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# HEALTH, INCOME AND INEQUALITY: EVIDENCE FROM A SURVEY OF OLDER ITALIANS

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# Health, Income and Inequality:

# Evidence from a Survey of Older Italians

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## 1. Introduction

This paper uses the Survey of Health, Ageing and Wealth (SHAW) to study the relationship between health status and economic welfare at individual level. SHAW is a newly developed (cross sectional) Survey collecting data on the Italian elderly population (people aged 50+). The novelty of this survey is that, along with the traditional socio-economic variables, a number of variables providing information on the health status of individuals are also collected.

We investigate the relationship between health and income at different levels. First we can describe the link between individual health and individual income, given a number of covariates. We cannot document paths to poverty and bad health and we cannot investigate the direction of causality between health and income (see the debate in Smith, 1999), because we do not have enough information to carry out this task, essentially we lack rich panel data. Hence we focus the attention on the distribution of income and distribution of health status in the sample. Differently from Deaton (2001) in our approach we are interested in welfare inequality, where health determines welfare overall but also economic welfare.
A large part of the paper will be devoted to measurement issues and methodological issues. E.g. it will be crucial to define and document "health performance" and "health inequality". Note that normally the link between economic performance and health performance makes use of actual deaths of individuals, while we will have to build a battery of "good health" and "poor health" indicators. But also for income inequality measures we will carefully investigate advantages and disadvantages of different indexes and of different definitions of income.

In particular, we investigate the relationship between a measure of "health performance" and a measure of economic performance or "welfare" of individuals. The latter is measured by making use of income, and in particular we intend to look at income inequality as a potential explanation for differences in health status of individuals. However, as pointed out by Deaton (2001), the attention should be devoted to income as a sufficient statistic for general living conditions, environment and stress. Where possible we will spell out what are the determinants of living conditions, which have an effect on health and are proxied by income.

## 2. The data: The Survey of Health, Ageing and Wealth

This paper makes use of a sample of older Italians: the Survey of Health, Ageing and Wealth (SHAW). SHAW is a small but interesting sample: it contains 2627 full individual interviews for 1068 households, on several aspects of health and socioeconomic conditions. Respondents are randomly selected from the Italian population of age 50 or over (the spouse of the main respondent and other members of the household may be younger than 50). The Survey is the result of a joint effort of researchers working on the area of the economics of ageing, who have recognized the importance of a multidisciplinary approach to investigate economic behaviour of the elderly. In particular, the Survey, which gets the inspiration from the American HRS (Health and Retirement Survey) and from the English ELSA (English Longitudinal Study on Ageing) aims at providing information on aspects of socio-economic decisions of the elderly which cannot be studied in isolation, such as health and labour supply, health and saving decisions etc..[1] In this paper we are mainly interested in a detailed analysis of the health-measures and the resource-measures, we want to document how health may affect economic conditions of the family and, in turn, economic decisions. However SHAW can be easily exploited to investigate other aspects of ageing[2]. Table 1 presents some basic characteristics of the individuals who are part of the survey: while one of the respondents (usually the head of the household) provides all the required information about the household (say wealth) and about himself/herself, the other members only provide some of the information regarding themselves.

### 2.1 Health Measures

As for the health measure, SHAW has no information on objective health measures (climbing stairs, walking etc..), which are available, for example in specific health surveys such as ILSA (Italian Longitudinal Study on Aging, but this lacks economic information) or in well established American studies such as the HRS. However, SHAW allows us to investigate self-reported health conditions along with some direct and indirect evidence of illness and chronic illness. These illness measures are not comparable to the conventional indicators of activity of daily living ADLs (eating etc..) and IADLs indicators, but, as we will later argue, they provide convincing statistical evidence in describing the "health-performance" of the

[1] The SHAW sample has been carried out by DOXA and the original questionnaire has been designed by researchers at the University of Padua, University of Rome "Tor Vergata", University of Salerno, University of Sassari and University of Venice. Funding has been provided by the Italian Ministry of Scientific Research and by the EU through the TMR-network on "Saving and Pensions".
[2] See Fort (2002) for a description of SHAW and other papers in this conference for different applications based on SHAW.

individual. In Tables 2a and 2b we describe the self-reported health status of each individual along with some covariates, which should measure objective health conditions[3]. While Table 2a looks at the entire sample Table 2b is based on the sub-sample of households which has exactly two persons: this is because in the application we will focus the attention on this group of individuals. The self-reported health measure ranges from very good to very poor and it is originally coded with 1 corresponding to very good and 5 to very poor. We rescale these values so that the value of 0 corresponds to very poor and 1 to very good (taking values 0, 0.25, 0.5, 0.75 and 1). Hence the negative correlations observed in Table 2a and Table 2b seem reasonable.

### *2.2 Economic Welfare Measures*

Since we want to study the relationship between health and welfare, both directly and indirectly (i.e. ill-health has an economic cost), we want to use a simple indicator of economic conditions on which to develop our analysis. On the basis of this simple but robust indicator (which we take to be income), we can elaborate on the economic cost of health.
As for observed income a preliminary analysis shows that only 2113 individuals (862 household) report some individual income. Because in what follows we will focus on couples we look at both family income (separately recorded in the survey) and also individual's incomes. For two-persons households we will later construct the income of the household as the sum of individual's income. Tables 3a and 3b show average income by age and by self reported health status. There exists a mild evidence of a health-income gradient, but we will develop this issue later in the application.

[3] We also use as a covariate the subjective survival probability, but this is available only for a sub-sample of individuals.

## 3. Health Equivalence Scales (HES)

In this section we develop a model to estimate the welfare cost of ill-health. The terminology and the intuition go along the lines developed by the equivalence scale literature: while in that case the focus is on the welfare cost brought about by the presence of children, we intend to measure the welfare cost of poor health. This requires some preliminary steps: first we have to clarify how health enters the utility function (actually the welfare function) of the household, then we can proceed to an actual measure of health which can be assigned to each family, finally we can show how household welfare indicators can be derived leading to an 'equivalent income' measure.

### 3.1 How health affects household's welfare

We operate on a cross section of households, hence we will assume a static one-period decision model.[4] We intend to measure household welfare as deriving from both the utility of health and the utility of consumption. While there exist many examples of health entering the utility function of individuals, to the best of our knowledge only a scanty literature on the welfare costs of poor health conditions has been developed. The novelty of this paper is to assume that health affects welfare both directly and indirectly: as for the former route we propose a simple and convenient measure of health which enters the utility function, while for the latter we develop health-based cost functions. As a result we obtain a health-deflated level of household income which accounts for health conditions.

Suppose that each household $h$ is characterised by a utility function defined over two indicators (both are goods): a *household health level* ($\Gamma_h$) and a *household economic welfare index* ($y_h^E$), where $y_h^E$ will be specified as "equivalent income" in what follows. Then the household welfare is:

$$U_h = U\left(\Gamma_h, y_h^E\right) \tag{1}$$

However, the household level (index) of health depends on the health status of each family member, ($H_{hc}$), which may, in turn, be affected by individual characteristics as well as household characteristics ($a_h$), by the actual level of income ($y_h$), by the consumption bundle (which may impact on health), and also by medical expenses[5].

[4] See Grossman (1972), Wagstaff (1986), Williams (1997), Levaggi-Capri (1999).
[5] Here we refer broadly to medical expenses. These will be specified later in the text.

Household economic welfare could depend on household demographics ($a_h$), on household income ($y_h$), on commodity prices and on health status.

In this paper we restrict the interactions between health conditions and economic welfare by assuming that, in any one given year, health is given exogenously. Some authors would argue that the causality runs the other way (see Case, Lubotsky and Paxson), but, our assumption is not too restrictive in the short run, and in any case it would be hard to identify the causality relationship with the data at our disposal. Furthermore, we can focus on modelling the health effects on economic welfare and total welfare (inclusive of a health indicator).

We assume a standard specification of the utility function:

$$U_h = \rho \ln y_h^E + (1-\rho) \ln \Gamma_h \tag{2}$$

For a given level of the health status we define equivalent income directly from (2) :

$$\ln y_h^E = \frac{1}{\rho} U_h - \frac{1-\rho}{\rho} \ln \Gamma_h \tag{3}$$

This gives the economic welfare level necessary to household $h$ in order to reach a utility level $U_h$ , given the household health status $\Gamma_h$ , i.e. this purges total welfare of the direct effect of health and leaves a measure of the economic component alone. We refer to this as:

$$v_h = \ln y_h^E \tag{4}$$

### *3.2 Household Health Indicators*

Before turning to the actual derivation of the economic component of total utility we provide some intuition on how to measure the health indicator at household level, starting from the health indicators available for each household member. For the time being we describe simple aggregation rules which give different weight to 'health inequality' within the household. After the 'aggregation' rule has been chosen, one can compute the household health indicator $\Gamma_h$ and in turn obtain total welfare in the household. This point will be taken up later in Section 4, where we compute welfare inequality indexes.

However, we are also concerned with the indirect effect of health status going *via* the cost function based on economic outcomes, which will be picked up by the income welfare measure $y_h^E$ . Hence the discussion on actual health measures turns out to be useful also in providing a total household health performance to then obtain $y_h^E$ .

Let's first define the health indicator at the individual level as $H_{hc}$ , which refers to $C$ household members of household $h$ (with $c$=1, …, $C$).
These can be aggregated at the household level on the basis of a 'selfish-behaviour' assumption, i.e. we simply take the average of individuals' health:

$$\Gamma_h = \frac{1}{C}\sum_{c=1}^{C}\frac{H_{hc}}{H_{\max}} \tag{4}$$

where $H_{max}$. represents the maximum level of health (i.e. someone in excellent health conditions). For example, in our data we take a scale between zero (very poor health) and one (excellent health)[6]. It is clear that the 'selfish' attitude is due to orthogonality between the contribution of one's health on total health and the level of health of relatives in the household:

$$\frac{\partial\Gamma_h}{\partial H_{hc}} = \frac{1}{CH_{\max}} \tag{4a}$$

The geometric mean exhibits a more 'altruistic' attitude if compared with the arithmetic mean. The whole household is affected by a poor health condition of one member (if one household member is ill his own indicator goes to the minimum (say zero), which is fully captured by the aggregate indicator (following on the same example it would be also equal to zero):

$$\Gamma_h = \prod_{c=1}^{C}\left(\frac{H_{hc}}{H_{\max}}\right)^{1/C} \tag{5}$$

In this case

$$\frac{\partial\Gamma_h}{\partial H_{hc}} = \frac{1}{C}H_{hc}^{\frac{1}{C}-1}\prod_{j\neq c}^{C}\left(\frac{H_{hj}}{H_{\max}}\right)^{1/C} \tag{5a}$$

More interesting aggregate indicators may be designed by combining average values with some measure of the difference between health conditions of the different members. In particular one may negatively emphasise the distances from the household mean $\overline{H}$ , for example[7]:

$$\Gamma_h = \overline{H} - \frac{1}{C}\sum_{c=1}^{C}\left[H_{hc} - \overline{H}\right]^{\varepsilon} \tag{6}$$

with $\varepsilon$ >1 measuring the degree of "altruism" (if $\varepsilon$ =1 we are back to the selfish case).

[6] In some cases, in the regression, we rescale to take values between 0 and 1000.

[7] For a similar specification of the social welfare function see Jorgenson-Slesnick (1986).

### *3.3 A health-deflated measure of economic welfare*

In order to describe economic welfare of the household we will refer to the idea of *equivalent household income,* which is obtained by rescaling the actual monetary measure of income ($y_h$) by a scale which accounts for household characteristics $s(a_h)$ and by a scale of the health of each household member $s(H_h)$, so that:

$$v_h = \ln y_h^E = \ln y_h - \ln s(a_h) - \ln s(H_h) = \ln\left(\frac{y_h}{s(a_h)s(H_{h)}}\right) \tag{7}$$

Note that the two scales are assumed to be separable and therefore we simply take the product of the two.

Suppose that the expenditure function $y_h = c(v_h, p, a_h, H_h)$ is defined by a demand system AIDS[8],i.e.:

$$\ln\left(\frac{y_h}{s(a_h)s(H_{h)}}\right) = \ln\left(\frac{c(v_h, p, a_h, H_h)}{s(a_h)s(H_{h)}}\right) = A(p, a_h, H_h) + v_h B(p) \tag{8}$$

where $p = [p_i, i=1,\ldots,N]$ is the vector of commodities which have been purchased and:

$$\begin{aligned} A(p, a_h, H_h) = \alpha_0 &+ \sum_{k=1}^{N} \alpha_k \ln p_k + \frac{1}{2}\sum_{k=1}^{N}\sum_{j=1}^{N} \gamma_{kj}^{*} \ln p_k \ln p_j \\ &+ \sum_{k=1}^{N}\sum_{m=1}^{M} \lambda_{km} \ln p_k a_{mh} + \sum_{k=1}^{N}\sum_{l=1}^{L} \eta_{kl} \ln p_k H_{lh} \end{aligned} \tag{9}$$

$$B(p) = \beta_0 \prod_{k=1}^{N} p_k^{\beta_k} \tag{10}$$

Note that the scale terms only enter the function A.

We define the equivalence scales as :

$$\ln s(a_h) = \sum_{m=1}^{M} \lambda_m a_{mh} \tag{11}$$

[8] Deaton-Muellbauer (1980a, 1980b).

where $a_h = [a_{mh}, m=1,\ldots,M]$ is the vector of household characteristics $a_{mh}$ for the household $h$ (e.g..: gender of the head of the household, age of the head of the household, geographical location, etc..), and:

$$\ln s(H_h) = \sum_{l=1}^{L} \lambda_l H_{lh} \tag{12}$$

where $H_h = [H_{lh}, l=1,\ldots,L]$ is the vector of health outcomes $H_{lh}$ for household $h$.
By taking the derivative of equation (9) with respect to $\ln p_i$ we obtain the budget share for the *i-th* commodity:

$$w_{ih} = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i [\ln y_h / P_h)] + \sum_{m=1}^{M} (\lambda_{mi} - \beta_i \lambda_m) a_{mh} + \sum_{l=1}^{L} (\lambda_{li} - \beta_i \lambda_l) H_{lh} \tag{13}$$

where $P_h=A(p,a_h,H_h)$ is again an aggregate price index of relative prices for household $h$.
In the econometric exercise we can substitute

$$\theta_{mi} = \lambda_{mi} - \beta_i \lambda_m \tag{14}$$

$$\pi_{il} = \lambda_{li} - \beta_i \lambda_l \tag{15}$$

Therefore the estimation of the budget shares as described in (13) does not directly deliver specific scales for each demographic characteristic or health outcome. However, if the terms $\lambda_{mh}$ and $\lambda_{lh}$ are regarded as zero-sum deviations from the general equivalence scale, then the latter can be retrieved once we know the estimates for the parameters $\theta_{mi}$, $\pi_{li}$ and $\beta_i$. This can be achieved *ex post* by looking at (14) and (15) as regressions where $\lambda_{mi}$ and $\lambda_{li}$ are zero-mean residuals and $\lambda_m$ and $\lambda_l$ are the intercepts of the general equivalence scale. Hence, for each characteristic or for each health outcome we can derive from[9]:

$$\hat{\lambda}_m = -\left( \sum_{i=1}^{N} \hat{\beta}_i \hat{\theta}_{mi} \right) \Big/ \left( \sum_{i=1}^{N} \hat{\beta}_i^2 \right) \tag{16}$$

$$\hat{\lambda}_l = -\left( \sum_{i=1}^{N} \hat{\beta}_i \hat{\pi}_{li} \right) \Big/ \left( \sum_{i=1}^{N} \hat{\beta}_i^2 \right) \tag{17}$$

If we apply the conventional normalization carried out in cross sectional data, such that $p_i$=1 and $\ln p_i$=0, the the budget shares of interest are:

$$w_{ih} = \alpha_i + \beta_i [\ln y_h - \ln s(a_h) - \ln s(H_h)] \tag{18}$$

[9] Patrizii and Rossi (1991) have also followed this route. Note however that the "regressions" (16) and (17) cannot be implemented through an OLS procedure as residuals are non independent. We take this up in Section 3.3. below.

(19) $$w_{ih} = \alpha_i + \beta_i \ln y_h + \sum_{m=1}^{M} \theta_{mi} a_{mh} + \sum_{l=1}^{L} \pi_{li} H_{lh}$$

We can show that by construction the general scales $s(a_h)$ behaves as an *equivalence scale* with respect to characteristics $a_h$, for a given health status, because:

(20) $$\frac{c(v_h, p, a_h, H_h)}{c(v_h, p, a_R, H_h)} = \frac{\exp(v_h)s(a_h)s(H_h)}{\exp(v_h)s(a_R)s(H_h)} = s(a_h)$$

where we normalize so that the scale takes value one for the reference household $s(a_R) = 1$.

Most interesting for our exercise, given $a_h$, $s(H_h)$ behaves as an *equivalence scale* based on health conditions, because:

(21) $$\frac{c(v_h, p, a_h, H_h)}{c(v_h, p, a_h, H_R)} = \frac{\exp(v_h)s(a_h)s(H_h)}{\exp(v_h)s(a_h)s(H_R)} = s(H_h)$$

where we normalize so that $s(H_R) = 1$ for the reference health level. Indeed $H_R$, could also be regarded as the maximum value that the health indicator can take, which is $s(H_{max})=1$.

The combined equivalence scale for a generic household *h* depends on both scales as follows:

(22) $$\frac{c(v_h, p, a_h, H_h)}{c(v_h, p, a_R, H_R)} = \frac{\exp(v_h)s(a_h)s(H_h)}{\exp(v_h)s(a_R)s(H_R)} = s(a_h)s(H_h) = S(a_h, H_h)$$

### *3.3 An empirical set up for health-based equivalence scales (HES)*

The definition of budget shares provided in equation (13) can be used to estimate equivalence scales in our data by making use of the health indicators contained in SHAW.

Suppose for example that we observe a two-persons household, that we observe for this household medical expenses as well as food purchases. Given the level of income we can assume that there exists a third composite good (unfortunately this includes also saving). Within each household we can distinguish health indicators of both members of the household as well as individual medical expenses, while we have to impute to each member of the household half of the expenditure on food purchases. Then budget shares are as follows.

The budget share of individual *i* of family *h,* where *j* indicates the other member of the household (typically the spouse) is defined over characteristics of the household (or of the head of the household or of both members of the household).

For the time being we have restricted ourselves to households with one or two-persons, but the notation carries through for any number of household members. In fact, we believe that it is important to properly take account of family composition as this may affect resources

(family income) on the one hand and consumption behaviour on the other, hence providing the variability required to properly identify the parameters of interest.

## 4. Results in the SHAW data

### 4.1 Estimates of Health Indicators and of the Health Equivalence Scales.

In applying the empirical implications derived in Section 3 above on the SHAW data, the first task is to obtain a reliable health indicator fo individual $i$ in household $h$:: $\boldsymbol{H_{hi}}$ . We have available the self reported health status for each individual, however this might be affected by individual's perception and have little relation with the actual health status of individuals.
In order to investigate these issues, we make use of a order probit analysis, while this is interesting per se it is not an input in the actual estimates of the demand system.
We take the variable $\boldsymbol{H}$ , which we have rescaled to take (discrete) ordered values between 0 and 1, with the value 1 corresponding to 'very good', as the dependent variable in a relationship where the right hand side contains only 'objective' information relevant to health (e.g. age and whether taking any medication etc..). This way we somehow purge $H$ of the individual perception which may be related to individual's attitudes (some individuals are incurable optimists) more than to actual health conditions. It may be argued that what matters is the subjective index $H$, rather than the fitted value of $H$, but we are going to relate the health performance to actual expenditures, hence actual health conditions seem to matter.

Table 5 shows the results of the Order Probit, this is carried out for a specific sub-sample of individuals belonging to two-persons households where there exists positive expenditures. Signs are as expected and some variables (e.g. if regularly assuming medications) are particularly important in determining subjective health status. Note that we have adopted a very parsimonious representation, but we have used age as an explanatory variable, in order to limit ourselves to the link between objective and subjective measures.
The results of the Order Probit, consisting of projected probabilities for each outcome of the dependent variable, could be transformed into an index. Hence we take the expected value of H by making use of the projected probabilities. Results are presented in Figure 1: only at very old age there exists some important divergence between the actual H measure and the expected health status from the Order Probit. Note that, as we said in Section 2 above, in the actual application we make use of the actual health indicators as recorded in the survey and we take simple averages within the household.

As for the commodities, we make use of two budget shares for food and for medical expenditures. While the latter is available for each individual, the former is imputed in equal shares to the two household members. A third composite commodity is left as residual budget share, but this would include also saving, which makes the results and their interpretation somewhat problematic. Therefore budget shares are defined by dividing medical expenses and half of the food expenses by the total income of the household (whether one or two members). Medical expenditures are obtained as the sum of different items (see Table 6).For the time being we take these expenditures as they are recorded in the survey, however we have some information on whether these expenditures have been partially or totally covered by private insurance or by transfers of family and friends (only a small fraction of the sample gives a positive answer on this). Hence, we will carry out a more thorough analysis of this issue.

Tables 6.1 and 6.2 show the results of estimates of the budget shares. The reference categories are for the health category *Hmax* (Health level 5, between 0.8 and 1); a household with members, with one man and one women, all members have secondary education and all members in dependent employment. We also make use of regional dummies (not shown in detail) and the reference category is for a household to be resident in Lombardia. We have available the implied estimates of the residual third equation which we do not report for brevity.

Log-income has a significant negative effect in both shares, which suggest that both commodities are necessities, however this result may also be due to the effective lack of a well specified third commodity. In fact the residual budget share contains saving as well as other expenditures. The health index has significant positive effects, particularly, as one might expect, for medical expenses. Those who report poor health conditions tend to spend more on health related commodities, while no clear pattern can be envisaged for food expenses. While the other variables have a minor role in the medical expenses equation, for the food equation we see that being single has a negative effect on food purchases, and having health insurance or other support has a significant positive effect on food expenses. Finally regional dummies exhibit a rather complex pattern which may reflect both variation in tastes and supply conditions. One word of warning should be spent on the fact that we are not capturing publicly provided medical goods and services, which are obviously relevant in Italy given the size of the National Health Service. Therefore the interpretation of the medical expenses budget share and its equation should be carried out with some care.

The commodity-specific equivalence scales can be derived *ex post* by following the procedure described in equations 14 and 15 above. Once the estimated parameters from the

budget shares equations are known, a GLS procedure allows us to retrieve the constrained parameters for each value of the variable of interest. For simplicity we only report equivalence scales for values of the health conditions and for one demographic characteristic (age) in Table 7 below. It should be stressed once again that these are not the average of the individual's value for that particular value of the relevant variable (e.g. at age 65) but are derived as characteristic-specific scales.

**Table 7. Characteristic-Specific Equivalence Scales**

| Household Health | Equivalence Scale | | Household Age | Equivalence Scale |
|---|---|---|---|---|
| Very Poor | 1.388 | | Age 95 | 0.865 |
| Poor | 1.290 | | Age 85 | 0.896 |
| Fair | 1.245 | | Age 75 | 0.932 |
| Good | 1.153 | | Age 65 | 0.975 |
| Very Good | 1.000 | | Age 60 | 1.000 |

Table 7 shows that, other things being equal, the scale is highest (the household is "poorest") for the worse health conditions and is decreasing almost linearly as health conditions get closer to their maximum value "very good". This is a very intuitive result which we find confirmed in the data, the implications will become clearer in Section 4.2 below. Interestingly enough older households are "less needy" than younger ones, other things being equal.

## *4.2 Health inequality and the effect of health on economic welfare: beyond the health-income gradient.*

Once we have available health-based equivalence scales these will allow us to study several aspects of the effects of health status which are usually neglected in studying economic welfare. As we argued in the introduction, much of the attention in the literature has focused on the correlation between health and resources (income or wealth), i.e. the health income gradient. However one problem is to analyse different aspects of economic welfare (say income inequality) while controlling for health conditions. A simple extension of our analysis is to construct equivalent incomes which are based on a coherent measure of the costs of ill-health.

The *standard household equivalent income* can be obtained by making use of the scale based on household demographics :

$$y_h^C = \frac{y_h}{s(a_h)}$$

This represents the income that household *h* would need to be as well off as at its given welfare level, if that household had the characteristics of the reference household.

The *health-based equivalent income( at the household level)* is derived in a similar fashion:

(23) $$y_h^H = \frac{y_h}{s(H_h)}$$

This represents the income that household *h* would need to reach its own welfare level (given its own demographic characteristics $a_h$), if that household had the health status of the reference household (i.e. the maximum health status).

If the household does not enjoy excellent health, then the equivalence scale is larger than 1 and equivalent income is below actual money income: it is as if that household was effectively made poorer by a lower health status.

The combined equivalent income, defined by equation (3) is obtained as:

(24) $$y_h^E = \frac{y_h}{s(a_h)s(H_h)}$$

This is the income that household *h* would need to be as well off as in its current situation evaluated at the demographics of the reference household and at the 'excellent health' status.

In all these cases equivalent income is a measure of household welfare (a positive monotonic transformation of utility).

A simple comparison of actual income and equivalent income provides some preliminary evidence of the welfare cost of health. The distribution of this over different characteristics (say age) also gives indications of the incidence of these costs in different groups of the population. Furthermore, for each definition of equivalent income, we will compute a standard summary statistic of the income distribution, such as the Atkinson index. If inequality increases when income is deflated by the health equivalence scale, then on average poorer households are more affected by health conditions (they tend to have poor health). In other words an increase in inequality can be regarded as a social welfare loss due to poor health.

To construct an inequality index we start from a isoelastic welfare function:

(25) $$W = W\left(U_1,...,U_h,...,U_{N_h}\right) = \frac{1}{N_h}\sum_{h=1}^{N_h}\frac{U^{1-\varepsilon}}{1-\varepsilon}$$

where U stands for the individual utility level (which could also be "equalised" according to one of the scales described above). For simplicity we assume that at the individual level utility is of the simple logarithmic form.

(26) $$U_h = \ln y_h$$

These assumptions allow us to derive an *equally distributed equivalent income*: $Y_{EDE}$, which represents the equivalent income assigned to each household, equally across households, such that the resulting level of total welfare is the same as the of level of actual welfare (the latter results from the actual income distribution). The income $Y_{EDE}$ as positive monotonic transformation of the level of social welfare, hence it is the *money metric* representation of the actual level of welfare associated with the distribution of the equivalent household incomes. We indicate with $\overline{Y}$ the actual mean value of the income distribution, i.e. the level of income implied by the maximum welfare level which could be achieved given the current resources in the economy. The Atkinson's index of relative inequality is then:

(27) $$I = 1 - \frac{Y_{EDE}}{\overline{Y}}$$

We can compute the Atkinson's index for different cases of relevance to us: for example we could look at the distribution of equivalent incomes based on demographic equivalnce scales or on health equivalence scales or both. The following Table 7 describes the results.

**Table 8. Atkinson's Index for different income distributions**

| Income measure | **Average Welfare** | **Actual Welfare (EDE)** | **Inequality Index %** |
|---|---|---|---|
| Household Income | 106.57298 | 86.96330 | 18.40 |
| Household Equivalent Income | 137.28122 | 112.75861 | 17.86 |
| Household Equivalent Income for the same health level | 117.27177 | 94.63160 | 19.31 |

*Note: the inequality index in percentage terms if based on the assumption that $\varepsilon$ =1. Incomes and health indicators have been normalised by dividing each by the highest in their respective distribution and then by multiplying by 1000*

For simplicity we only report results where welfare is measured with a modest inequality aversion $\varepsilon$ *=1,* it emerges that income equivalence scales, which account for health conditions, produce a higher welfare loss, due to increased inequality. The loss increases from a 17.86% of mean income to 19.31% of mean income. Note that if we look at the distribution

of the health indicator (mean health indicator within the household) this is more equally distributed than incomes, the inequality index is 7.39%.

In fact, we can apply exactly the same argument to the distribution og household health conditions: in a similar fashion we obtain the actual welfare level, the maximum available welfare and the welfare loss due to ill-health. The actual welfare level is:

$$W_\Gamma = W\left(\Gamma_1,...,\Gamma_h,...,\Gamma_{N_h}\right) = \frac{1}{N_h}\sum_{h=1}^{N_h}\frac{\Gamma^{1-\varepsilon}}{1-\varepsilon} \tag{28}$$

The maximum achievable social welfare can be obtained if <u>*all*</u> households enjoy excellent health $\Gamma_{\max}$ :

$$W_\Gamma^{\max} = \frac{1}{N_h}\sum_{h=1}^{N_h}\frac{\Gamma_{\max}^{1-\varepsilon}}{1-\varepsilon} \tag{29}$$

Hence the welfare loss due to bad health is:

$$I_\Gamma = 1 - \frac{W_\Gamma}{W_\Gamma^{\max}} \tag{30}$$

By taking the inverse transformation of this function we can map the loss index onto the original health space and generate an equally distributed level of health $\Gamma_{EDE}$ such that

$$I_\Gamma = 1 - \frac{\Gamma_{EDE}}{\Gamma_{\max}} \tag{31}$$

is the relevant indicator of such loss.

**Table 9. Atkinson's Index for different health distributions**

| | Maximum welfare | Actual Welfare | Welfare Loss % |
|---|---|---|---|
| Welfare with respect to the average health | 6.38711 | 6.31029 | 1.20 |
| Welfare with respect to "excellent health" | 6.90776 | 6.31029 | 8.65 |
| Welfare EDE (with respect to mean) | 594.13580 | 550.20508 | 7.39 |
| Welfare EDE (with respect to max) | 1000. | 550.20508 | 45.00 |

### *4.3 Combined health effects on welfare*

Recall that in Section 2 we assumed that total utility is made up of two components: an indirect effect, via equivalent income, and a direct effect. It may be handy to present again equation (2) which we will refer to as "generalised utility"[10]

$$U_h = \rho \ln y_h^E + (1-\rho)\ln \Gamma_h$$

In the absence of specific priors $\rho$ has been assumed to take value 0.5. For the welfare function adopted throughout we have at hand three possible cases:

1) Actual social welfare, based on the actual values of household equivalent icnome (controlling for health) and based on actual health conditions:

$$W = W\left[U\left(\Gamma_1, y_{1,}^E\right),...,U\left(\Gamma_N, y_{N,}^E\right)\right] = W\left(\Gamma, y^E\right)$$

2) Social welfare with no inequality (each household is endowed with mean income)

$$\overline{W} = W\left[U\left(\Gamma_1, \bar{y}_{1,}\right),...,U\left(\Gamma_N, \bar{y}_{N,}\right)\right] = W\left(\Gamma, \bar{y}\right)$$

3) Social welfare with no inequality and perfect health (each household is endowed with mean income and excellent health):

$$\overline{W}_{\max} = W\left[U\left(\overline{\Gamma}, \bar{y}\right),...,U\left(\overline{\Gamma}, \bar{y}\right)\right] = W\left(\overline{\Gamma}, \bar{y}\right)$$

The latter, i.e. the Maximum Achievable Welfare, can be decomposed into two parts:

$$\overline{W}_{\max} = \overline{W}_{\max} - \left(\overline{W}_{\max} - \overline{W}\right) - \left(\overline{W} - W\right)$$

hence highlighting the welfare losses (the reduction in welfare) due to the existence of household which are not in perfect health and to income inequality, respectively. These losses can also be expressed in index form:

(32)
$$L_\Gamma = \left(\overline{W}_{\max} - \overline{W}\right)/\overline{W}_{\max} = 1 - \overline{W}/\overline{W}_{\max}$$

$$\boldsymbol{L_{ineq} = \left(\overline{W} - W\right)/\overline{W}_{\max}}$$

The advantage of these indexes (32) is that a direct mapping into the income space can be obtained through a *money metric* transformation by computing the EDE incomes associated with each welfare definition. The money value of the "poor health" distribution is given by the income level which is needed to a healthy household ($\Gamma_h = \overline{\Gamma} = 1000$) to reach the utility of a given household:

[10] Once again income and health have been normalised to take a max value of 1000.

$$\ln y_h^{\Gamma} = \frac{1}{\rho} U_h - \frac{1-\rho}{\rho} \ln \overline{\Gamma}$$

For example, if $\rho$=0.5, a household with income equal to 100 and health equal to 500 has the same utility as a household of a healthy household (health 1000) whose income is 50. The *money metric* in this case is indeed 50. To be more precise the actual income corresponds to $y_{EDE}$ such that:

$$W = W\left(\Gamma, y^E\right) = W\left(\overline{\Gamma}, y_{EDE}\right)$$

i.e.:

$$y_{EDE} = \exp\left\{\frac{1}{\rho} W - \frac{1-\rho}{\rho} \ln \overline{\Gamma}\right\}$$

In a similar fashion we can compute the EDE incomes resulting from a combined welfare measure where we refer take as reference the welfare distribution with no income inequality or the welfare distribution with perfect health.:

$$\bar{y}_{EDE} = \exp\left\{\frac{1}{\rho} \overline{W} - \frac{1-\rho}{\rho} \ln \overline{\Gamma}\right\}$$

$$\bar{y}_{EDE}^{\max} = \exp\left\{\frac{1}{\rho} \overline{W}_{\max} - \frac{1-\rho}{\rho} \ln \overline{\Gamma}\right\}$$

Once again a pair of indexes for the welfare loss would result:

$$L_{\Gamma} = 1 - \bar{y}_{EDE} / \bar{y}_{EDE}^{\max}$$

$$L_{ineq} = 1 - y_{EDE} / \bar{y}_{EDE}^{\max}$$

**Table 10. Social Welfare Indexes**

| | Social Welfare | Social Welfare in Money Metric |
|---|---|---|
| **Levels** | | |
| Max Welfare with no inequality and perfect health | 5.83612 | 117.27182 |
| Max Welfare with no inequality and actual health | 5.53739 | 64.52352 |
| Actual welfare | 5.43014 | 52.06679 |
| Welfare Loss due to "Imperfect Health Society" | 0.29873 | 52.74830 |
| Welfare Loss due to income inequality | 0.10725 | 12.45674 |
| **Percentages** | | |
| Max Welfare with no inequality and perfect health | 100,00% | 100,00% |
| Welfare Loss due to "Imperfect Health Society" | 5.11868 | 44.97952 |
| Welfare Loss due to income inequality | 1.83771 | 10.62211 |
| Actual Welfare | 93.04361 | 44.39838 |

*Note: The index in % is computed for $\varepsilon$ =1. Income and health are normalized to take value 1000 as max values.*

### *4.4 Sensitivity Analysis*

Two parameters may affect our results: one enters directly the social welfare function and it represents aversion to inequality by the State ( $\varepsilon$ ), the other is the parameter governing the relative importance of the direct health effects on utility vis-à-vis income measures ( $\rho$ ). In this section we provide some insight into the sensitivity of our results to assumptions regarding these parameters.

**Table 11. Money Metric Social Welfare Indexes for different values of $\rho$ (in %)**

| | **Welfare Loss from imperfect health society** | **Welfare Loss from inequality** | **Actual welfare** | **Max Welfare** |
|---|---|---|---|---|
| $\rho$ | | | | |
| 0 | 100.00 | 0.00 | 0.00 | 100.00 |
| 0.1 | 99.54 | 0.09 | 0.37 | 100.00 |
| 0.2 | 90.84 | 1.77 | 7.40 | 100.00 |
| 0.3 | 75.19 | 4.79 | 20.02 | 100.00 |
| 0.4 | 59.19 | 7.88 | 32.93 | 100.00 |
| 0.5 | 44.98 | 10.62 | 44.40 | 100.00 |
| 0.6 | 32.85 | 12.96 | 54.18 | 100.00 |
| 0.7 | 22.59 | 14.94 | 62.47 | 100.00 |
| 0.8 | 13.87 | 16.63 | 69.50 | 100.00 |
| 0.9 | 6.42 | 18.07 | 75.51 | 100.00 |
| 1 | 0.00 | 19.31 | 80.69 | 100.00 |

**Table 12. Money Metric Social Welfare Indexes for different values of $\varepsilon$ (in %)**

| $\varepsilon$ | **Welfare Loss from imperfect health society** | **Welfare Loss from inequality** | **Actual welfare** | **Max Welfare** |
|---|---|---|---|---|
| 1 | 44.98 | 10.62 | 44.40 | 100.00 |
| 1.5 | 21.87 | 18.17 | 59.96 | 100.00 |
| 2 | 10.87 | 25.29 | 63.83 | 100.00 |
| 3 | 3.14 | 36.15 | 60.71 | 100.00 |
| 5 | 0.67 | 48.74 | 50.59 | 100.00 |
| 10 | 0.17 | 64.20 | 35.63 | 100.00 |

Figure 2. **Money Metric Social Welfare Indexes for different values of $\rho$**

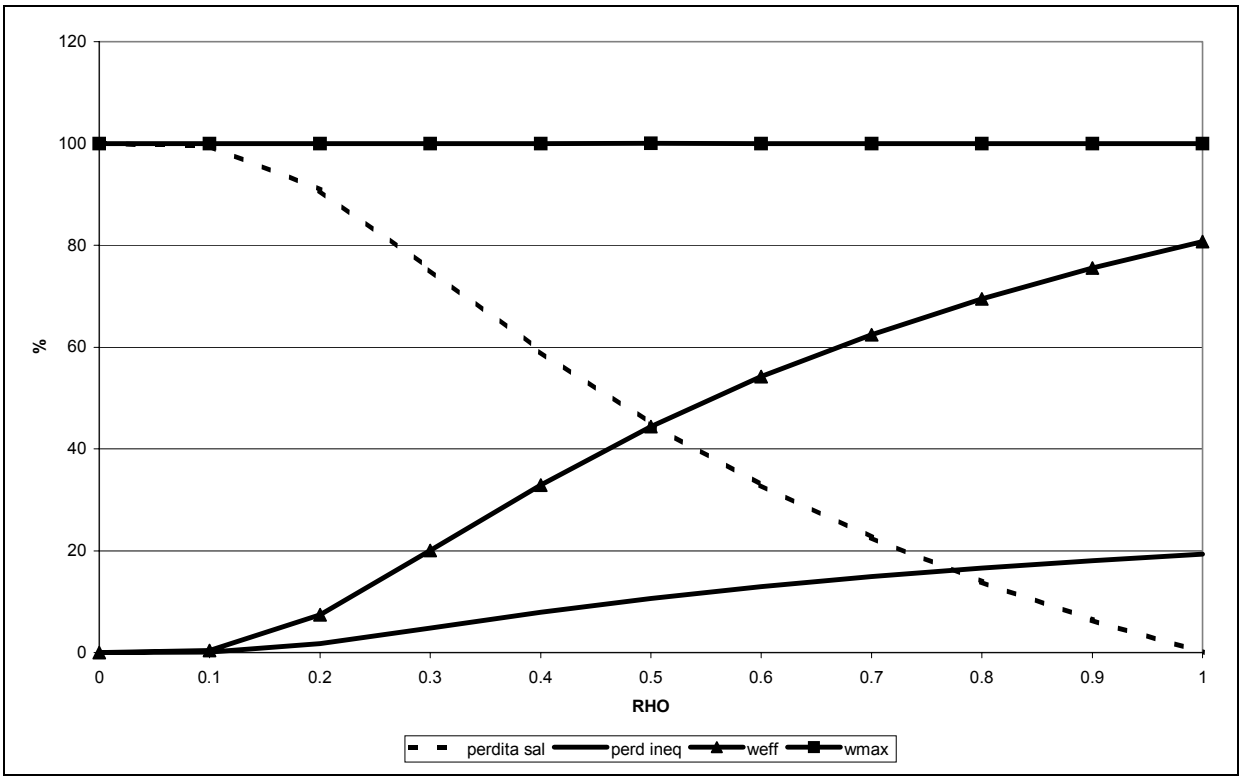
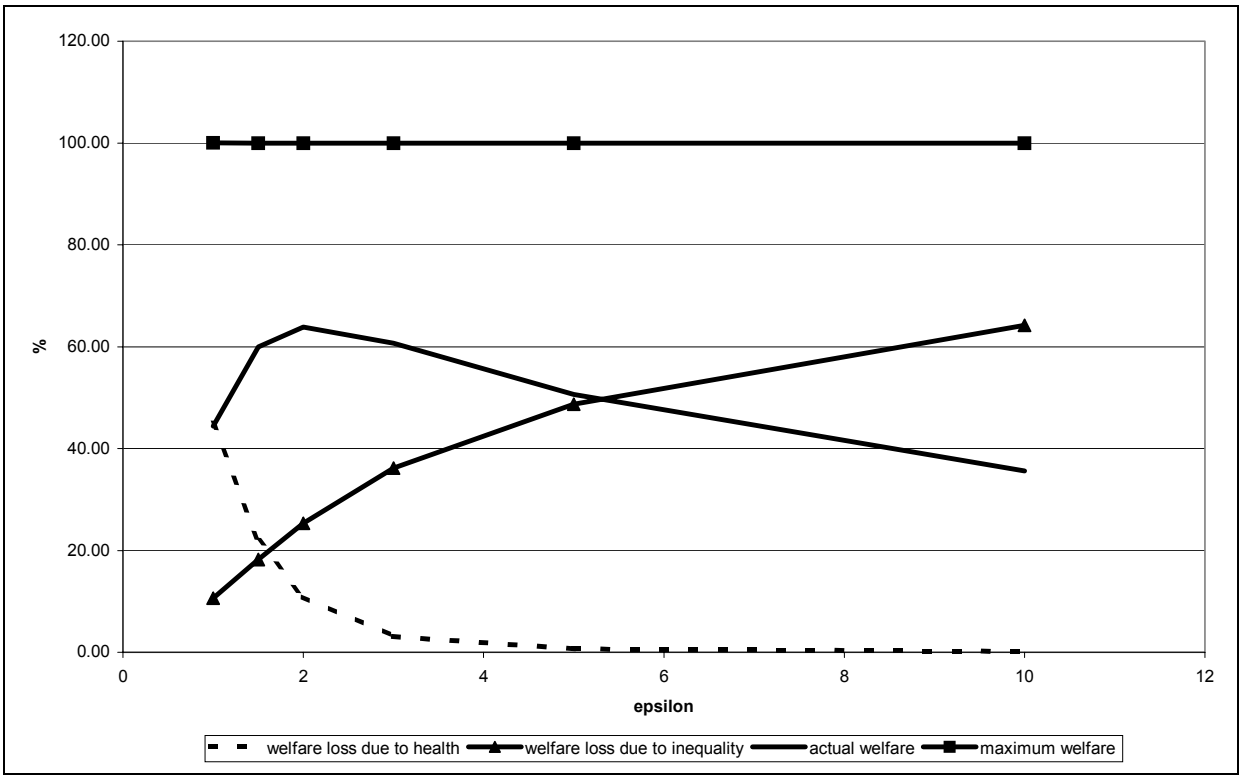



Figure 3.. **Money Metric Social Welfare Indexes for different values of $\varepsilon$**



The first set of results is very intuitive (also shown in Figure 2): as the relative importance of the direct-health component of utility decreases also the welfare loss associated to the difference between a society with perfect health and a society with imperfect health decreases. The impact of the inequality aversion parameter is less straightforward: there is a hump shaped pattern also in actual welfare. While the welfare loss due to inequality grows almost linearly as $\varepsilon$ increases, the welfare loss due to a society not in perfect health has a sudden drop before $\varepsilon$ reaches the value of 4 and it is then negligible. These pattern clearly needs further investigation.

## *5. Conclusions*

In this paper we provide a novel approach to measure the effects of health on the well being of households. This is based on the well known concept of "equivalent income", i.e. a measure of income defined by economists to account for different characteristics of the household (such as number of children) which may impact on households' purchasing power and therefore make a household "poorer" than a reference household.

We assume that health conditions affect welfare directly and indirectly: directly because health enters the utility function, and indirectly because people with different health conditions have different spending patterns. We implicitly assume that "health causes economic outcomes" and we do not investigate empirically the validity of this causality relationship. Our approach allows us to actually measure the welfare implications of the distribution of self-reported health conditions for a sample of older Italian households in terms of welfare losses.

Our exercise makes use of equivalence scales estimated for two commodities which we believe to be relevant for the age group under investigation: medical expenses and food purchases. In the basis of these scales we can measure equivalent incomes (the income the household would need to enjoy the same utility that it actually does enjoy if it were in "good health") and map welfare levels in money metric terms. We find that inequalities in health induce a substantial welfare loss reflected in inequality in equivalent incomes. This welfare loss is higher that simple welfare loss due to inequality of health levels in the sample. The implication is that health differences impact on consumption pattern making some households effectively poorer.

The combined effect of income inequality (controlling for health) and direct health effects on welfare is particularly interesting. With respect to a society where there exists no inequality in equivalent incomes and every household is in perfect health, deviations due to income inequality weigh more, however imperfect health has a non-negligible impact.

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**Table 1. Demographic characteristics of the SHAW sample**

| | **All Individuals in the Entire sample** | **Both individuals in two-persons households** |
|---|---|---|
| Age | 50.71 | 62.72 |
| Male | 47% | 46% |
| Married | 54.47% | 79.48% |
| Single | 32.24% | 9.91% |
| Divorced | 3.15% | 3.12% |
| Widow/widower | 10.12% | 7.47% |
| Less than primary school | 7.76 | 13.17% |
| Primary school | 29.61 | 41.98% |
| Lower secondary school | 27.71 | 24.59% |
| Upper secondary school | 27.71 | 14.94% |
| College | 7.19 | 5.29% |
| Household size | 2.459738 | 2 |
| Sample size | 2627 | 736 |

**Table 2a. The distribution oh health indicators by self-reported health status (entire sample)**

| | Subjective health status | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Very good** | **Good** | **Fair** | **Poor** | **Very poor** | **Total** | **correlation** |
| Temporary Illness | 0.0206 (14) | 0.2017 (137) | 0.4108 (279) | 0.2871 (195) | 0.0795 (54) | 1 (679) | -0.6259 |
| Temporary disability | 0.0105 (4) | 0.0976 (37) | 0.3456 (131) | 0.4089 (155) | 0.1372 (52) | 1 (379) | -0.4411 |
| Days in bed | 0.1373 (39.5) | 0.0627 (18.0) | 0.0936 (26.9) | 0.2272 (65.3) | 0.479 (137.8) | 1 (287.7) | -0.3787 |
| Chronic Illness | 0.024 (14) | 0.2216 (129) | 0.414 (241) | 0.2714 (158) | 0.0687 (40) | 1 (582) | -0.5296 |
| Disability | 0.009 (2) | 0.1855 (41) | 0.3122 (69) | 0.38 (84) | 0.1131 (25) | 1 (221) | -0.3960 |
| Nursing homes | 0 | 0.3103 (9) | 0.2413 (7) | 0.3448 (10) | 0.1034 (3) | 1 (29) | -0.1163 |
| Survival probability to 75 (if younger than 66 years) | 81.35% | 78.01% | 76.02% | 66.71% | 51.72% | | 0.1463 |

**Table 2b. The distribution oh health indicators by self-reported health status (Two-persons household)**

| | Subjective health status | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Very good** | **Good** | **Fair** | **Poor** | **Very poor** | **Total** | **correlation** |
| Temporary Illness | 0.0034 (1) | 0.2157 (63) | 0.3732 (109) | 0.3082 (90) | 0.0993 (29) | (292) | -0.6018 |
| Temporary disability | 0.006 (1) | 0.08484 (14) | 0.2909 (48) | 0.4484 (74) | 0.1696 (28) | (165) | -0.5015 |
| Days in bed | 0.3102 (120) | 0.0552 (21.35) | 0.0522 (20.22) | 0.1836 (71.02) | 0.3986 (154.17) | (386.76) | -0.4244 |
| Chronic Illness | 0.01509 (4) | 0.23773 (63) | (99) 0.37358 | (76) 0.28679 | 0.08679 (23) | (265) | -0.5139 |
| Disability | 0.01754 (2) | 0.20175 (23) | 0.2543 (29) | 0.4122 (47) | 0.114 (13) | (114) | -0.3865 |
| Nursing homes | 0 | 0.3636 (4) | 0.2727 (3) | 0.2727 (3) | 0.0909 (1) | (11) | -0.0676 |
| Survival probability to 75 (if younger than 66 years) | 79.15% | 77.62% | 73.64% | 71.32% | 34.97% | | 0.1827 |

**Table 3a Average income and consumption by age class and health status (entire sample)**

| | Age Class | | | | | | |
|---|---|---|---|---|---|---|---|
| Health Status | Less than 55 | 55-60 | 61-65 | 66-70 | 71-75 | More than 75 | All |
| | **Monthly Household Income** | | | | | | |
| Very Good | 2193.5152 | 2997.8602 | 2083.5347 | 1248.8867 | 1416.5265 | 1368.6108 | 2190.8874 |
| Good | 2043.5193 | 2014.4033 | 1839.0653 | 1628.8931 | 1476.9041 | 1430.7805 | 1929.4681 |
| Fair | 1618.2223 | 1732.7737 | 1518.3833 | 1329.7971 | 1314.8654 | 1365.199 | 1498.2734 |
| Poor | 1450.0634 | 1439.6236 | 1201.0205 | 1146.3357 | 980.46115 | 1196.0702 | 1221.0466 |
| Very Poor | 1431.9941 | 1549.3707 | 1454.4717 | 748.25998 | 1095.6264 | 1221.0517 | 1182.6473 |
| | **Monthly Consumption** | | | | | | |
| Very Good | 574.76343 | 644.87321 | 505.267 | 377.95255 | 495.79862 | 460.5074 | 568.76547 |
| Good | 583.04522 | 511.38738 | 480.63811 | 457.68954 | 416.8307 | 399.71983 | 535.26018 |
| Fair | 492.04624 | 542.61952 | 476.14807 | 382.97825 | 395.20871 | 472.24506 | 465.80602 |
| Poor | 547.16515 | 528.68877 | 446.25104 | 452.51462 | 386.56016 | 363.56414 | 444.47113 |
| Very Poor | 510.00119 | 361.51983 | 629.43185 | 335.69698 | 284.05129 | 316.32985 | 408.78051 |

Note: All figure are expressed in 2000 Euro.

**Table 4b. Average income and consumption by age class and health status (Two-persons household)**

| | Age Class | | | | | | |
|---|---|---|---|---|---|---|---|
| Health Status | Less than 55 | 55-60 | 61-65 | 66-70 | 71-75 | More than 75 | All |
| | **Monthly Household Income** | | | | | | |
| Very Good | 1599.70 | 3867.11 | 1847.97 | 1224.74 | 1048.83 | 1101.77 | 1814.96 |
| Good | 1456.12 | 1907.85 | 1775.82 | 1766.69 | 1506.71 | 1303.19 | 1639.91 |
| Fair | 1282.53 | 1116.63 | 1410.05 | 1327.83 | 1386.09 | 1269.45 | 1321.67 |
| Poor | 1062.42 | 1262.45 | 1181.1 | 1146.04 | 1016.07 | 1654.02 | 1225.99 |
| Very Poor | 1229.16 | No. obs. | 1079.39 | 832.67 | 1893.67 | 1184.98 | 1162.66 |
| | **Consumption** | | | | | | |
| Very Good | 401.15 | 756.24 | 434.68 | 405.78 | 420.54 | 387.34 | 465.11 |
| Good | 439.93 | 470.49 | 467.5 | 465.32 | 365.39 | 375.94 | 441.23 |
| Fair | 458.11 | 454.24 | 437.09 | 392.63 | 397.52 | 397.86 | 420.16 |
| Poor | 376.27 | 464.81 | 440.27 | 500.02 | 387.34 | 456.92 | 442.69 |
| Very Poor | 444.15 | No. obs. | 480.3 | 424.23 | 413.16 | 364.74 | 419.62 |

Note: All figure are expressed in 2000 Euro.

**Table 5. Order Probit for Subjective Health Status**
**(Two-persons households with positive expenditures)**

| | |
|---|---|
| Age | -0.0207 * |
| | (0.0066) |
| Male | 0.2028 |
| | (0.1111) |
| Severe condition | -0.8916 * |
| | (0.1818) |
| Days in bed | -0.0045* |
| | (0.0013) |
| Assuming medication | -1.1894* |
| | (0.2340) |
| Some illnesses | 0.4830 |
| | (0.2430) |
| Disabled | -0.3860* |
| | (0.1537) |
| Chronic Illness | -0.4085* |
| | (0.1371) |
| Cut1 | -4.83 |
| Cut2 | -3.30 |
| Cut3 | -1.96 |
| Cut4 | 0.008 |
| Pseudo R-squared | 0.244 |
| N | 449 |

Note: standard errors in parentheses, a star indicates a statistically significant coefficient.

**Figure 1. Actual health status versus expected health status**

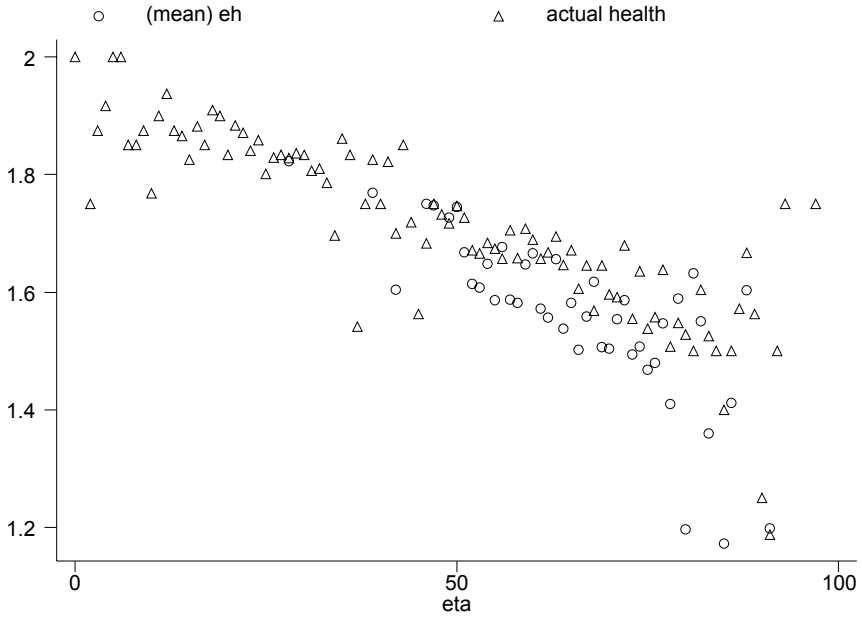


**TABLE 6. Medical expenditures**
**(Subsample of positive expenditures)**
**Euro year 2000**

| Subjective Health | 0 | 0.25 | 0.5 | 0.75 | 1 |
|---|---|---|---|---|---|
| Total Medical Expenditure | 913.44 | 782.06 | 609.7 | 626.25 | 821.9 |
| Medications-drugs | 327.27 | 279.25 | 179.24 | 99.48 | 113.09 |
| Surgery (public) | 61.57 | 18.45 | 19.12 | 8.48 | 2.55 |
| Medical examinations and tests (public) | 80.77 | 54.79 | 49.96 | 33.84 | 27.75 |
| Periods in Hospital | 0.07 | 6.66 | 0.1 | 0.16 | 0 |
| Medical examinations and tests (private) | 19.2 | 34.68 | 26.3 | 16.6 | 10.03 |
| Surgery (private) | 26.48 | 65.57 | 13.87 | 5.79 | 0 |
| Examinations (public) | 58.08 | 63.33 | 46.61 | 38.32 | 103.33 |
| Examinations (private) | 339.96 | 259.29 | 274.46 | 423.55 | 565.11 |

Note: 1228 have medical expenses, around 10% report that some expenditures have been totally covered by insurance or family, and around 4% report that these have been partially covered.

**Table 6.1 Budget Shares Estimates.**
**Dependent variable: budget share of medical expenses.**

| | **Estimated Coefficients** | **t-statistic** |
|---|---|---|
| Household health status 1 | .0610 | 2.42645 |
| Household Health status 2 | .0188 | 1.02665 |
| Household health status 3 | .0104 | .553077 |
| Household health status 4 | .0036 | .245104 |
| Single | .0058 | .601275 |
| 2 Earners household | -.0177 | -1.98597 |
| All women | .0093 | 1.16225 |
| Log Average Age | -.0169 | -.619182 |
| One member with low education | -.013561 | -1.57658 |
| Both with low education | -.010175 | -.977035 |
| One member with high education | .0034513 | .273972 |
| Both with high education | .013564 | 1.07425 |
| One member retired | -.00155 | -.110152 |
| Both members retired | .003548 | .169148 |
| One self-employed | -.02065 | -1.50395 |
| Both self-employed | -.01324 | -.527962 |
| One member inactive | -.00896 | -.625495 |
| Both members inactive | -.03042 | -1.13632 |
| Kids living close | .00649 | .981542 |
| One member with health insurance | .0106 | .858299 |
| Both have health insurance | -.01161 | -.598885 |
| Received insurance payments | -.01385 | -.839020 |
| Received payments from relatives | .0079 | .812361 |
| Log household income | -.01736 | -2.87599 |
| Constant | .223 | 2.101 |
| | | |
| Regional dummies | Y | |
| Log-Likelihood | 888 | |
| Number of Observations | 414 | |

Note: The sample contains only households with one or two members and with budget shares between 0 and 100. The health status is the reported subjective health status rescaled to take values between 0 and 0.20 (first category), 0.20-0.40 (second category); 0.40-0.60; 0.60-0.80; 0.80-1.00. The first category represents the worst outcome.

**Table 6.2 Budget Shares Estimates.**
**Dependent variable: budget share of food.**

| | **Estimated Coefficients** | **t-statistic** |
|---|---|---|
| Household health status 1 | .033001 | .825065 |
| Household Health status 2 | .040015 | 1.29211 |
| Household health status 3 | .037464 | 1.34540 |
| Household health status 4 | .025899 | 1.08161 |
| Single | -.131052 | -7.85042 |
| 2 Earners household | -.004099 | -.202906 |
| All women | -.005844 | -.413215 |
| Log Average Age | -.052391 | -1.01137 |
| One member with low education | -.023902 | -1.26962 |
| Both with low education | .000506 | .021027 |
| One member with high education | .040604 | 1.50122 |
| Both with high education | .110179 | 2.11621 |
| One member retired | .024234 | 1.24553 |
| Both members retired | .039305 | .915358 |
| One self-employed | .021306 | .794411 |
| Both self-employed | .072944 | .579685 |
| One member inactive | .087274 | 2.54673 |
| Both members inactive | .146626 | 2.87505 |
| Kids living close | .018575 | 1.50757 |
| One member with health insurance | -.027719 | -1.19606 |
| Both have health insurance | .145630 | 3.35609 |
| Received insurance payments | .116063 | 3.68321 |
| Received payments from relatives | .026341 | 1.22330 |
| Log household income | -.185826 | -12.8806 |
| Constant | 1.40579 | 6.81333 |
| | | |
| Regional dummies | Y | |
| Log-Likelihood | 877 | |
| Number of Observations | 414 | |

Note: The sample contains only households with one or two members and with budget shares between 0 and 100. The health status is the reported subjective health status rescaled to take values between 0 and 0.20 (first category), 0.20-0.40 (second category); 0.40-0.60; 0.60-0.80; 0.80-1.00. The first category represents the worst outcome.