HEDG Health, Econometrics and Data Group
THE UNIVERSITY of York

HEDG Working Paper 08/24

Inequality of Opportunities in Health in France: A first pass.

Alain Trannoy
Sandy Tubeuf
Florence Jusot
Marion Devaux

October 2008

http://www.york.ac.uk/res/herc/research/hedg/wp.htm

Inequality of Opportunities in Health in France: A first pass.

Alain Trannoy [a], Sandy Tubeuf [b], Florence Jusot [c], Marion Devaux [d]

[a] trannoy@ehess.univ-mrs.fr – EHESS (Ecole des Hautes Etudes en Sciences Sociales) and GREQAM-IDEP (Institut d'Economie Publique), Marseille.

[b] s.tubeuf@leeds.ac.uk – Academic Unit of Health Economics (Leeds Institute of Health Sciences).

[c] jusot@irdes.fr – LEGOS (Université Paris-Dauphine) and IRDES (Institut de Recherche et de Documentation en Economie de la Santé).

[d] marion.devaux@oecd.org – OECD, Paris.

Acknowledgements

This paper is part of the research program "*Inégalités sociales de santé*", supported by DREES-MiRe, Inserm, DGS, InVS, INCa and CANAM. The authors thank Brigitte Dormont, Brenda Gannon, Andrew Jones, Lise Rochaix, Jerome Wittwer, and participants to the 6th European Conference on Health Inequalities, the 6th World Congress of iHEA, and the Health, Econometrics and Data Group in York for their helpful comments.

Inequality of Opportunities in Health in France: A first pass

Abstract

This article analyses the role played by childhood circumstances, especially social and family background in explaining health status among older adults. We also explore the hypothesis of an intergenerational transmission of health inequalities using the French part of SHARE. As the impact of both social background and parents' health on health status in adulthood represent circumstances independent of individual responsibility, this study allows us to test for the existence in France of inequalities of opportunity in health related to family and social background. Empirically, our study relies both on tests of stochastic dominance at first order and multivariate regressions, supplemented by a counterfactual analysis to evaluate the long-lasting impact of childhood conditions on inequality in health. Allocating the best circumstances in both parents' SES and parents' health reduces inequality in health by an impressive 57% using the Gini coefficient. The mother's social status has a direct effect on the health of her offspring. By contrast, the effect on the descendant's health from the father's social status is indirect only, going through the descendant's social status as an adult. There is also a direct effect of each parent's health on health in adulthood.

Keywords: Stochastic dominance - equality of opportunity – inequality in health – intergenerational transmission – older adults – Gini index

1. Introduction

It is a question that has hovered over the research in health economics for some time as testified for instance by the editorial of Dias and Jones (2007) in this journal or the report of the World Bank (2005): "what is the role and the extent of childhood conditions and more generally of initial conditions in current inequality in health among adulthood?" Of course, many studies show strong and long-lasting inequalities in health related to current socioeconomic status (Wagstaff and van Doorslaer 2000; Mackenbach et al. 1997). These health inequalities have extensively been explained by differences in living and working conditions, access to health care, or health-related behaviours such as beneficial or risky choices (van Doorslaer and Koolman 2004; Smith 1999; Deaton 2003). Recent analyses, mainly epidemiological, support evidence that these social health inequalities can also be explained by living conditions in childhood, even *in utero* (Smith 1999; Marmot and Wilkinson 1999; Case et al. 2002; Currie and Stabile, 2003; Currie et al. 2007; Blane et al. 2007). This article aims to get a step further in exploring the particular role played by parents' characteristics, especially their occupation and their longevity, on health status in adulthood and more specifically among older adults and the elderly.

The study of the correlation between social and health characteristics of one generation and the health status of the following generation is important both from a philosophical stance and from a policy view point. As social background and parents' health both represent factors beyond the realm of individual responsibility (Dworkin 1981; Arneson 1989; Roemer 1998), they represent socially or morally unacceptable sources of inequality. Consequently, they appear to be first-rate candidates for a policy aiming at reducing inequality in health. However at the same time, they are the most persistent sources of inequality and hence are difficult to cope with. Such an analysis of inequalities of opportunity in health matters for comparing the role of the transmission of the past generation advantages to the current generation in various

spheres such as education, employment, housing or income distribution (Bourguignon et al. 2007; Lefranc et al. 2008; Ferreira and Gignoux 2008).

At this stage an important warning is in order. It is sufficient to uncover an "association" between initial conditions and health status in adulthood for inequality of opportunity to be detected: a simple and purely descriptive correlation is relevant in that matter. The first goal of this paper is precisely to exhibit such simple correlation between data of two different generations and to figure out what is the *global impact* of initial conditions on health status in adulthood.

Of course, the study of the *channels* of transmission from one generation to another is also of interest, specifically in the perspective to design leveling opportunities for the economic policy. Three potential ways of transmission over different generations have been shown in the literature. The first way considers the direct influence of social background on health in adulthood following a latency period; it is the *latency model* (Barker 1996; Wadsworth 1999). During childhood, a specific risk is established and it needs a trigger in adulthood to be reactivated. The second way, called *pathway model*, relies on parents' socioeconomic status having an indirect influence on the health status in adulthood through subsequent life trajectories and particularly through a transmission of socioeconomic status (SES) over different generations (Case et al. 2005)[1]. Nevertheless, the correlation between social background and health in adulthood could also be explained by another characteristic seldom considered: parents' health status. Indeed, if on the one hand, there are social health inequalities in the parents' generation, and on the other hand, parental health status is correlated to the descendant's health status, then one can infer that social background influences descendant's health status. This "*hypothesis of health intergenerational*

[1] Both models have been widely studied using British data and large epidemiological cohorts (Power and Hertzman 1997; Hertzman et al. 2001; Elstad 2005; van de Mheen et al. 1998a, 1998b). In France, some studies using either the GAZEL cohort of employees from the national electricity and gas company (Hyde et al. 2006; Melchior et al. 2006a) or the Life history survey (Melchior et al. 2006b), have shown an influence of the father's social status on both the health status and risk of death of their descendants.

transmission" relies on health capital models (Grossman 1972). According to these models, health is likened to a capital, which evolves over time according to age, individual health behaviours, and investment in health and stays strongly influenced by its initial level. It is partly related to parents' health status through a common genetic inheritance. This has to be distinguished from hereditary dependence which comes from the same exposure to a risky living context such as accommodation or neighbourhood conditions. In that case, this influence would not imply a causality link. Besides, parents' health may also have an impact on descendant's health status through a transmission of preferences for health or of health related behaviours. This third hypothesis is reinforced by recent analyses showing the influence of parents' health status on their children's health status (Case et al. 2002; Llena-Nozal 2007). Several studies have also shown evidence of inheritance in some specific diseases such as cancers, Alzheimer disease and in human longevity (Ahlburg 1998; Cournil and Kirkwood 2001). Nevertheless, the persistency of this effect on a descendant's health over the whole life-cycle, especially for older adults and the elderly, has been seldom studied for lack of data. This research aims firstly to fill this gap and secondly to investigate through which *channel* the intergenerational transmission of health inequalities finds his track.

We use the French part of 2004 Survey on Health, Ageing and Retirement in Europe (SHARE). As the survey sample concerns individuals aged 50 and more, we test the hypothesis of a long term transmission of living conditions in childhood and in teenage on health status in mature age and beyond.

Two different methodologies are used either to detect the global impact of the past generation or to identify the channels of transmission. For measuring the global impact of initial conditions, we call upon a first stochastic dominance analysis which is parameter-free using

the methodology from Lefranc et al. (2006; 2008). Then, a more classic regression analysis helps us to partially identify the channels of transmission.

The stochastic dominance analysis reveals the existence of inequalities of opportunities in health in adulthood. Beyond the relationship with current social conditions, health status in adulthood is influenced by social background, parents' vital status and parents' longevity. The regression analysis shows that the channel of transmission is not the same for mothers and fathers. The mother's social status has a direct effect on the health of her offspring whereas the effect from the father's social status is indirect only, going through the descendant's social status as an adult. Furthermore, there is a direct effect of each parent's health on health in adulthood and hence the hypothesis of health intergenerational transmission is not invalidated in general population. Finally, we assess the impact of childhood circumstances using counterfactual health distributions and show that allocating the best circumstances in both parents' SES and parents' health reduces the Gini coefficient of the probabilities of having a good or very self assessed health status by 57%.

The following section describes the data. The third section defines the concept of inequalities of opportunity in the specific context of health. Section 4 presents the results of the non-parametric approach, relying on instruments of stochastic dominance analysis. Section 5 comments the estimates of multinomial logit regressions which are used to build counterfactual distributions of health status. A discussion of the results and concluding remarks are gathered in the final section.

2. Data

This study relies on the French part of SHARE, which for the first time in France permits linking an individual's health status in adulthood with his social background on a representative sample of 2 666 adults aged 49 years and older as well as their spouses. In

addition to their current situation, individuals are asked about past circumstances such as their parents' final social status and demographic characteristics (age at death for deceased parents and age at the time of the survey for parents still alive).

Social background

In SHARE, social background is measured by the last job or occupation the father or the mother had. Occupations are described with the ISCO classification (International Standard Classification of Occupations). This classification distinguishes ten main groups of occupation with respect to the type of work performed (Elias, 1997). The basic criteria used to define the system of major, sub-major, minor and unit groups are "skill level" and "skill specialisation", which are required to carry out the tasks and duties of the occupations. In our analysis, these ten groups have been gathered in order to be comparable to the French-specific PCS[2] classification.

Fathers' job are classified into six groups: (i) "senior managers and professionals"; (ii) "technicians and associate professionals" and "armed forces"; (iii) "office clerks" and "service workers and shop and market sales workers"; (iv) "skilled agricultural and fishery workers"; (v) "craftsmen and skilled workers" and plant and machine operators and assemblers"; and (vi) "elementary occupations and unskilled workers".

Concerning mothers, a classification in six groups is also proposed. The five first groups are the same as the six groups of the father's job, where groups (i) and (ii) have been mixed as regard to very low sample. A sixth group, the group of homemakers, is added and represents almost one half of the respondents.

Current socioeconomic status of the descendant

Each respondent's current SES is considered on two levels: education and social status. Education level as measured by the highest diploma gained is firstly considered. In this way,

[2] The so-called *Nomenclature des Professions et Catégories Socioprofessionnelles*

education is described in four categories: no diploma (23%), elementary level diploma (31%), secondary level diploma (27%) and A-levels and university diplomas (19%). Then, current or last job as classified by ISCO is considered into seven groups: (i) "senior managers and professionals"; (ii) "technicians and associate professionals" and "armed forces"; (iii) "office clerks" and "service workers and shop and market sales workers"; (iv) "skilled agricultural and fishery workers"; (v) "craftsmen and skilled workers" and "plant and machine operators and assemblers"; (vi) "elementary occupations and unskilled workers"; and (vii) "homemakers".

Self-assessed health of the descendant

Health is a multidimensional parameter which is difficult to represent as a unique indicator. SAH is the most collected variable in interview-based European surveys on health. Despite its subjectivity, this indicator has been found to be a good indicator of health, which predicts mortality (Idler and Benyamini, 1997) as well as health care utilisation (DeSalvo et al. 2005). SHARE contains two questions on SAH, the one, promoted by the RAND and the one recommended by the European WHO (1996). They both rely on the same question: "*Would you say your health is …*" but vary in response choices, respectively: "*excellent, very good, good, acceptable, poor*" and "*very good, good, fair, poor, very poor*". Moreover, these two questions have been randomly positioned before or after an extended questionnaire on health. Hereafter, we ignore the position effect[3] and consider the European wording (Fig 1).

Figure 1 about here

[3] The position of the question has been found to influence SAH: people report a better SAH when the question is asked after the extended questionnaire on health (Clark and Vicard 2007). Nevertheless, our results are the same whether we introduce in the model a variable indicating the position of the SAH question in the questionnaire or not.

The measure of parents' health: the relative longevity

In general, it is difficult to construct a health indicator, which would be the same for the oldest and the youngest adults as regard to the depreciation of health with age. To measure parents' health status, we construct a proxy of their health status using the only information available on their health available in the survey: their vital status or age at death. Considering the age of the studied sample, most of the respondents have lost their parents: only 13% of the fathers are still alive and 30% of the mothers. Consequently, first information on parents' health is their vital status in the survey.

Concerning health status of deceased parents, we propose an indicator based on their age at death. This health indicator relies on parents' relative longevity compared to their expected longevity at 20 years old. That is, the indicator equals the difference between the actual age at death minus 20 years and the life expectancy at 20 years old of their birth generation. We assume thus that health status is better if an individual has lived longer than other people of their generation, where all have lived (or survived) at least long enough to have children[4].

The construction of this indicator requires both the age at death and the year of birth in order to evaluate the birth cohort. The age at death is known in the survey but the year of birth has to be estimated from the descendant's year of birth and data on age at maternity and paternity in the 20th century from another source (Daguet, 2002). We refine this estimation by taking into account whether the descendant is the eldest of his siblings. When the respondent was not the eldest, we estimate his mother's year of birth (respectively his father's one) using the average age at maternity (respectively paternity) of his year of birth. Likewise, when the respondent was the eldest, we estimate his mother's year of birth using national data on the average age at delivery for first births corresponding to his year of birth. As for the father's

[4] In this context, we consider that accidental deaths are not significant.

year of birth, we estimate it reproducing the difference between average age at maternity and average age at paternity to the average age at delivery for first births of mothers.

The relative longevity of both parents is described in the figure 2 and equals on average –0.67 years for mothers and 5.5 years for fathers. These distributions are spread as some generations experienced a very low life expectancy at 20 years old because of the world war and the Spanish influenza pandemic in 1918 and 1919.

Figure 2 about here

Conversely to the life expectancy, which equals the average age at death of a whole generation, this indicator of relative longevity concerns a selected population of men and women, which has lived long enough to have children. In order to validate our process of estimation for the parents' year of birth, we compare the estimated year of birth with the actual year of birth for parents who are still alive. The mean average difference between these two elements equals three years for the fathers and one year for the mothers. This bias is not correlated to the social status of the fathers. Nevertheless, the multiple average comparisons show a significant difference for mothers who are farmers: their estimated year of birth would be one year later than their actual one. Couples of farmers are known to have on average more children (Mazuy, 2002). Thus, we can assume that the average age at delivery for first births of farmers is earlier than the one of other mothers. This bias would thus lead to an underestimation of relative longevity for mothers who were farmers; but as we will see later, our results do not provide evidence of any specific effect of this social category.

3. Concept and Method

The intergenerational equality of opportunity in health relies on the comparison of different cumulative distribution functions of health status across several sub-groups of individuals, distinguished by a characteristic of the parental generation. Health statuses are more generally described with qualitative than quantitative variables. The distribution of health status over

different categories allows definition of the proportion of individuals with a given health status in the same generation. One can then easily represent the cumulative distribution function of health statuses which shows the proportion of individuals within a specific health status, which is at least equal to a given category. For instance, in figure 1, individuals with fair and poorer health would represent 35%. This cumulative distribution function of the general population can be interpreted as a distribution of opportunities. Indeed, a randomly selected individual has a 35% chance of belonging to the group which is at most in fair health. In the context of health, one can actively contribute to improve or to worsen it. Consider now that instead of a simple description of health statuses over a population, one is interested in the distribution of health statuses according to specific characteristics of childhood conditions. For instance, we figure the cumulative distribution function of the health status of individuals born either of a father who was a blue collar worker or of a prematurely dead father. Being the son of a blue collar worker as well as being the son of a prematurely dead father is obviously an exogenous characteristic; descendants have no control over these factors. The fact of being born in a particular family background is equivalent to get a lottery ticket, whose winnings will only be known later on. The cumulative distribution function of health status of individuals born to blue collar workers, 30, 40, or 50 years later describes the distribution of equality of opportunities in the health of sons of blue collar workers. If on the one hand, this cumulative distribution function is clearly different than the one of individuals born to white collar workers and if on the other hand, this difference is such that a descendant has a higher chance of being in poor health when he is born to a blue collar worker, one can reasonably associate this result to a difference in social background. The previous example is a typical situation of stochastic dominance at first order. Graphically, the cumulative distribution function of health statuses of individuals born to a blue collar worker is always above that of individuals born to a white collar worker at any point of comparison. In this context, the

comparison of random distributions of health statuses conditional on family background leads any individual to systematically prefer being born to a white collar worker than born to a blue one regardless of his risk-aversion. There is thus a social inequality of opportunity in health. Conversely, if two cumulative distribution functions are the same, then one concludes that there is a social equality of opportunity in health. The equality of opportunity is equivalent to a situation where an individual would be indifferent to the choice of a family background. The same approach can be proposed when comparing sub-groups of individuals according to parents' health. Analogously, if there are no differences between two cumulative distribution functions of health status, one would conclude an equality of opportunity in health. However, in this context, this equality cannot be called "social" because of the intergenerational transmission of genes but one would conclude there is a "health" inequality of opportunity in health. A direct interpretation of a "complete" intergenerational equality of opportunity in health would be that family background does not endow any advantages not only on average but also on any percentile of the distribution of health statuses. As a result, either one is in poor health or good health; social background is not a determinant of health status. In this context, if the descendant is in poor health, this could be explained either by risky health behaviours or misfortune in adult life. The distribution of health status is the result of misfortune and factors within the control of the descendant. Empirically, the inference procedure relies on tests of stochastic dominance at first order. Since the distributions considered are discrete, unilateral *Kolmogorov-Smirnov* (KS) tests of equality of distribution are required.

One of the difficulties of the dominance analysis is that it assumes the availability of large samples. If we intersect every possible social background with other different criteria then the sample size reduces and the dominance tools cannot be used any longer. In particular, we cannot test the equality of opportunity hypothesis on sub-samples of people of same age and

gender whereas we should reach at least this precision level to test equality of opportunity in health. Consequently, a multivariate regression analysis involving the descendant's SAH as the dependant variable supplements the dominance analysis. This second approach permits controlling age and gender. If the analysis offers flexibility to test for a variety of hypotheses that could not be considered in the dominance approach, however, a parametric context is always more restrictive. Indeed, the regression analysis only explains mean differences whereas the dominance analysis is interested in differences within distributions. The quantile regression would be the appropriate tool but sample sizes do not permit its use.

4. Results of the non-parametric approach

The first approach does not limit the definition of equality of opportunity to a simple equality of the average health status which is conditional on family and social background. Indeed, it also studies the effect of family and social background on the whole distribution of health. From the 5-points health status variable, distributions of health status are constructed conditional on family and social background, using dominance tests.

Dominance according to parents' relative longevity

The hypothesis of inequality of opportunity in health according to parents' health is tested by building distributions of health status conditional on each parent's health status. In order to rely on comprehensive numbers of observations, parental health is considered as a three-category variable which distinguishes (i) parents alive in the survey (ii) parents having had a high relative longevity (i.e. a relative longevity higher than the median[5] of the relative longevity distribution), and (iii) prematurely dead parents (i.e. those having had a relative longevity lower than the median).

Figure 3 shows inequalities of opportunities in health according to the father's health as well as the mother's health. Indeed, the distribution of health of individuals whose parents are still

[5] The median respectively equals 7.78 years for fathers and 2.18 years for mothers.

alive dominates the distribution of health of individuals whose parents are deceased and differences are significant for both parents. On the contrary, no significant dominance is observed between distributions of health of individuals whose parents had a weak longevity and those of individuals whose parents had a high longevity. This first result does not allow us to conclude that there are inequalities of opportunities in health related to parental health because the respondent's age, which is not considered, could explain these differences.

Figure 3 about here

Younger respondents are more likely to be in better health and to have parents still alive. In order to take into account the respondent's age, we restrict the analysis to the age category 60-69 years old which contains both individuals whose parents are alive and individuals whose parents are deceased. The comparison of distributions of respondent's health related to parents' health shows small differences between the three parental health categories. Figure 4 describe ranked health cumulative distribution functions favouring individuals whose parents are alive, and then individuals whose parents experienced a high longevity, nevertheless the corresponding KS tests (cf. table I) do not show significant differences between distributions.

Figure 4 and table I about here

Dominance according to social background

We test inequality of opportunity in health according to social background and therefore compare distributions of health status according to each parent's socioeconomic status[6].

Respondents born to "senior managers and professionals" or "technicians and associate professionals" and "armed forces" are more likely to report a good health status than a respondent born to "skilled agricultural and fishery workers", "craftsmen and skilled workers" or "elementary occupations and unskilled workers". Figure 5-A represents the cumulative

[6] The result (proposition 3 in Lefranc et al. 2006) shows that when social background is not fully described, which is likely to be the case, equality of distributions conditional on social background is a necessary condition for equality of opportunity. As a result, if the KS test shows significant difference between cumulative distribution functions then we can say that equality of opportunity is violated if we had the opportunity to measure perfectly social background.

distribution function of descendants' SAH conditional on their father's social status. The cumulative proportion of individuals in very poor and poor health born in high social background is smaller than the cumulative proportion of those born in socially disadvantaged families. The KS unilateral tests in table II confirm the existence of inequalities of opportunity in health according to the father's social status. The distributions of health of respondents whose father was "senior managers and professional" or "technician and associate professional" and in "armed forces" significantly dominate the distributions of health of respondents whose father was "skilled agricultural and fishery worker", "craftsman and skilled worker" or in "elementary occupations and unskilled worker". Moreover, the results show the distribution of health in adulthood of respondents born to an office clerk or a service worker dominates significantly the one of those born to an unskilled workers.

The results are similar for the mother's socioeconomic status (cf. fig. 5-B and table II). The distribution of health status of individuals born to a mother in the groups of "senior managers, professionals and technicians" or "office clerks and service workers" dominates significantly the distribution of health of those born to a mother who belonged to any other social category. Therefore, the descendant's health is better if his mother had a higher socioeconomic position.

Figure 5 and table II about here

This non-parametric approach shows the existence of inequalities of opportunity in health according to social background and to a lesser extent, according to parents' health, which represent circumstances independent from individual responsibility.

Dominance according to current socioeconomic status

Traditionally, studies which are interested in social health inequalities analyse the effects of current social conditions on health in adulthood. We now consider the descendant's social status as a conditional variable in order to test for social health inequalities and to compare them to inequalities of opportunity in health previously shown.

As shown on figure 6, there are social health inequalities according to current social status. The distribution of SAH of "senior managers and professionals" and "technicians and associate professionals and armed forces" dominates the one of "office clerks service workers", "skilled agricultural and fishery workers", "craftsmen and skilled workers", "elementary occupations and unskilled workers", and "homemakers". Similarly, "office clerks and service and shop workers" have a higher probability of being in very good health than "skilled agricultural and fishery workers", "craftsmen and skilled workers" and "elementary occupations and unskilled workers". These social health inequalities are significant (cf. table III) and are even more pronounced than inequalities of opportunity in health when related to the father's social status. There are more significant unilateral tests for distributions of health status in adulthood when it is conditional on current social status than on the father's social status. Nevertheless, inequalities of opportunity due to family and social background are not negligible and deserve to be considered.

Figure 6 and Table III about here

5. Results of the parametric approach

Considering that individual's health is measured by a 5-points variable, we estimate the effect of family background variables using ordered polytomous logistic regressions. Our estimation strategy follows three steps and results are presented in table IV; they are interpreted in terms of proportional odds ratios.

Model 1 estimates the impact of parents' socioeconomic status and relative longevity on the probability to report good health controlling the respondent's age and gender[7].

[7] The construction of the relative longevity indicator would make this variable correlated to respondent's age as it is used to estimate his parents' birth cohort. In order to check that the relative longevity variable is reliable, we have tested an alternative model to this first model where parents' age at death is used instead of the relative longevity. The odds ratio in this alternative model are very close to those in model 1, it confirms that relative longevity is a valid instrument and does not introduce particular bias in our analysis.

We supplement this first model with other specifications for two reasons. Firstly, the initial specification can be criticised because of omitted variables, which might induce an endogeneity bias of parents' socioeconomic status as regard to descendant's health in adulthood. Secondly, it is interesting to understand through which transmission *channels* social background influences health in adulthood. Model 2 adds the respondent's education level to test if the influence of social background shown in model 1 comes from a direct effect of this background on health or from an indirect effect going through education level. Model 3 introduces the respondent's socioeconomic status in order to show direct effects of social background on self-assessed health independently from the effect of social background on respondent's socioeconomic status.

Table IV about here

Influence of social background and parents' relative longevity

Model 1 estimates the following equation where H_i represents self-assessed health in adulthood, F is a cumulative distribution function associated to the logistic distribution, and SES_{Fath} and SES_{Moth} represent parents' social status.

$$H_i^* = F(\alpha_1 Gender_i + \alpha_2 Age_i + \beta_1 SES_{Fath} + \beta_2 Alive_{Fath} + \beta_3 Long_{Fath} + \beta_4 SES_{Moth} + \beta_5 Alive_{Moth} + \beta_6 Long_{Moth}) \quad (1)$$

The variables $Alive_{Fath}$ and $Alive_{Moth}$ are dummy variables indicating if the father (respectively the mother) is alive in 2004 and $Long_{Fath}$ and $Long_{Moth}$ are continuous variable representing the relative longevity of deceased parents. As expected, the probability to have a good SAH strongly reduces with age but there are no significant differences by gender. The results show that the probability of self-assessing a poor health in adulthood decreases with parents' SES. An individual born to a father whose occupation is either "senior managers and professionals" or "technicians and associate professionals" and "armed forces" or "office clerks and service workers", has a significantly lower probability of poor health status than

those whose father has an elementary occupation, after adjusting for age and gender. These results match exactly with those emphasised by the dominance approach. As for mothers' SES, a respondent whose mother had an elementary occupation always has a higher probability of poor health status in adulthood than someone born to a mother who was a homemaker. Moreover, individuals born to parents who had a higher relative longevity are significantly more likely to report better health. It is also true for individuals whose father is still alive. The difference of significance according to the gender of the parent reflects what the longevity variable means: if the father of a respondent of this generation is still alive then he has gone through several hardships such as world war. Regarding the lower longevity of men, this element is more informative on natural robustness of parents than the fact that the mother is still alive.

Influence of social background, parents' relative longevity and current socioeconomic status

We shall denote the descendant's education as $Educ_i$, model 2 is written

$$H_i^* = F(\alpha_1 Gender_i + \alpha_2 Age_i + \beta_1 SES_{Fath} + \beta_2 Alive_{Fath} + \beta_3 Long_{Fath} + \beta_4 SES_{Moth} + \beta_5 Alive_{Moth} + \beta_6 Long_{Moth} + \alpha_3 Educ_i) \quad (2)$$

We observe, *ceteris paribus*, that education significantly influences health status: the higher the education level, the lower the risk of poor health. In addition, the introduction of education level modifies previous results: the effect of the father's SES on descendant's health is removed; it is indirect and comes from the respondent's education level, which reminds the *pathway model*. On the contrary, the influence of mother's SES on health status in adulthood persists. Indeed, there is a positive and significant impact on health status for individuals born to a mother who was "office clerks" or "shop and market sales workers" and a negative and significant impact for individuals born to mothers in elementary occupations. This direct impact confirms the *latency hypothesis*. This latter effect can be interpreted as

either being the influence of living standards in childhood or the influence of the mother's education level on education to health.

Parents' health still influences health status in adulthood; an individual whose parents had a higher longevity is significantly in better health. Nevertheless, the introduction of education reduces both the significance and the value of odds ratios related to parents' health, particularly those associated to the mother's longevity. This result suggests that education could reduce the influence of parents' health, i.e. the transmission of intergenerational health inequalities. A higher education level would thus be able to protect health, because of a lower reproduction of poor family habits or an improved awareness of health transmitted difficulties such as genetic screening.

The descendant's social status, SES_i is introduced in model 3 as follows.

$$H_i^* = F(\alpha_1 Gender_i + \alpha_2 Age_i + \beta_1 SES_{Fath} + \beta_2 Alive_{Fath} + \beta_3 Long_{Fath} + \beta_4 SES_{Moth} + \beta_5 Alive_{Moth} + \beta_6 Long_{Moth} + \alpha_3 Educ_i + \alpha_4 SES_i) \quad (3)$$

As expected, individual's SES significantly influences self-assessed health. Individuals who are "senior managers and professionals", "technicians and associate professionals and armed forces", "office clerks service workers" and "skilled agricultural and fishery workers" are more likely to report a better health status than individuals having elementary occupations and being unskilled workers. Results concerning parents' SES are similar to the previous model. Father's SES does not directly influence descendants' health in adulthood whereas having a mother in elementary occupations or unskilled workers reduces chances to report a poor health status. The magnitude of the impact of social background on self-assessed health in adulthood is important, particularly for better health statuses.

Finally, this model removes the significant effect of the father's relative longevity but confirms the effect of the mother's relative longevity and the father's vital status on health in adulthood.

Influence of childhood circumstances

So far, the estimated models have explained health status in adulthood, nevertheless, the actual impact of childhood circumstances has not been understood. Firstly, the impact of circumstances is absorbed by the introduction of current individual social characteristics in model 3. Secondly, their impact is also not fully described in models 1 and 2 because all the variables impacting health are not considered and so, the estimated coefficients associated to circumstances might be mis-estimated.

In this context, the solution is the following. We shall ethically assume that the share of individual social characteristics, namely education and social status, correlated with social and family background are circumstances as well. This assumption is not the only ethical position that could be defended but it is a relevant assumption. It is clearly the assumption supported by Roemer (1998) about individual outcomes depending on circumstances and effort: effort is orthogonal to circumstances. Therefore we estimate education level and then social status within two separated equations according to the vector of circumstances. We introduce then the estimated residuals of these two equations into the third equation explaining health status in adulthood along with the vector of circumstances. The coefficients associated to circumstances variables are thus the sum of direct and indirect effects of circumstances on health. The scalar product of the circumstances βX represents the impact of social and family background on health status in adulthood. The residual components do not belong to the vector of circumstances as they are orthogonal to circumstances in this third equation and represent the share of individual social characteristics explained by effort for a given vector of circumstances. The model is written as follows.

$$Educ_i^* = \alpha_1^a Sex_i + \alpha_2^a Age_i + \beta_1^a SES_{Fath} + \beta_2^a Alive_{Fath} + \beta_3^a Long_{Fath} + \beta_4^a SES_{Moth} + \beta_5^a Alive_{Moth} + \beta_6^a Long_{Moth} + u^a \quad (4.a)$$

$$SES_i^* = \alpha_1^b Sex_i + \alpha_2^b Age_i + \beta_1^b SES_{Fath} + \beta_2^b Alive_{Fath} + \beta_3^b Long_{Fath} + \beta_4^b SES_{Moth} + \beta_5^b Alive_{Moth} + \beta_6^b Long_{Moth} + \alpha_3^b \hat{u}^a + u^b \quad (4.b)$$

$$H_i^* = \alpha_1 Sex_i + \alpha_2 Age_i + \beta_1 SES_{Fath} + \beta_2 Alive_{Fath} + \beta_3 Long_{Fath} + \beta_4 SES_{Moth} + \beta_5 Alive_{Moth} + \beta_6 Long_{Moth} + \alpha_3 \hat{u}^a + \alpha_4 \hat{u}^b + u \quad (4.c)$$

Equation (4.a) is estimated using a binary probit model for having a higher educational level because the use of an ordered probit model rejected the test of parallel lines. Because of the non linear specification of the model, estimated residuals are not directly available. We then computed generalised residual $\hat{u}^a$, which corresponds to the conditional expected value of the residual given the exploratory variables (Gourieroux et al., 1987). The second reduced equation (4.b) analyses the propensity of having a higher social status in adulthood SES_i^* within a binary probit model[8]. Moreover, the generalised residual terms $\hat{u}^a$ and $\hat{u}^b$ represent represents individual effort, luck and unobserved circumstances respectively permitting the individual to reach a higher education level considering childhood circumstances or to get a higher social status independently from childhood circumstances and the individual effort given for education. Equation (4.c) is estimated using an ordered Logit model. Results are presented in table V.

Table V about here

The two reduced equations show that current socioeconomic status, as measured by education level and social status is significantly influenced by childhood circumstances. The father's social status influences similarly education level and social status: individuals born to a father, who had a higher professional status (i.e office clerks and higher) have both a higher probability to have a higher education and a higher probability to have a higher social status than those born to an unskilled worker. The mother's social status also significantly influences the probability of having higher socioeconomic characteristics. Individuals born to

[8] The use of a binary variable permits avoiding an arbitrary hierarchy among social statuses.

a senior manager mother have a higher probability of having both a higher education level and a higher social status than individuals born to a homemaker mother, whereas it is the contrary for individuals born to a mother who worked in agriculture: they have lower probability of both high education and high social status than homemakers' descendants. Moreover, individuals born to office clerks mothers are also more likely to have a higher social status than individuals born to homemaker mothers. Considering the probability of having a higher education level, individuals born to a mother in elementary occupations are more likely to be socially disadvantaged than individuals born to homemakers' mothers. Mothers' longevity as well as vital status significantly increases the probability of having both higher education and higher social status. As for father's health, education is positively and significantly influenced by the relative longevity whereas the probability of higher social status significantly increases with the father's vital status. Furthermore, the individual effort to get a higher education level as measured by the generalised residual of equation (4.a) significantly and positively influences the probability of having a higher social status.

Finally, the odds ratios of the third estimation reported in table V show that health status in adulthood is significantly influenced by childhood circumstances. Individuals born to a father who was in higher social categories (senior managers, technicians and associate professional and office clerks) are more likely to have a good health status than individuals born to a father who had an elementary occupation. As for the mother's social status, descendants from office clerks are more likely to be in good health than homemakers' descendants whereas descendants from unskilled workers mothers are less likely to be in good health. Both the relative longevity and the vital status of the father significantly influence the probability of having a good health. The relative longevity of the deceased mother has also a significant effect on health in adulthood. Another innovative result of this estimation yields in the significant and positive impact of the two residuals terms. Individual efforts and luck for a

higher education as well as individual efforts and luck in social status increase the probability of having a good health status in adulthood. It is relevant to assume that individuals doing efforts for socioeconomic status are also doing efforts in health. Moreover, we notice that the odds ratio associated to efforts and luck in education is higher than the one of efforts and luck in social status. Indeed education for health is a component of a better health status.

From this last equation, we can quantify the impact of childhood circumstances on the level of inequality in health.

Magnitude of the impact of circumstances on inequalities of opportunity in health

We argue that the impact of circumstances on the distribution of health in adulthood can be meaningfully assessed only by comparing the distribution of the predicted probability of having a good or a very good self assessed health status with a reference distribution. The reference distribution we use is the counterfactual distribution of the predicted probability of having a good or a very good self assessed health status for the best circumstances for the individuals. To compare the level of inequalities of the both distribution we assess the Gini coefficient. The distribution of health among descendants exhibits a Gini coefficient equal to 15.5 points. This value is compared to 5 other measures levelling circumstances for the whole sample. If the whole sample had been fortunate enough to grow up with the best circumstances, from the estimation of equation (4.c) it is having both parents alive, a senior manager father and an office clerk mother, then the Gini coefficient decreases of almost 60% and equals only 6.5 points (cf table VI). We find thus that childhood circumstances increase inequality in health in the sense that inequality would have been lower if circumstances were the same for any individual. The other counterfactual hypotheses aim to accurately show which initial conditions matter the most among parents' health or social background. If we concentrate on the effect of father's characteristics as compared to mother's characteristics, the Gini coefficient reduces by 6 points when the best father's circumstances are allocated

whereas it reduces by 4 points for the mother's circumstances. Therefore, the level of inequality in health reduces more when individuals have the best circumstances in father's characteristics than when they have the best circumstances in mother's characteristics.

Moreover within the transmission of health inequalities, socioeconomic issues seem to be more important than health issues for descendants. If all the parents were alive then the reduction of the Gini coefficient would equal 4.5 points, whereas if all the descendants were born of the best social background then the reduction would be of 6 points. Therefore, the level of inequality in health is more influenced by social circumstances than circumstances of health in childhood.

6. Discussion

This analysis shows inequalities of opportunity in health for older adults according to social background and parents' longevity. These results are obtained using two complementary approaches. The non-parametric one gives very robust results in terms of stochastic dominance at first-order whereas the parametric approach confirms and refines results by reasoning *ceteris paribus*.

First of all, the mother's SES is found to have a direct effect on health status of descendants in older ages, which is coherent with the *latency hypothesis*. Father's SES only has an indirect effect through the descendant's education level and socioeconomic status in accordance with the *pathways hypothesis*. Moreover, the hypothesis of health transmission from one generation to the next is shown as there is a direct effect of the father's relative longevity on the health of descendants in adulthood. On the contrary, there is no more effect of the mother's relative longevity when individual's education level is introduced. As socioeconomic statuses are coded with ISCO classification relying on individuals' ability to carry out the tasks and duties of the occupations, the absence of the direct effect of mother's

relative longevity on health in adulthood could be explained as the impact of living standards in childhood or the impact of mother's education level.

As a consequence, three channels through which family background can influence health in adulthood are involved in the explanation of inequalities of opportunity in health in France.

Moreover, the counterfactual analysis permits interpreting the effect of differences in circumstances on inequality in health. It shows that childhood circumstances increase inequality in health in the sense that inequality would have been more twice lower if circumstances were the same for any individual. Furthermore, circumstances in social aspects and circumstances in father's characteristics are found to have a higher impact on the level of inequality in health. This result advocates the need to neutralize the effect of circumstances.

The use of SAH to measure the respondent's health could be criticised as this variable may suffer from individual reporting heterogeneity. Nevertheless, our study sample concerns older individuals and they are less likely to misreport their health status, especially after retirement (Bryant et al., 2000).

Data do not permit disentangling whether transmission of health is due to genetic inheritance or copying parental behaviours. This question is yet of importance in an analysis of inequalities of opportunity since from an ethical point of view, inequalities due to genes will not be equivalent to inequalities in social background (Lefranc et al., 2004). In particular, public policies of correction in each context would be very different too. Furthermore, the effect of parents' health could also be explained by a common family characteristic influencing the health status of all the members in the family. For example, a similar exposure to either a risky geographical environment (radioactive, environmental pollution) or a similar sanitary risk or a socially disadvantaged context would suggest similar health statuses within a family.

The paper offers thus various extensions for empirical work at national and European levels.

7. References

Ahlburg D. Intergenerational transmission of health. *American Economic Review* 1998; 88:265-270.

Arneson, RJ. Equality and equal opportunity of welfare. *Philosophical Studies* 1989; 56:77-93.

Barker, DJP., Fetal origins of coronary heart disease. *Britain Medicine Journal* 1996; 311:171-174.

Blane D, Netuveli G, Stone J. The development of life course epidemiology, *Revue d'Epidémiologie et de Santé Publique*, 2007; 55 : 31-38.

Bourguignon F, Ferreira FHG, Menendez M. "Inequality of Opportunity in Brasil." *Review of Income and Wealth* 2007; 53, 4.

Bryant LL, Beck A, Fairclough DL. Factors that contribute to positive perceived health in older population. *Journal of Ageing and Health* 2000; 12:169-192.

Case A, Fertig A, Paxson C. The lasting impact of childhood health and circumstance. *Journal of Health Economics* 2005; 24:365-389.

Case A, Lubotsky D, Paxson C. Economic status and health in childhood: the origins of the gradient. *American Economic Review* 2002; 92:1308-1334.

Clark A, Vicard A, Conditions de collecte et santé auto-déclarée : analyse sur données européennes. *Economie et statistique* 2007 ; 403-404:143-163.

Currie A, Shields MA, Wheatley Price S. The child health/family income gradient: Evidence from England, *Journal of Health Economics* 2007, 26: 213-232.

Currie J, Stabile M. Socioeconomic status and child health: why is the relationship stronger for older children, *American Economic Review* 2003; 93: 1813-1823.

Cournil A, Kirkwood TBL. If you would live long, choose your parents well. *TRENDS in Genetics* 2001; 17:233-235.

Daguet F, Un siècle de fécondité française, caractéristiques et évolution de la fécondité de 1901 à 1999. *Insee Résultats Société* 2002 [8].

Deaton A. Health, Inequality, and Economic Development, *Journal of Economic Literature* 2003; 41 (1): 113-158. American Economic Association.

DeSalvo K, Fan VS, McDonnell MB, Fihn SD. Predicting mortality and healthcare utilization with a single question. *Health Services Research* 2005; 40:1234-1246.

Dias PR, Jones A. Giving equality of opportunity a fair innings. *Health Economics*, 2007; 16:109-112.

Dworkin A. What is equality? Part I: Equality of Welfare. *Philosophy and Public Affairs* 1981; 10:185-246.

Elias P. *La classification des professions (CITP-88): Concepts, méthodes, fiabilité, validité et comparabilité internationale*. Editions OCDE 1997.

Elstad JI. Childhood adversities and health variations among middle-aged men: a retrospective life course study. *European Journal of Public Health* 2005; 15:51-58.

Ferreira F, Gignoux J. *The Measurement of Inequality of Opportunity: Theory and an application to Latin America*. The World Bank; Policy Research Working Paper 4659, 2008.

Gourieroux C, Monfort A, Renault E, Trognon A. Generalised residuals, *Journal of Econometrics* 1987, 34(1-2): 5-32.

Grossman M. *The demand for health: a theoretical and empirical investigation*. 1972; New York.

Hertzman C, Power C, Matthews S, Manor O. Using an interactive framework of society and lifecourse to explain self-rated health in early adulthood. *Social Science and Medicine* 2001; 53:1575-1585.

Hyde M, Jakub H, Melchior M, van Oort F, Weyers S. Comparison of the effects of low childhood socioeconomic position and low adulthood socioeconomic position on self-rated health in four European countries. *Journal of Epidemiology and Community Health* 2006; 60: 882-886 pp.

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

Lefranc A, Pistolesi N, Trannoy A. Inequality of opportunities vs. inequality of outcomes: Are Western societies all alike. *Review of Income and Wealth* 2008 (forthcoming).

Lefranc A, Pistolesi N, Trannoy A. *Equality of opportunity: Definitions and testable conditions, with an application to income in France*. Robert Schuman Centre for Advanced Studies Working paper N°2006/35, 2006.

Lefranc A, Pistolesi N, Trannoy A. Le revenu selon l'origine sociale. *Economie et statistique* 2004; 371:49-82.

Llena-Nozal A. *On the Dynamics of Health, Work and Socioeconomic Status*. PhD thesis, Vrije Univertiteit Amsterdam 2007.

Mackenbach JP, Kunst AE, Cavelaars AEJM, Groenhof F, Geurts JJM, the EU Working Group on Socioeconomic Inequalities in Health, Socioeconomic inequalities in morbidity and mortality in western Europe. *The Lancet*, 1997; 349:1655-1659.

Marmot M, Wilkinson R. *Social determinants of health*, Oxford University Press 1999.

Mazuy M. Situations familiales et fécondité selon le milieu social. Résultats à partir de l'enquête EHF de 1999. Documents de travail de l'INED. 2002.

Melchior M, Berkman LF, Kawachi I, Krieger N, Zins M, Bonenfant S. Lifelong socioeconomic trajectory and premature mortality (35-65 years) in France: findings from the GAZEL Cohort Study. J*ournal of Epidemiology and Community Health* 2006a; 60:937-944.

Melchior M, Lert F, Martin M, Ville I. Socioeconomic position in childhood and in adulthood and functional limitations in midlife: data from a nationally-representative survey of French men and women. *Social Science and Medicine* 2006b. 63:2813-2824.

Power C, Hertzman C. Social and biological pathways linking early life and adult disease. *British Medical Bulletin* 1997; 53:210-221.

Roemer J. *Equality of Opportunity*. Cambridge University Press 1998.

Smith JP. Healthy bodies and thick wallets: the dual relation between health and economic status. *Journal of Economic Perspectives* 1999; 13:145-166.

Vallin J, Meslé F. *Tables de mortalité françaises pour les XIXème et XXème siècle et projections pour le XXIème*, Paris: INED, 2001.

van de Mheen H, Stronks K, Looman CW, Mackenbach JP. Does childhood socioeconomic status influence adult health through behavioural factors? *International Journal of Epidemiology* 1998; 27(3):431-7.

van de Mheen H, Stronks K, Looman CW, Mackenbach JP. Role of childhood health in the explanation of socioeconomic inequalities in early adult health, *Journal of Epidemiology Community Health* 1998; 52(1):15-9.

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

Wadsworth MEJ. Early life hypothesis. In: *Social determinants of health*, Marmot and Wilkinson (Ed) Oxford University Press, 1999.

Wagstaff A, van Doorslaer E, "Equity in health care finance and delivery", in: A. J. Culyer & J. P. Newhouse (ed.), *Handbook of Health Economics*, edition 1, volume 1, chapter 34, 2000; 1803-1862.

World Bank. *World Development Report 2006: Equity and development*. Washington, D.C.2005.

World Health Organisation. *Health interview surveys: towards international harmonization*. WHO Regional Publications, European Series, 1996.

8. Figures

Figure 1: Distribution of respondents' self-assessed health

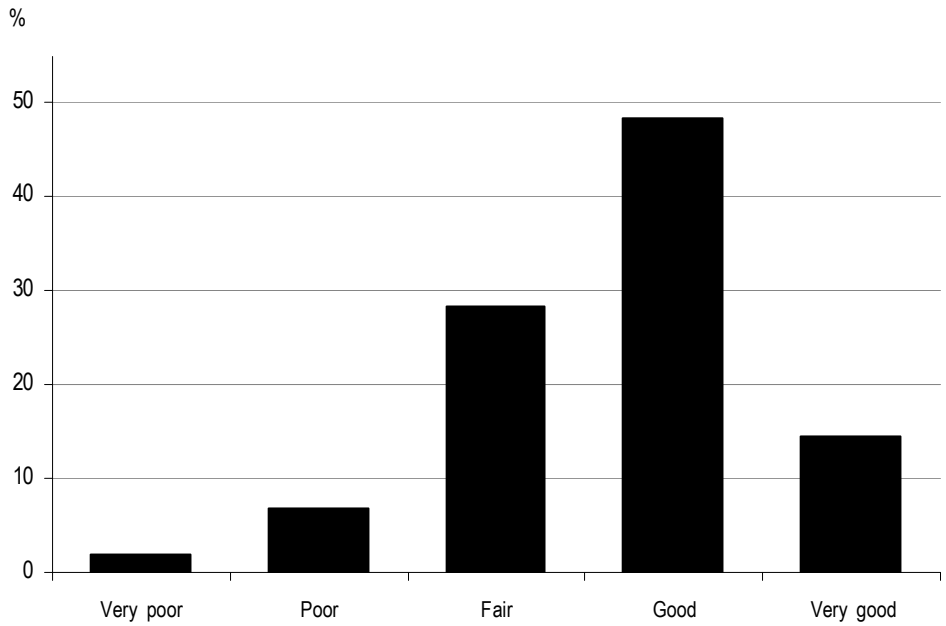


Figure 2: Distribution of deceased parents' relative longevity

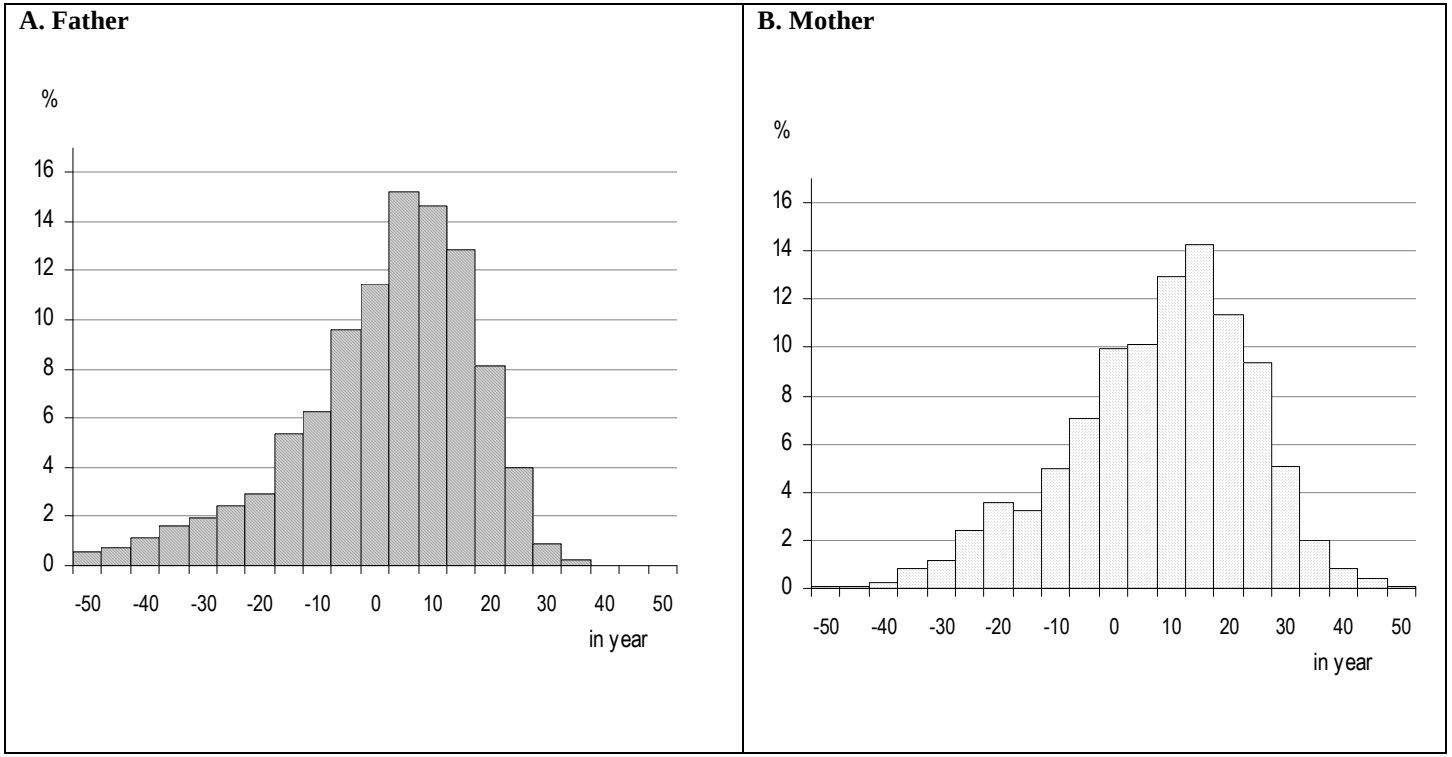


Figure 3: Cumulative distribution function of self-assessed health according to their parents' health

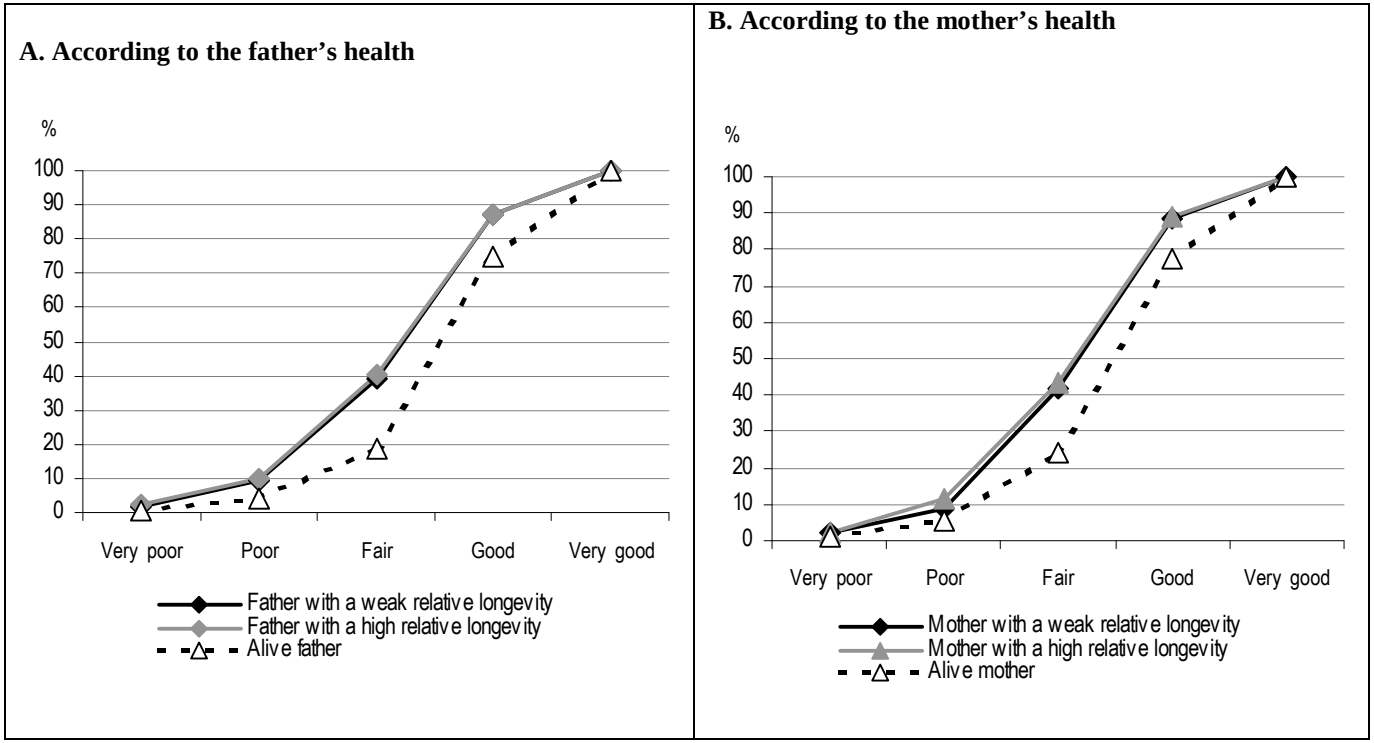


Figure 4: Cumulative distribution function of self-assessed health of individuals aged 60-69 years old according to their parents' health

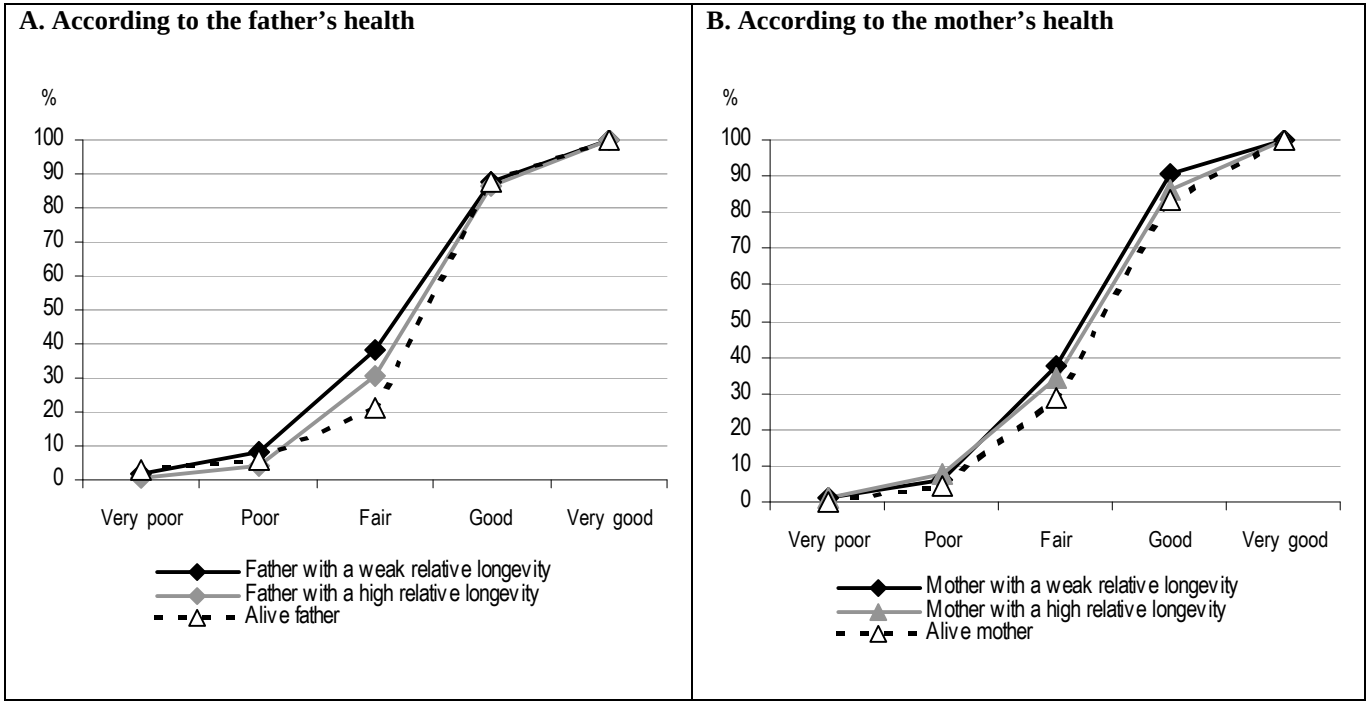
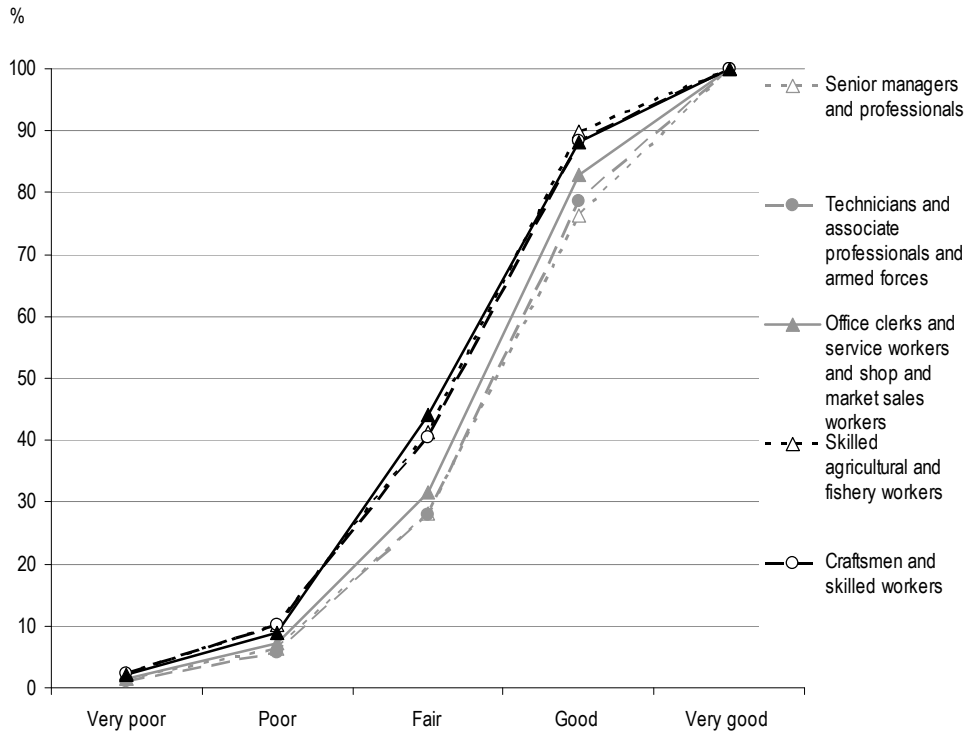


Figure 5: Dominance analysis according to social background

A. Cumulative distribution function of respondents' self-assessed health according to their father's professional occupation



B. Cumulative distribution function of respondents' self-assessed health according to their mother's professional occupation

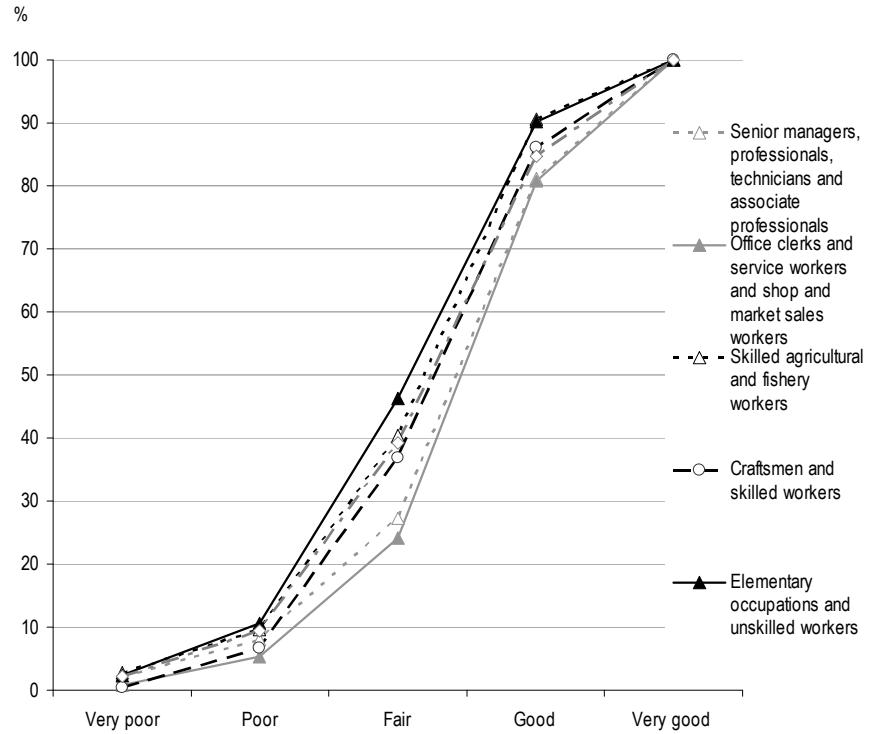
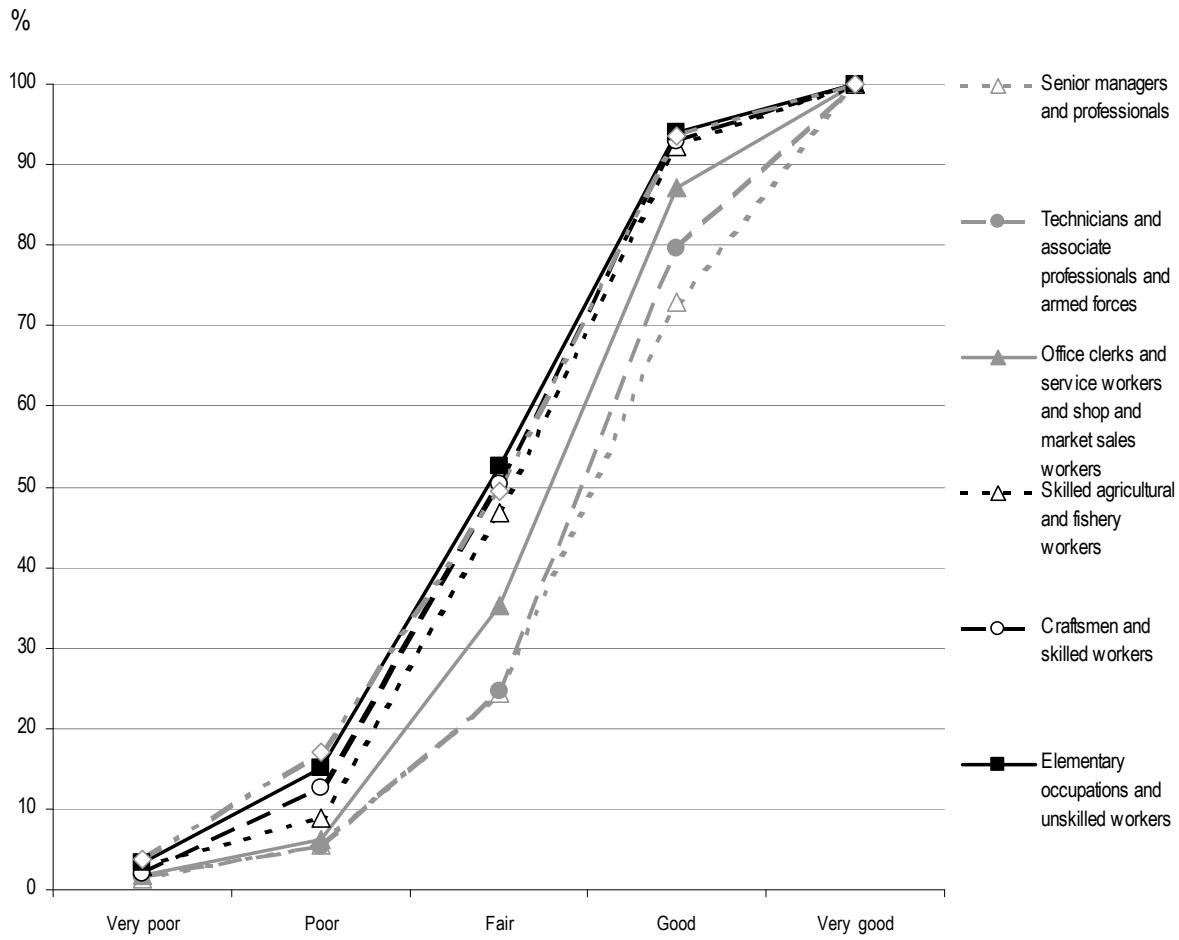


Figure 6: Cumulative distribution function of respondents' self-assessed health according to their own professional occupation



9. Tables

Table I: Homogeneity tests of distributions of self-assessed health of respondents aged 60-69 years old according to parents' health

	Father with a weak relative longevity	Father with a high relative longevity	Alive father
Father with a weak relative longevity		0,9991	**<0,0001**
Father with a high relative longevity	0,8234		**<0,0001**
Alive father	1	1	

	Mother with a weak relative longevity	Mother with a high relative longevity	Alive mother
Mother with a weak relative longevity		1	**<0,0001**
Mother with a high relative longevity	0,5739		**<0,0001**
Alive mother	1	1	

Table II: Homogeneity tests of distributions of respondents' self-assessed health according to social background

	Senior managers and professionals	Technicians and associate professionals and armed forces	Office clerks and service workers and shop and market sales workers	Skilled agricultural and fishery workers	Craftsmen and skilled workers	Elementary occupations and unskilled workers
Senior managers and professionals		0,8544	0,3389	**0,0001**	**0,0002**	**0,0013**
Technicians and associate professionals and armed forces	0,9888		0,6676	**0,0012**	**0,0014**	**0,0029**
Office clerks and service workers and shop and market sales workers	1	1		**0,056**	**0,073**	**0,0459**
Skilled agricultural and fishery workers	1	1	1		1	0,7986
Craftsmen and skilled workers	1	1	1	0,8292		0,6544
Elementary occupations and unskilled workers	1	1	1	0,9053	0,9475	

Mothers' occupation	Senior managers, professionals, technicians and associate professionals	Office clerks and service workers and shop and market sales workers	Skilled agricultural and fishery workers	Craftsmen and skilled workers	Elementary occupations and unskilled workers	Homemakers
Senior managers, professionals, technicians and associate professionals		1	**0,0049**	0,1117	**<0,0001**	**0,0017**
Office clerks and service workers and shop and market sales workers	0,7545		**0,0002**	**0,0185**	**<0,0001**	**<0,0001**
Skilled agricultural and fishery workers	1	1		1	0,3424	1
Craftsmen and skilled workers	0,9266	0,9983	0,5696		0,1166	0,7592
Elementary occupations and unskilled workers	1	1	0,9953	1		1
Homemakers	1	1	0,1453	0,9379	0,1248	

Table III: Homogeneity tests of distributions of respondents' self-assessed health according their own professional occupation

Descendants' occupation	Senior managers and professionals	Technicians and associate professionals and armed forces	Office clerks and service workers and shop and market sales workers	Skilled agricultural and fishery workers	Craftsmen and skilled workers	Elementary occupations and unskilled workers	Homemakers
Senior managers and professionals		0,1053	**<0,0001**	**<0,0001**	**<0,0001**	**<0,0001**	**<0,0001**
Technicians and associate professionals and armed forces	0,9993		**0,0017**	**<0,0001**	**<0,0001**	**<0,0001**	**<0,0001**
Office clerks and service workers and shop and market sales workers	1	1		**0,032**	**<,0001**	**<0,0001**	**0,0068**
Skilled agricultural and fishery workers	1	1	1		0,7203	0,4712	0,344
Craftsmen and skilled workers	1	1	1	0,9724		0,8221	0,6259
Elementary occupations and unskilled workers	1	1	1	1	1		0,92
Homemakers	1	1	1	1	0,9787	0,8096	

Table IV: Odds ratio associated to the determinants of the probability to report a good health status when parents' health is measured with a binary variable for alive parents and the continuous relative longevity for deceased parents

Explanatory variables	Freq.	Model 1	Model 2	Model 3
Gender				
Woman	1475	1,042	1,126	1,129
Man	1191	ref	ref	ref
Age				
49-54	586	4,901***	3,917***	4,27***
55-59	515	5,498***	4,415***	4,731***
60-64	364	3,937***	3,411***	3,613***
65-69	339	3,01***	2,642***	2,767***
70-74	325	2,277***	2,173***	2,303***
75-79	259	1,448**	1,427**	1,467**
>=80	278	ref	ref	ref
Fathers' occupation				
Senior managers and professionals	406	1,834***	1,27	1,179
Technicians and associate professionals and armed forces	275	1,779***	1,22	1,122
Office clerks and service workers and shop and market sales workers	197	1,476**	1,165	1,136
Skilled agricultural and fishery workers	625	1,173	1,205	1,194
Craftsmen and skilled workers	970	1,061	0,987	0,985
Elementary occupations and unskilled workers	193	ref	ref	ref
Mothers' occupation				
Senior managers. professionals and technicians	271	1,113	0,942	0,904
Office clerks and service workers and shop and market sales workers	282	1,376**	1,287*	1,219
Skilled agricultural and fishery workers	372	0,937	0,994	1,013
Craft and related trades workers	223	1,139	1,086	1,098
Elementary occupations and unskilled workers	255	0,784*	0,793*	0,796*
Homemakers	1263	ref	ref	ref
Fathers' longevity				
relative longevity of deceased father	350	1,007***	1,005*	1,004
alive father	2316	1,402***	1,37**	1,349**
Mothers' longevity				
Relative longevity of deceased mother	1862	1,008**	1,005*	1,005*
Alive mother	794	1,164	1,076	1,063
Education level				
No diploma	494	ref	ref	ref
Elementary level diploma	694		1,589***	1,468***
Secondary level diplomas	823		1,989***	1,608***
Baccalauréat (A-levels)	655		4,171***	2,742***
Descendants' occupation				
Senior managers and professionals	468			2,32***
Technicians and associate professionals and armed forces	552			2,127***
Office clerks and service workers and shop and market sales workers	588			1,642***
Skilled agricultural and fishery workers	167			1,473**
Craftsmen and skilled workers	467			1,129
Elementary occupations and unskilled workers	266	ref	ref	ref
Homemakers	158			1,206
Model quality				
Score Test for the Proportional Odds Assumption (P-value)		0.109	0.091	0.164
AIC (intercept only 6670.075)		6362.16	6246.43	6216.12
Adjusted R2		0.134	0.177	0.191
Percent Concordant pairs		66.2	68.7	69.7
N		2666	2666	2666

Table V: Results of the estimation of the three equations model with incorporated residual terms

	Probability to have a higher educational level (binary variable)	Probability to have a higher social status (binary variable)	Probability to have a good health status (ordinal variable)
	Binary probit	Binary probit	Ordered
Explanatory variables	**Coefficient**	**Coefficient**	**O.R.**
Gender			
Woman	-0,116***	-0,2832***	1,037
Man	ref	ref	ref
Age			
49-54	0,703***	-0,026	5,064***
55-59	0,734***	-0,026	5,710***
60-64	0,524***	0,079	4,079***
65-69	0,407***	0,0136	3,079***
70-74	-0,003	-0,1978	2,303***
75-79	0,031	-0,2369*	1,443**
>=80	ref	ref	ref
Fathers' occupation			
Senior managers and professionals	1,09***	1,0295***	1,900***
Technicians and associate professionals and armed forces	1,039***	0,9958***	1,825***
Office clerks and service workers and shop and market	0,545***	0,5386***	1,513**
Skilled agricultural and fishery workers	-0,094	-0,1551	1,173
Craftsmen and skilled workers	0,079	0,1099	1,060
Elementary occupations and unskilled workers	ref	ref	ref
Mothers' occupation			
Senior managers. professionals and technicians	0,291***	0,4342***	1,110
Office clerks and service workers and shop and market	0,036	0,2474***	1,393**
Skilled agricultural and fishery workers	-0,463***	-0,2503**	0,941
Craft and related trades workers	-0,15	-0,0193	1,136
Elementary occupations and unskilled workers	-0,289**	-0,0462	0,777*
Homemakers	ref	ref	ref
Fathers' longevity			
Alive father	0,064	0,2149**	1,411***
Relative longevity of deceased father	0,007***	0,0019	1,007***
Mothers' longevity			
Alive mother	0,204***	0,2218***	1,169
Relative longevity of deceased mother	0,007***	0,00481**	1,008***
Residuals			
Education equation		0,846***	1,685***
Occupation equation			1,376***
Model quality			
AIC (intercept only)	2974,84	3549,49	6670,08
AIC (intercept and covariates)	2404,55	2621,53	6248,24
Adjusted R2	0,305	0,415	0,175
Percent Concordant pairs	80,3	82,6	68,7
Score Test for the Proportional Odds Assumption (P-value)			0,17
N	2666	2666	2666

Table VI: Results of the counterfactual analysis

Variables used for predicting the probability of having better health (ordered polytomous logit)	Mean probability of good or very good health	Gini Index	% of variation
Current characteristics	0,633	0,155	
With the best circumstances	0,825	0,066	-57,275
With the best fathers' characteristics	0,760	0,095	-38,818
With the best mothers' characteristics	0,717	0,114	-26,707
With the best parents' occupation	0,767	0,092	-41,045
With alive parents	0,709	0,119	-23,676