distribution of SF6D in the French population is thus used to scale intervals of the five (respectively the eleven) categories of SAH in 2004 IRDES-HHIS.

For every individual, we assume a direct mapping from SF6D to the latent variable subjacent to SAH. An individual's rank according to SF6D, for instance the p^{th} quantile, corresponds to his rank according to SAH in 2004 IRDES-HHIS. Thresholds, so called c_a, are estimated using a non parametric approach. First, we compute the cumulative frequency of the observations for each of the five (respectively the eleven) categories of SAH. Then, we

[5] Computer programs can be obtained on `www.shef.ac.uk/scharr/sections/heds/mvh/sf-6d/index.html`

find the values of the distribution of SF6D that match these frequencies.

Figure 1 presents boundaries from SF6D that match the cumulated frequency of the 5-points SAH and those that match the 11-points SAH in 2004. In concrete terms, thresholds of category a of the French SAH equal the inverse of SF6D empirical distribution F of the cumulative proportion of observations for the category a, i.e. the cumulative value of the upper-bound of the category a. Therefore, there are six (respectively twelve) thresholds to consider from $0,337$ (the worse possible status in SF6D) to $0,948$ (the best possible status in SF6D). For the 5-points SAH, these threshold are $0,337$; $0,364$; $0,457$; $0,574$; $0,717$ and $0,948$ whereas for the 11-points SAH, they are $0,337$ $0,365$; $0,433$; $0,44$; $0,457$; $0,516$; $0,558$; $0,592$; $0,671$; $0,727$ and $0,948$.

An interval regression model can then be carried out using these thresholds and including different regressors in the model. In this context, this is the level of SF6D that is predicted considering that an individual has characteristics Z_i.

4.3 Innovative health index: a first empirical utilisation

The health index generated in Tubeuf & Perronnin (2008) is a relevant tool to measure individual health status. We consider it to be another measurement of health for our analysis of inequalities in health in 2004. In order to be able to understand the best way to involve this new health index in the analysis, we describe this health index more precisely.

4.3.1 Distributional analysis of the health index

The cumulative distribution function for the health index is drawn in figure 2 for the full sample. The inverted L-shape of the empirical distribution function emphasises that there is a long left-hand tail which represents relatively few individuals in very bad health. Many people are concentrated in the right-hand tail and so have a higher health index. The vertical line at the right-end of the distribution shows that a large proportion of individuals have a health status which equals 1. The quantitative form and the continuous aspect of the health index permit carrying out an ordinary least square regression model. We shall verify if it is appropriate to use a simple linear regression specification with our indicator. We run a simple linear regression on individual characteristics Z_i and analyse residuals from this regression. Figure 4 graphically represents the shape of the distribution of residuals. The associated skewness and kurtosis statistics are summarised in figure 3. These elements show non-normality in the distribution of residuals, which shed some doubt on the use of an OLS regression. This non-normality can be explained by the distribution of the health index, which is truncated at an upper limit of 1. A good way to check if the regression specification is appropriate is to use a reset test. The reset test related to this regression specification is $F(1, 8207) = 12,91$ with a probability of rejection of $Prob > F = 0,0003$. This means that the model is mis-specified and an OLS regression is inappropriate.

Several studies (van Doorslaer & Jones, 2003; Fonseca & Jones, 2003; Lecluyse & Cleemput, 2006) have recently concluded that the interval regression approach outperforms other approaches. The health index could thus be used to scale intervals of SAH. We assumen assume that there is a stable mapping from the health index to the latent variable that determines SAH and that this applies for all individuals in the sample. We apply a mapping similar to the one described before with SF6D. The p^{th} quantile of the distribution of the health index corresponds to the p^{th} quantile of the distribution of SAH in 2004 IRDES-HHIS. Thresholds are estimated using a non parametric approach. Figure 5 presents boundaries from the health index that match the cumulated frequency of the 5-points (respectively the 11-points) SAH. The six thresholds to consider for the mapping are 0, $0,033$, $0,445$, $0,773$, $0,955$ and 1 (the best possible status for the health index). As for the 11-points SAH, threshold are 0; $0,107$; $0,228$; $0,311$; $0,376$, $0,376$, $0,446$ $0,638$; $0,718$; $0,83$; $0,943$; $0,955$ and 1. These thresholds are then used in an interval regression model explaining SAH and including various regressors. We will compare the measurement of inequalities in health offered by this mapping with the measurement obtained by other mappings.

5 Measuring income-related inequality in health

5.1 Measurement method

Our study of inequalities in health relies on the calculation of concentration indices, which capture the socioeconomic dimension of health inequalities and use information from the whole distribution of health over income (Jones *et al.*, 2007). Analysis controls for various covariates of health such as demographic, socioeconomic and health insurance characteristics. Nevertheless, it is important to underline that the study does not allow any causal interpretation; regression coefficients in particular may reflect either reverse causality or joint determination due to unobserved factors.

We assume that a linear regression model defines health status y_i of individual i according to k regressors, such as $k = (1, ..., K)$. This can be written:

$$y_i = a + \sum_{k=1}^{K} b_k x_{ki} + \epsilon_i \tag{1}$$

The random error term, ϵ_i is assumed to have expected mean value equal to zero and constant variance. The b_k are assumed constant for every individual i.

The concentration index requires a ranking variable for the population. We use the logarithm of the equivalent household income per consumption unit. The concentration index related to this income-related health is given by the following equation

$$CI = (\frac{2}{\overline{y}}) cov(y_i, R_i) \tag{2}$$

where R_i is the cumulative proportion of the population ranked by increased income up to individual i and $\overline{x} = E(x_i)$.

The linear regression model includes several regressors, namely age-gender categories, levels of education, categories of activity status, socioeconomic status and health insurance variables. These latter variables indicate whether the individual is covered by private health insurance beyond compulsory insurance or by CMU. Marital status was firstly also involved in preliminary analyses but it has been dropped for non significance.

5.2 Sample characteristics

Table 1 presents some descriptive statistics of 2004 IRDES-HHIS sample. The mean value of equivalent income is 1,986 euros per month. This value is tricky to compare to overall French statistics, as this value concerns a specific sample and is in gross salary terms. For instance, the mean value of net income for the 18-59 years old was about 17,879 euros per year in 2004[6]. Nevertheless, it has been shown that IRDES-HHIS surveys underestimate the average income as regard to national accounts (Grignon, 2003). Regarding unemployment status, it represents almost 6% of the sample. In reality, the unemployment rate equals 9.1% in December 2004. Our sample, once again, presents lower proportions than proportions observed in national statistics. These differences are explained by both

[6] INSEE `www.insee.fr`, La France en faits et en chiffres.

our restricted age sample and the inability to interview precarious households. As for the supplementary health insurance, data under-estimate the proportion of CMU beneficiaries as it should equal 7% in 2005 (Boisguérin, 2005). This under-estimation is due to an under-representation of precarious people in most of general population surveys.

5.3 Explaining health within a linear model

We specify and estimate a linear regression model explaining SAH. We carry out five different interval regression models using the five alternative mappings. It is useful to stress that these regression models do not provide a structural model for health and therefore estimates do not give a causal interpretation. However, these models might be interpreted as reduced form static models of demand for health whose estimates provide an indication of how exogenous changes in health determinants can affect the degree of income-related inequality in health (Garcia & Lopez, 2007). Moreover, coefficients of interval regression models are measured on the same scale as cut-points so they can be interpreted in terms of changes in the distribution of health (Jones *et al.*, 2007).

Table 2 presents results of the interval regressions of the five different mappings. It is noteworthy that relationships are qualitatively and significatively similar regardless of the mapping or the scale of SAH. There is, nevertheless, a number of cases where they differ. We will consider these after describing their similarities.

We firstly consider predicted health according to the mapping of the 5-points SAH. It should be noted that assuming identical health distributions between France and Canada leads to a higher distribution of health status. As illustrated in figure 6, there is a lower probability of poor health status with this particular mapping than with the other two. The mapping with SF6D thresholds leads to a more compressed health distribution than the two other mappings. We supplement this graphical analysis by unilateral tests of *Kolmogorov-Smirnov* on the expected health values of the three health indicators. Results in table 3 confirm that the predicted distribution of HUI significantly dominates the predicted distributions of SF6D and of the predicted health index. Moreover, the predicted distribution of SF6D is dominated by the predicted distribution of the health index. In this context, it seems that individuals have a higher health utility when SAH is mapped with HUI as compared to the two other distributions and with the health index as compared to SF6D.

Consequently coefficients of the HUI mapping tend to be lower than those concerning the two other mappings. These lower values confirm the stochastic dominance at first order of HUI on the two other mappings. It could also be explained just as it is proposed in Leu and Schellhorn (2006), who compare three different scalings for SAH and observe that coefficients depend on the spreading of the health distribution involved in the mapping. There is indeed a direct consequence of the less compressed health distribution of the HUI as opposed to the two others distributions.

As expected, health decreases substantially with age for both genders. For instance, women as well as men between 56 and 65 years old on average report a health status lower than men aged 36 to 45 years old. With HUI, their health status is around 0,02 times lower, whereas with SF6D mapping (respectively the health index mapping) regardless of the SAH scaling, their health status is around 0,06 (respectively 0,07) times lower for women and 0,05 times lower for men. Health is likely to be worse for women than men. Incidentally, there is no significant effect on health of women aged 26 to 35 years old, this lack of significance could be explained by a better assessment of health status of this age category.

When it comes to socioeconomic characteristics, income has a positive and significant direct effect on health regardless of the health indicator. Similarly, more educated people, i.e those having a primary/secondary or high school level education, have a significantly better health than less educated people irrespective of the health indicator. Compared to employed people, homemakers, inactive and unemployed people have a negative and significant lower health, irrespective of the health mapping of SAH in 5 categories.

As regard to the very weak proportion of inactive people in the sample (1,15%), a poor health might be the reason for inactivity. It could also be an illustration of the justification bias of inactivity as described in Kerkhofs and Lindeboom (1995). Nevertheless, unemployment and inactivity are associated with an excess mortality for both men and women among individuals aged 16-65 years old. Indeed, during the five years following an unemployment period, the annual risk of death for an unemployed individual is *ceteris paribus* approximately three times higher than that of the general 16-60 population (Mesrine, 2000). Moreover, health status of people who are unemployed is significantly worse than that of people who are employed because unemployed people have significantly higher rates of psychosocial diseases such as anxiety and depression (Khlat & Sermet, 2004). There is no significant effect on health of being retired or being a student. Unskilled workers report a poorer health status as compared with the reference group of employees when self-assessed is considered on a five categories scale. Self-employed people, executives and technicians are in significantly better health than employees, whatever the mapping of health.

The effect of private health insurance appears to be positively related to health. Irrespective of the health mapping corresponding to a 5-points SAH, a negative relationship links health and CMU. It is due to CMU eligibility conditions which target individuals with very low incomes and often imply low health statuses, too. Similarly, Boisguérin (2005) shows that individuals tend to enrol CMU if they anticipate health care needs; there would thus be a selection bias.

Mismatches in results become particularly obvious when we consider SAH described in eleven categories. These differences concern a loss of significance of some regressors, such as being a beneficiary of CMU, being homemakers or being an unskilled worker. When coded on eleven categories, SAH seems to be less correlated to particular socioeconomic variables but a significant correlation is still observed with the log of income. This can be explained by these eleven categories which smooth away of correlations between health and regressors due to a larger range of possible reported health statuses. There can also be differences in a significance gain with farmers, who are in significantly better health than employees according to both mapping on the 11-points SAH. It is also remarkable that when all the mappings are non significant, there can be some disparities in the signs of the relationship with health. This is the case for students or skilled workers. Nevertheless, as the degree of significance is highly exceeded, we believe that these differences are of little importance.

5.4 Global concentration indices: income-related inequality in health

Prior to the decomposition of inequalities in health, we can analyse the global concentration index of inequality in health in 2004 according to the mapping and to the scale of SAH. This global health concentration index measures income-related inequalities in health, which is the prime goal of our analysis.

Table 4 recapitulates values of total health inequality.

The five concentration indices related to the predicted health indicator are positive and describe an inequality in health favouring the richest individuals. Quantitatively, some differences are shown. When the 5-points SAH is cardinalised with the HUI, the value of the health concentration is lower than any other mappings with the same SAH variable. This difference in magnitude can be explained by higher thresholds of HUI. HUI distribution gives a lower probability to poor health statuses. Conversely, the health index describes well poor health statuses and this feature is illustrated by the higher value of the health concentration index related to this mapping, regardless of the scale on which SAH is described. Similarly, thresholds associated to SF6D are low, which explains the higher health concentration index. It is remarkable that with the 11-points SAH, inequality in health decreases. This wider scale implies a moving of individual health reports over the larger scale and therefore a lower concentration in extreme categories. Nevertheless, it is worth to stress that the mapping using SF6D is the trickiest one. Indeed, the income-related inequality associated with this mapping substantially changes with the scale of SAH. When SAH is described on a 5-points scale, the value of the health concentration related to SF6D is similar to the value obtained with a mapping using the health index. However, when SAH is described on 11-points, the SF6D mapping leads to a value of concentration index closer to the concentration index with HUI. The inequality in health seems to be sensitive both to the mapping and to the number of responses categories of SAH. These differences between mappings and scale may be clearer with a decomposition analysis of the inequality in health.

6 Explaining income-related inequality in health

6.1 Measurement method

An attractive feature of the concentration index is its ability to be decomposed into contributions of each of the regressors involved in the econometric model for health (Wagstaff *et al.*, 2003). If we substitute the concentration index formula described in Eq. 2 in the expression of the regression linear model (Eq. 1), we obtain

$$CI = \sum \left(b_k \frac{\overline{x_k}}{\overline{y}} \right) CI_k + \frac{2}{\overline{y}} cov(\epsilon_i, r_i) \qquad (3)$$

The concentration index is thus assumed to be made up of two components: an explained component equal to a weighted sum of the concentration indices of the k regressors, and a residual one. The residual component reflects the health inequality which is not explained by systematic variation across income groups in the regressors. In the case of the interval regression approach, no residuals can be computed and the decomposition reduces to the explained part of the previous equation. The use of interval regression is more efficient than standard methods of ordered Probit or Logit. Therefore the linear index $z_i\beta$ gives a measure of predicted utility from an individual i, who has characteristics Z_i.

In this way, the estimated inequality in health can simply be written

$$\widehat{CI} = \sum_k \widehat{\eta_k} CI_k \tag{4}$$

Therefore, the decomposition method separates the contribution of each regressor k into two quantifiable elements: its impact on health, as measured by the health elasticity $\widehat{\eta_k}$, and the degree of inequality of its own distribution with respect to income, as measured by the income concentration index CI_k.

6.2 Concentration indices over income

The first step of the decomposition method allows us to analyse concentration indices of each regressor over the income distribution. The second column in table 5, called CI, shows the distribution over income of each regressor involved in the regression model explaining health.

Concentration indices for determinants of health are identical for all the health indicators as inequality is measured over the same ranking variable.

With respect to age-gender categories, it is clear, regardless of gender, that the youngest are concentrated in lower income groups whereas people over 46 years old are concentrated in higher income groups. Unlike their male peers, middle-aged women appear to be poor. Moreover, it is remarkable that there is an income inequality favouring men: when similar pattern is observed, concentration indices over income are most of the time more favorable for men than women.

The most-educated individuals are heavily concentrated in the richest income groups. When people have a primary/secondary school level education, they are also concentrated in the richest income groups but the value of the concentration index associated is very weak as compared to the concentration index for people having at least baccalauréat, i.e A-levels.

Homemakers, students, inactive and unemployed people are concentrated in lower income groups, the most disadvantaged being homemakers. When it comes to retired people, an inequality favouring the richest is observed. As the sample only includes individuals between the age of 16 and 65, we can presume that those who have retired earlier have either done so for a reason of poor health or because it was economically more advantageous. Nevertheless, it is clear that the needy people, even when they have a poor health status, are likely to keep on working.

As regard to social status, except executives and technicians who belong to higher income groups, all the other social statuses are concentrated among lower income groups. In particular, farmers and unskilled workers experienced the highest income inequality.

Finally, concentration indices concerning health insurance accord with primary intuition. Having a supplementary health insurance is widespread in the population; the concentration index associated is weak but favours higher incomes. Indeed, some analyses IRDES-HHIS show that those who have no supplementary health insurance are either the youngest, who are healthy and have a lowest preference for health, or the poorest who cannot pay for it, or else old women who were beneficiary of their husband's cover and do not subscribe after widowhood (Allonier *et al.*, 2006). As for CMU, it appears to be the highest concentration index. It strongly favours the poorest as it is means-tested.

6.3 Contribution to the income-related inequality in health

The decomposition method previously presented gives contribution of each regressor to income-related inequality in health in 2004. We now move to the explanation of inequality in health according to the health mapping and the regressors. Table 5 exhibits contribution to income-related inequality in health of each regressor for each mapping. This contribution value is presented in exact value and in proportion of the total inequality. Table 5 shows that from one mapping of SAH to another, regressors mainly contribute in the same way to the inequality. Nevertheless, it is remarkable that the three mappings of SAH in five categories give similar contributions to inequality in health whereas those of SAH in eleven categories are very different. Differences in magnitude have already been underlined in the literature. When comparing the scaling of Flemish SAH using the Flemish EQ-index and the scaling using the Canadian HUI in a perspective of measurement of inequalities in health, Lecluyse & Cleemput (2004) show different values in terms of magnitude of concentration indices.

Despite these mismatches, irrespective of the health indicator, the highest contributions come from same regressors: log of income, higher education, older age-gender categories, higher social status such as executive or technician. We firstly consider regressors contributing the most to the total inequality, and we secondly focus on regressors whose contributions strongly vary according to the mapping.

6.3.1 Some regressors explain most of the total inequality

The contribution of income to inequality in health is relevant. Regardless of the mapping, its contribution to inequality is at least three times higher than the contribution of any other parameter. There is also a high positive elasticity of health with income. This result is in line with most of European analyses on income-related inequalities in health. For instance, in Switzerland, the contribution of income to inequality is around 60% (Leu & Schellhorn, 2006) and in Spain, it equals 102.5% or 30.6% according to the mapping.

People with more years of schooling tend to have better health. Education interacts in many ways with income and having a higher education level is the second most explicative parameter of inequality. There are several references in literature which have emphasised the protective role played by a higher education level on mental and physical health (Feinstein *et al.*, 2006) or mortality (Kunst & Mackenbach, 1994).

Some age-classes comprehensively contribute to inequality. It is the case of older people, especially women. Their contribution to inequality is negative, decreasing the income-related inequality in health. This reduction comes from the fact that older people are both richer as shown by the associated positive concentration index over income and in worse health as shown by the negative elasticity of health with older age-gender categories. Asymmetrically, elasticity of health with women aged 16-25 is positive, and the high negative contribution of younger women to inequality is due to their concentration in low income levels in spite of their good health status.

Being executive or technician explains inequality in health in a similar proportion than having a high education level. Individuals belonging to these social statuses enjoy a better health status, which is shown by the positive elasticity with health. This result is in line with other analyses of inequalities over socioeconomic status, using other health indicators, such as mortality or specific diseases (Mackenbach, 2006).

6.3.2 Sensitivity to the mapping or the scale of SAH

It is noteworthy that contributions to inequality are qualitatively similar regardless of the mapping. There are some exceptions with characteristics of activity status and socioeconomic status. For example, being retired and being a skilled worker. Indeed, whereas all the other mappings show a positive contribution to inequality of these characteristics, the mapping using SF6D with the 11-points SAH describes a negative contribution. Similarly, being a student always contributes to reduce inequality level, except when SAH is mapped using the health index. Nevertheless, it is noticeable that these unsteady variations concern individual variables, which are weakly contributing to inequality.

As regard to differences in the magnitude of contributions, we have previously mentioned that the 11-points SAH generally presents twice higher contributions then the other scale. However the contribution of CMU is lower in this context. It contributes for about 8% when SAH is mapped on five categories and to only 4% when SAH is mapped with the health index on eleven categories. Nevertheless, CMU always contributes positively to inequality in health. As the concentration index of CMU-beneficiary over income was negative, the positive contribution is due to a negative relationship between health and asking for CMU: the sickest are also the poorest, which increases their will to ask for CMU.

6.4 Legitimate or illegitimate income-related inequalities in health?

So far we have measured a concentration index of income-related inequality in health, which does not distinguish policy relevant and policy irrelevant variables. A variable is considered as policy irrelevant if it is impossible to alter either its direct effect on health or its joint distribution with income. Effects of such policy irrelevant variables have to be removed from income-related health inequality in order to evaluate the level of inequity in health. The distinction between the two types of variables relies on the policy context. However, the literature mainly considers age and gender as policy irrelevant variables[7] (Gravelle , 2003) and a standardisation on age and gender is carried out in most of the economic and epidemiological analyses (van Doorslaer & Koolman, 2004; Gravelle & Sutton, 2003; Boissonnat & Mormiche, 2007). Kakwani *et al.* (1997) refer about legitimate inequalities and argue that variations in health due to biological differences can be considered to a large degree legitimate.

[7]Gravelle (2003) underlines that demographic factors could even be considered as policy relevant factors as it may be possible to alter the joint distribution of age and income by for example a taxation policy or to change the relationship between age and health by targeting health care towards elderly. The distinction between policy relevant and policy irrelevant variables can be linked to the distinction between individual characteristics coming from responsibility and those coming from circumstances. Age and gender are individual characteristics that are independent of individual responsibility.

As we have seen, contributions of age and sex categories to income-related health inequality is far from negligible, particularly for extreme age-classes. We can thus expect differences in results if we remove effects of these policy irrelevant variables from income-related inequality.

There are two methods for standardisation: the direct and the indirect methods. The direct method determines the distribution of health that would be observed if every individual had the same age and gender structure. Policy irrelevant variables are thus fixed at a reference level which is the same for all individuals. As for the indirect method, it represents the difference between actual and expected health, where expected health for an individual is the average health of individuals having same age and gender characteristics.

Gravelle (2003) shows that the indirect standardisation leads to inconsistent estimates of income-related inequality in health and recommends the direct standardisation method. The direct standardisation is also advisable because it relies on full information on the policy relevant and policy irrelevant variables affecting health.

We implement a direct standardisation of the previous concentration indices on age and gender. The three last rows of table 5 describe the calculation of inequity in health. Regardless of the mapping, income-related inequity in health is higher than income-related inequality in health. Again, the value of inequity in health is lower when SAH is scaled on HUI.

Our analysis shows income-related inequalities in health in France in 2004 and underlines that some social individual characteristics, such as income, social status and education, explain a large part of these inequalities.

7 Conclusion

As compared to the existing literature in France, this analysis is relevant for several reasons. Firstly it uses more recent data. Secondly, it uses innovative measurements of health. Finally, it achieves a more reliable measurement of inequality due to the use of interval regression approach to estimate a fully specified health equation.

The analysis of income-related inequalities in health shows that France experiences inequalities in health to the detriment of the poorest. Results are qualitatively analogous to those reported in the European study from the 1996 ECHP (van Doorslaer & Koolman, 2004), which studies inequalities in health in the whole population from 16 years old. The decomposition of inequality in health in 2004 shows that a higher income, a higher education level and a higher socioeconomic status, such as executive or technician strongly contribute to income-related inequality in health. Therefore, income does not act on health in isolation from other factors. Indeed, education as well as socioeconomic status are other important factors that influences health. These results for education and income coincide with European results (van Doorslaer & Koolman, 2004). As for CMU, this reform was proposed in 2000 and its positive contribution to inequality in health relies on the fact that poor people in very bad health are more likely to ask for a free health care coverage. Our analysis of inequalities confirms that the reform concerns the targeted population but the time period is too short to observe global changes on health status. The strong contribution of income to inequalities in health emphasises that policy measures which can reduce either health-harming effects of income losses or income consequences of health losses could reduce inequalities in health (van Doorslaer & Koolman, 2004).

Another considerable contribution of this study is to involve sophisticated health indicators suitable for the measurement of inequalities in health in France. Firstly, the use of thresholds of HUI in the French context is particularly relevant as the van Doorslaer and Jones (2003) mapping as turned out to be the preferred tool in the most recent European studies of social inequalities in health. Secondly, the use of the SF6D utility algorithm to estimate a preference-based measure of health from the French SF36 has no precedent. It allows researchers to use specific econometric models, such as interval regression, and it might increase the number of uses that could be done from the French SF36 questionnaire in econometric analyses and economic evaluation studies. Finally, we find that the health index is a valid indicator for the study. The relevant similarities from a qualitative point of view with other mappings such as SF6D or HUI confirm its validity to measure health status.

So far, it was unclear to what extent social inequalities in health in France were sensitive to recent measurement of health which rely on promising construction methodologies and do not concern ill-health. We have discussed the influence of the measurement of health on inequalities in health at two relevant levels: firstly, as regard to the distribution of health used in the mapping, and secondly as regard to the scale of SAH. It appears that the magnitude of income-related inequalities in health is sensitive to the spreading of the distribution of health. For example, when a distribution such as HUI is concentrated in good health statuses, it always induces a lower level of inequalities. Income-related inequalities in health are also sensitive to the number of categories of SAH. A lower number of categories is likely to perceive less distinctions among health statuses and imply higher concentration indices, as shown by the lower concentration indices observed for the mapping of the 11-points SAH with both the health index and SF6D. Moreover, the distribution of the health index presents an advantage in comparison with the two other distributions of health because it describes health from 0 to 1. Indeed, the health utility index as well as the SF6D have no natural zero point[8].

This study offers also to use an appropriate econometric modeling. Thresholds used in the interval regression can be allowed to be different for different groups of individuals or when comparing across different countries as they depend on relative frequencies in each category of SAH. Moreover, as thresholds determine the scale of the latent variable; this is equivalent to allowing for heteroscedasticity in the error term of the latent variable specification.

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[8] Some Canadian surveys after the wave 1994, include negative health utility index scores. It would mean that there are health statuses worse than death. In this context, the health utility index cannot be compared to a ratio-scale variable and the main assumption formulated by van Doorslaer and Jones (2003) would not be respected.

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9 Appendix

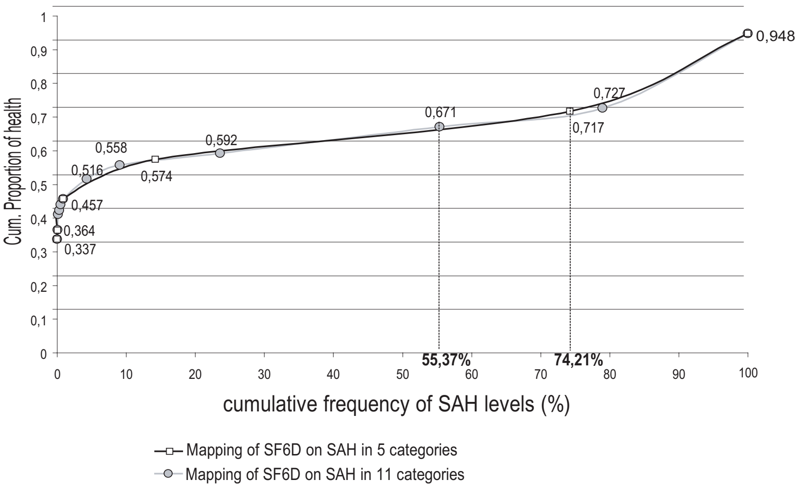

Figure 1: Derivation of boundaries from SF6D for SAH described in 5 and in 11 categories (*2004 IRDES-HHIS*)

Explanation of the figure: Individuals who have reported a health status equal or lower than "good" represent 74,2% of the sample and have a health status lower than 0,717 according to SF6D. Respectively, the 55,37% of the individuals who have reported a health status equal or lower than 9 have a health status equal or lower than 0,671 according to SF6D.

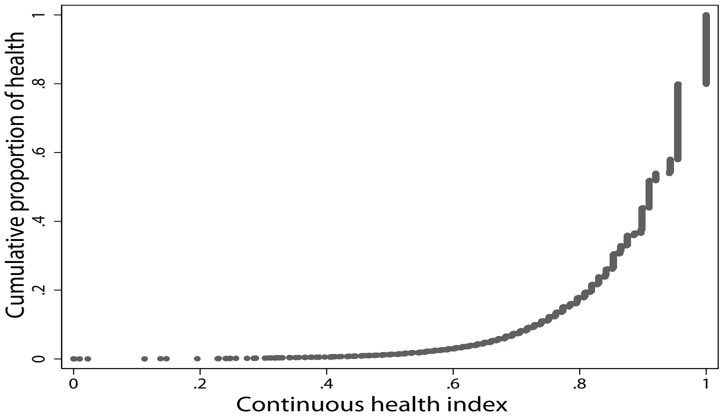

Figure 2: Empirical distribution function of the health index.

Obs	8,235
Variance	0.0107124
Skewness	-1.719254
Kurtosis	8.460832

Figure 3: Descriptive statistics of residuals of an OLS regression of the health index.

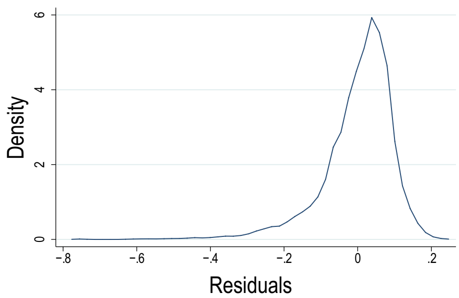

Figure 4: Kernel density estimates for OLS residuals

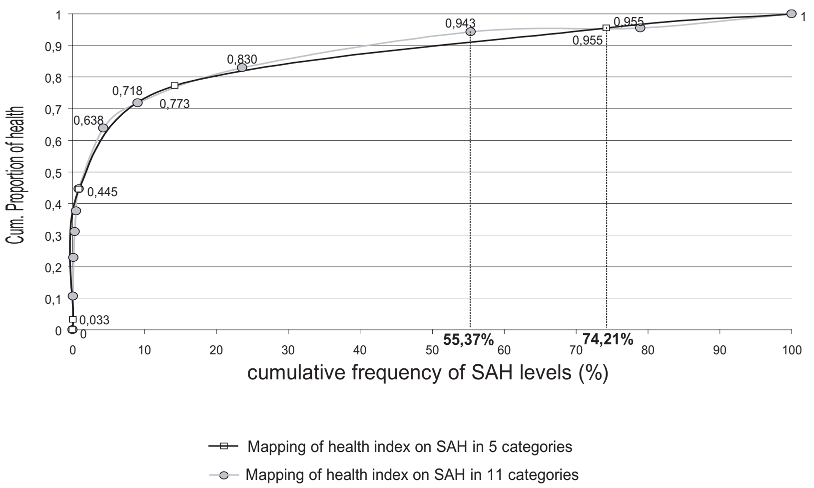

Figure 5: Derivation of boundaries from health index for SAH described in 5 and in 11 categories (*2004 IRDES-HHIS*)

Variables	Mean
Income per CU (€/month)	1985,90
Age	38,46
Education less	45,45
Education 2	21,14
Education 3	33,41
Private health insurance	90,69
No private health insurance	7,37
CMU	1,94
Employed	67,83
Inactive	1,15
Homemaker	5,34
Retired	5,84
Unemployed	5,85
Student	13,98
Employee	26,98
Farmer	1,99
Self-employed	4,80
Executive	14,61
Technician	22,27
Skilled worker	21,07
Unskilled worker	7,67

Table 1: Descriptive statistics (*2004 IRDES-HHIS*).

Variables	Predicted HUI			Predicted SF6D on 5-SAH			Predicted health index on 5-SAH			Predicted SF6D on 11-SAH			Predicted health index on 11-SAH		
	Coeff.	S.E	P-value	Coeff.	S.E	P-value	Coeff.	S.E	P-value	Coeff.	S.E	P-value	Coeff.	S.E	P-value
F 16-25	0,0085	0,0021	0	0,0229	0,0051	0	0,0247	0,0057	0	0,0290	0,0047	0	0,0344	0,0060	0
F 26-35	-0,0004	0,0018	0,847	0,0013	0,0043	0,759	0,0005	0,0049	0,923	0,0060	0,0040	0,130	0,0085	0,0052	0,100
F 36-45	-0,0077	0,0018	0	-0,0165	0,0042	0	-0,0201	0,0048	0	-0,0093	0,0039	0,016	-0,0119	0,0050	0,018
F 46-55	-0,0165	0,0018	0	-0,0405	0,0042	0	-0,0482	0,0049	0	-0,0345	0,0039	0	-0,0485	0,0051	0
F 56-65	-0,0239	0,0023	0	-0,0552	0,0053	0	-0,0682	0,0063	0	-0,0474	0,0049	0	-0,0695	0,0065	0
M 16-25	0,0157	0,0021	0	0,0434	0,0049	0	0,0424	0,0055	0	0,0489	0,0045	0	0,0516	0,0058	0
M 26-35	0,0066	0,0018	0	0,0191	0,0042	0	0,0186	0,0048	0	0,0149	0,0039	0	0,0160	0,0051	0,002
M 36-45	ref.														
M 46-55	-0,0123	0,0018	0	-0,0311	0,0041	0	-0,0352	0,0048	0	-0,0247	0,0038	0	-0,0291	0,0050	0
M 56-65	-0,0195	0,0023	0	-0,0476	0,0054	0	-0,0558	0,0063	0	-0,0414	0,0049	0	-0,0544	0,0065	0
Log income	0,0050	0,0008	0	0,0110	0,0019	0	0,0136	0,0022	0	0,0069	0,0017	0	0,0119	0,0023	0
Education less	ref.														
Education 2	0,0040	0,0012	0,001	0,0083	0,0028	0,002	0,0111	0,0032	0	0,0052	0,0026	0,042	0,0110	0,0033	0,001
Education 3	0,0055	0,0012	0	0,0135	0,0028	0	0,0159	0,0032	0	0,0068	0,0026	0,009	0,0137	0,0033	0
Private health insurance	0,0038	0,0016	0,021	0,00423	0,0038	0,026	0,0091	0,0043	0,034	0,0110	0,0035	0,002	0,0186	0,0045	0
No private health insurance	ref.														
CMU	-0,0113	0,0035	0,001	-0,0209	0,0080	0,009	-0,0289	0,0094	0,002	-0,0068	0,0075	0,359	-0,0118	0,0098	0,228
Employed	ref.														
Inactive	-0,0264	0,0040	0	-0,0403	0,0090	0	-0,0688	0,0105	0	-0,0360	0,0085	0	-0,0752	0,0111	0
Homemaker	-0,0056	0,0020	0,004	-0,0111	0,0045	0,014	-0,0165	0,0053	0,002	-0,0040	0,0042	0,339	-0,0070	0,0055	0,202
Retired	0,0007	0,0023	0,772	-0,0003	0,0052	0,949	0,0003	0,0062	0,96	-0,0034	0,0048	0,475	0,0042	0,0064	0,514
Unemployed	-0,0044	0,0019	0,020	-0,0103	0,0043	0,016	-0,0141	0,0050	0,005	-0,0083	0,0040	0,038	-0,0097	0,0052	0,063
Student	0,0006	0,0018	0,736	0,0041	0,0043	0,347	-0,0006	0,0048	0,894	0,0032	0,0040	0,434	-0,0053	0,0051	0,300
Employee	ref.														
Farmer	0,0043	0,0031	0,166	0,0075	0,0072	0,299	0,0103	0,0083	0,217	0,0109	0,0067	0,103	0,0182	0,0087	0,036
Self-employed	0,0042	0,0021	0,047	0,0137	0,0049	0,006	0,0114	0,0056	0,043	0,0136	0,0046	0,003	0,0138	0,0059	0,020
Executive	0,0033	0,0016	0,04	0,0096	0,0037	0,011	0,0091	0,0043	0,032	0,0078	0,0034	0,024	0,0097	0,0045	0,030
Technician	0,0030	0,0013	0,021	0,0065	0,0030	0,032	0,0081	0,0035	0,02	0,0082	0,0028	0,003	0,0117	0,0036	0,001
Skilled worker	-0,0018	0,0013	0,184	-0,0041	0,0031	0,191	-0,0049	0,0036	0,174	0,0002	0,0029	0,937	-0,0012	0,0038	0,744
Unskil. worker	-0,0029	0,0018	0,095	-0,0092	0,0040	0,023	-0,0089	0,0047	0,058	-0,0029	0,0038	0,442	-0,0051	0,0049	0,294
Constant	0,8864	0,0061	0	0,5770	0,0142	0	0,7644	0,0163	0	0,5938	0,0131	0	0,7727	0,0171	0

Table 2: Health interval regressions coefficients (*2004 IRDES-HHIS*).

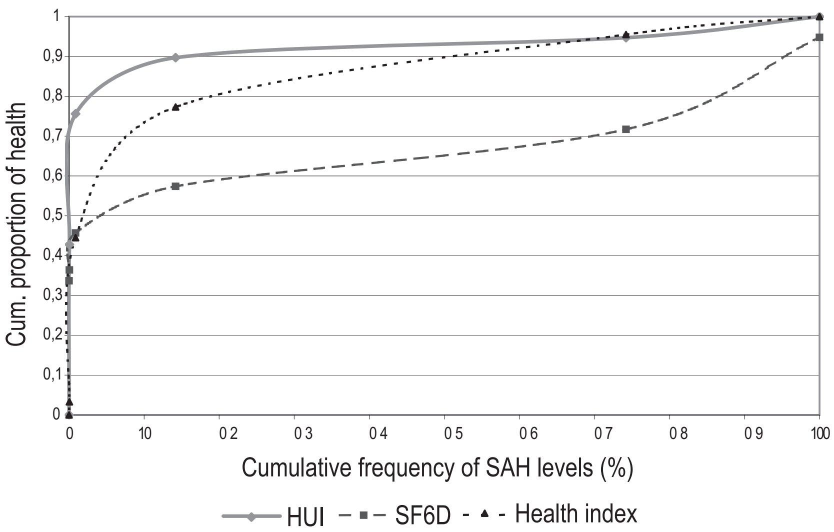

Figure 6: Thresholds for SAH in 5 categories according to the mapping.

	Predicted Health Index	Predicted SF6D	Predicted HUI
Predicted Health Index		<0,0001***	0,999
Predicted SF6D	1		1
Predicted HUI	<0,0001***	<0,0001***	

Significance levels: * (10%), ** (5%) and *** (1%)

Table 3: P-value of *Kolmogorov-Smirnov* test related to the three predicted health measurements on self-assessed in 5 categories

Health indicators	CI	Newey-West S.E	[95% Confidence Interval]
Predicted HUI	0,00194	0,00010	[0,00175; 0,00214]
Predicted SF6D on 5-SAH	0,00541	0,00034	[0,00474; 0,00609]
Predicted health index on 5-SAH	0,00566	0,00029	[0,00508; 0,00624]
Predicted SF6D on 11-SAH	0,00195	0,00031	[0,00134; 0,00253]
Predicted health index on 11-SAH	0,00431	0,00029	[0,00374; 0,00489]

Table 4: Concentration indices for income-related health inequality in 2004 (*2004 IRDES-HHIS*).

Variables			Predicted HUI			Predicted SF6D on 5-SAH			Predicted health index 5-SAH			Predicted SF6D on 11-SAH			Predicted health index 11-SAH		
	Mean	CI	Elast.	Contrib.	%	Elast.	Contrib.	%	Elast.	Contrib.	%	Elast.	Contrib.	%	Elast.	Contrib.	%
F 16-25	0,108	-0,173	0,001	-0,0002	-8,82%	0,004	-0,0006	-11,94%	0,003	-0,0005	-9,36%	0,005	-0,0008	-42,14%	0,004	-0,0007	-16,92%
F 26-35	0,110	-0,020	0,000	0,0000	0,04%	0,000	0,0000	-0,08%	0,000	0,0000	-0,02%	0,001	0,0000	-1,02%	0,001	0,0000	-0,49%
F 36-45	0,116	-0,078	-0,001	0,0001	3,81%	-0,003	0,0002	4,12%	-0,003	0,0002	3,67%	-0,002	0,0001	6,47%	-0,002	0,0001	2,82%
F 46-55	0,111	0,094	-0,002	-0,0002	-9,57%	-0,007	-0,0006	-11,77%	-0,006	-0,0006	-10,22%	-0,006	-0,0005	-28,03%	-0,006	-0,0006	-13,32%
F 56-65	0,068	0,188	-0,002	-0,0003	-16,98%	-0,006	-0,0011	-19,68%	-0,005	-0,0010	-17,69%	-0,005	-0,0009	-47,23%	-0,005	-0,0010	-23,39%
M 16-25	0,113	-0,141	0,002	-0,0003	-13,93%	0,007	-0,0010	-19,32%	0,005	-0,0008	-13,74%	0,008	-0,0012	-60,80%	0,007	-0,0009	-21,68%
M 26-35	0,096	0,020	0,001	0,0000	0,72%	0,003	0,0001	1,04%	0,002	0,0000	0,73%	0,002	0,0000	2,25%	0,002	0,0000	0,82%
M 36-45	ref.																
M 46-55	0,099	0,120	-0,001	-0,0002	-8,10%	-0,005	-0,0006	-10,29%	-0,004	-0,0005	-8,48%	-0,004	-0,0004	-22,84%	-0,003	-0,0004	-9,11%
M 56-65	0,062	0,186	-0,001	-0,0002	-12,43%	-0,004	-0,0008	-15,20%	-0,004	-0,0007	-12,98%	-0,004	-0,0007	-36,97%	-0,004	-0,0007	-16,41%
Log income	7,434	0,041	0,040	0,0016	84,45%	0,123	0,0051	93,64%	0,116	0,0048	84,61%	0,078	0,0032	163,94%	0,100	0,0041	95,44%
Education less	ref.																
Education 2	0,211	-0,032	0,001	0,0000	-1,51%	0,003	-0,0001	-1,58%	0,003	-0,0001	-1,53%	0,002	-0,0001	-2,74%	0,003	-0,0001	-1,96%
Education 3	0,334	0,242	0,002	0,0005	24,58%	0,007	0,0016	30,44%	0,006	0,0015	26,15%	0,003	0,0008	42,71%	0,005	0,0013	29,10%
Private health insurance	0,907	0,041	0,004	0,0001	7,70%	0,006	0,0002	4,34%	0,010	0,0004	6,83%	0,015	0,0006	31,41%	0,019	0,0008	18,06%
No private health insurance	ref.																
CMU	0,018	-0,711	0,000	0,0002	7,94%	-0,001	0,0004	7,41%	-0,001	0,0004	7,44%	0,000	0,0001	6,75%	0,000	0,0002	3,93%
Employed	ref.																
Inactive	0,012	-0,303	0,000	0,0001	5,12%	-0,001	0,0002	3,92%	-0,001	0,0003	4,88%	-0,001	0,0002	9,80%	-0,001	0,0003	6,91%
Homemaker	0,053	-0,327	0,000	0,0001	5,49%	-0,001	0,0003	5,39%	-0,001	0,0003	5,86%	0,000	0,0001	5,47%	0,000	0,0001	3,24%
Retired	0,059	0,184	0,000	0,0000	0,39%	0,000	0,0000	-0,10%	0,000	0,0000	0,07%	0,000	-0,0001	-2,87%	0,000	0,0001	1,18%
Unemployed	0,058	-0,294	0,000	0,0001	4,15%	-0,001	0,0003	4,92%	-0,001	0,0003	4,90%	-0,001	0,0002	11,05%	-0,001	0,0002	4,38%
Student	0,140	-0,170	0,000	0,0000	-0,81%	0,001	-0,0001	-2,71%	0,000	0,0000	0,31%	0,001	-0,0001	-5,86%	-0,001	0,0001	3,31%
Employee	ref.																
Farmer	0,020	-0,285	0,000	0,0000	-1,36%	0,000	-0,0001	-1,18%	0,000	-0,0001	-1,19%	0,000	-0,0001	-4,81%	0,000	-0,0001	-2,72%
Self-employed	0,048	-0,034	0,000	0,0000	-0,39%	0,001	0,0000	-0,63%	0,001	0,0000	-0,38%	0,001	0,0000	-1,75%	0,001	0,0000	-0,60%
Executive	0,146	0,471	0,001	0,0002	12,54%	0,002	0,0010	18,34%	0,002	0,0007	12,74%	0,002	0,0008	41,85%	0,002	0,0008	17,58%
Technician	0,223	0,211	0,001	0,0002	7,76%	0,002	0,0005	8,45%	0,002	0,0004	7,69%	0,003	0,0006	29,86%	0,003	0,0006	14,50%
Skilled worker	0,211	-0,222	0,000	0,0001	4,63%	-0,001	0,0003	5,30%	-0,001	0,0003	4,63%	0,000	0,0000	-0,84%	0,000	0,0001	1,51%
Unskil. worker	0,077	-0,366	0,000	0,0001	4,57%	-0,001	0,0004	7,17%	-0,001	0,0003	5,08%	0,000	0,0001	6,33%	0,000	0,0002	3,80%
Total CI				0,0019			0,0054			0,0057			0,0019			0,0043	
CI*				-0,0013			-0,0045			-0,0039			-0,0045			-0,0042	
I=CI-CI*				0,0032			0,0099			0,0095			0,0064			0,0085	

Table 5: Decomposition of concentration indices for health (*2004 IRDES-HHIS*).