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The distributional effects of public health transfers in kind: the Italian case

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The distributional effects of public health transfers in kind: the Italian case *

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Abstract

The aim of the paper is to translate into a monetary form the benefits received by the provision of health related public goods, analyze their incidence and relevance in the Italian context and study their implication on the distribution of income among individuals. We follow the traditional insurance-based approach in the measurement of health benefits in kind by evaluating them in terms of the costs borne to produce health care services and by assigning the imputed amount to each person, according to some specific individual characteristics such as age and gender. Beyond the traditional approach, we propose an alternative method, which assigns health related transfers according also to the individual income and self-assessed health status. We apply the two approaches to Italy for the year 2003, employing data on income from the European Survey of Income and Living Conditions (EU-SILC 2004) and information on the public costs for health care provided by the Italian General Accounting Office for the year 2003.

Keywords: income distribution, health opportunity, public in kind health benefits, EU-SILC.

JEL Classification: D31, I18.

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1 Introduction

The analysis of the distributional effects of public policies is generally performed on interventions aimed directly at the individual's income, such as taxes and cash transfers. Equally important is the impact of public expenses for services, i.e. transfers in kind, such as education and health. The importance of this evaluation is particularly relevant for the policy implications of monetary transfers vs. services supply.

Empirically, the evaluation of the effects of transfers in kind requires both the monetary assessment of the public service and its allocation to recipients. The former may be estimated according to the costs incurred in producing the service, an amount that could differ from the benefit enjoyed by the user because of possible inefficiencies in their production; see, among others, Aaberge and Langørgen (2006), Bordignon, Fontana and Peragine (2006), Baldini, Bosi and Pacifico (2007). Allocation to recipients could be performed according to two alternatives, as clearly discussed in Baldini, Bosi and Pacifico (2007). On the one hand, we may look at the actual benefit occurred to the individual, i.e. whether she has actually used health care services during the period of reference or not; in this case, the variability of the benefits' distribution would depend only on random effects (this is the so called *actual use approach*). On the other hand, we may consider the health related transfer in terms of its insurance function, i.e. the benefit is a sort of insurance premium that individuals with particular socio-demographic characteristics such as age and gender should pay in order to receive the services (the so called *insurance-based approach*). See Section 3 for more details on the two methods.

There is a rich literature on the distributional impact of transfers in kind, and health in particular, in an international context; see, among others, Smeeding et al. (1993), Steckmest (1996), van Doorslaer et al. (1999), Marical et al. (2006), Aaberge and Langørgen (2006).

Most of the cited authors applied the insurance based approach in order to study the effect on the income distribution of health related public services (also combined with other non-cash income as education and housing), comparing several countries and showing that these non-cash transfers have a leveling effect on the income distribution. In particular, Smeeding et al. (1993) showed moreover that the most advantaged types of households are the middle-aged families with children and the very elderly, while the most disadvantaged socio-economic groups in many of the analyzed countries are the young singles and younger families without children.

Only a few studies focused on the distributional impact of health related public transfers in Italy. The most recent studies, to the best of our knowledge, are Citoni (2001), Sonedda and Turati (2005), Baldini, Bosi and Pacifico (2007) and Marical et al. (2006).

Citoni (2001) applied the actual use method concluding that the degree of inequality in the income distribution reduces after including health care transfers, with a redistribution of income in favor of the poor and the middle class.

Sonedda and Turati (2005) measured the health transfers in kind through a mixture of the two approaches cited above. They applied the insurance-based approach to the non-employed and the actual use approach to the employed individuals (taking

into account the information on the number of days of non-working due to illness). Differently from Citoni (2001), they concluded that inequality slightly increases after adding the health related transfers. Moreover, they compared cash public transfers (including pensions) and transfers in kind, concluding that the latter have a weaker redistributive effect than the former.

Given the controversial results of these two studies, Baldini, Bosi and Pacifico (2007) tried to better clarify the distributional impact of health related transfers in kind in Italy, applying both the insurance-based and the actual use method. Their result showed that, according to both methods, the health related benefits have a redistributive effect in reducing inequality in the income distribution; in particular, inequality reduces more with the insurance-based approach than with the actual use approach.

Most of the authors mentioned above applied the insurance-based approach, since it is much easier to implement than the actual usage approach. However, the insurance approach is based on quite strong assumptions: it assumes that individuals with same age and gender have equal needs of health care services, regardless of their actual health status or income; the health related transfers are then defined as weighted per capita health expenditure, with exogenous weights that depend on age and gender.

There exists, instead, empirical evidence that shows a high correlation of the individual needs of health care with income; for references see Zheng (2007).

In this paper we propose a new method for allocating the health benefits that is aimed at overcoming the main drawback of the traditional insurance-based approach described above, that is the disregard of information on individual health condition and on income.

This method is still an insurance-based approach and aggregates individuals into groups defined according to age, gender and income, that are therefore more homogeneous in terms of health care needs than the ones defined in the traditional insurance-based approach; moreover, information on self-assessed health status is also taken into account, since the individual health transfers are obtained as weighted per capita health expenditure with weights that are equal to the average self-assessed health status of each group.

The aim of the paper is therefore to provide an accurate value of personal income that includes also the benefit from publicly provided health care services in Italy in the year 2003, by comparing two insurance-based approaches.

Since the national Italian health care system is managed mainly by the 20 regions into which Italy is split, health benefits occurring to each individual may differ considerably depending on her region of residence; that is there could not be equal opportunities of health status across different regions. For a review on equality of health opportunity we refer to Zheng (2006) and Fleurbaey and Schokkaert (2007).

Finally, we do not derive direct conclusions on the implication of these transfers in kind on inequality and poverty, since we do not believe in an exercise of this type: transfers in kind to sick individuals do not make them economically better off hence increasing their well-being; note that our point of view differs from the one in Aaberge and Langørgen (2006).

The paper is structured as follows: in the next section we briefly summarize the

Italian health care system, in Section 3 we describe the two methods used for imputing the health related benefits, i.e. the traditional and the alternative insurance-based approach. In Section 4 we show the results from the empirical applications. Section 5 concludes.

2 The Italian health care system: a brief review

Starting from the year 1978 the Italian health care system is characterized by a National Health System ("Servizio Sanitario Nazionale", henceforth SSN), established with the law no. 833/1978 and modelled on the British National Health System, according to which each Italian resident and each foreign resident has the right to receive direct and free health assistance.

A series of reforms have gradually increased the importance of the 20 Italian regions and the local administration versus the central government. Nowadays the main tasks that remain in charge of the central government are the definition of the "essential levels of care" (Livelli Essenziali di Assistenza), which are a list of the services that the SSN is required to provide uniformly in all regions, the guarantee of financial inter-regional solidarity, according to which the regions with lower average income benefit from transfers from the richest regions, and the provision of public contributions for public hospitals. The 20 regions have the responsibility for the organization, funding and administration of publicly financed health care.

An important step in the procedure of the establishment of the health care system's financing is constituted by the periodical agreement between the central government and the regions ("Accordo Stato-Regioni") to decide how to allocate the amount of central government's funding among regions; this often causes huge political friction. The formula for the allocation of financial resources has changed several times; at the moment it is based on population size, weighed by age-specific utilization rates for hospital care, drugs and residential care, on the standardized mortality rate and on an adjustment for interregional patient flows.

The Italian health care system is a mixture of private, insurance-based and public health system, and is financed by: regional add-on to the national personal income tax ("Addizionale Regionale IRPEF"[1]), central grant ("Fondo per il fabbisogno sanitario ex D.Lvo 56/2000 ") financed by the value-added tax (VAT) and other indirect tax (e.g. fuel) revenues, compulsory social insurance, replaced in 1998 by the business tax IRAP, transfers from the state (known as ex FSN), and co-payments (or tickets) of patients for pharmaceutical and specialist ambulatory services.

In particular, in 2003, which is the year of interest for our empirical analyses, 75% of the total health care expenditure was publicly financed, 21% was financed out-of-pocket and 0.9% was financed by private insurance. Within the public SSN, the total revenues were constituted for 39% by IRAP, for 3% by Addizionale Regionale

[1]Each region decides whether the rate of the regional add-on to the national personal income tax is a unique rate or varies according to income brackets; the taxable income is the same as for the national personal income tax IRPEF. Therefore the individuals exempt from the national tax are exempt also from the Addizionale Regionale IRPEF.

IRPEF, for 43% by VAT and other indirect taxes, for 3% by co-payments of patients (tickets), for 7% by transfers from public and private sectors and 5% from additional integration by the state.

The total public health care expenditure[2] was equal to 83.2 billion Euro, a per capita expense equal to 1407 Euro, with a deficit of 1.9 billion Euro (see Ministero dell'Economia e delle Finanze, 2004, and OECD, 2005). In the same year, 10% of the public total health expenditure was for the hospital sector, 34% for pharmaceutical care, 25% for services, 13% for drugs, 6% for general medicine and 3% for outpatient specialist care, according to the Italian General Accounting Office.

The Italian health system is characterized by free mobility of patients throughout the country, so that patients can choose the place of treatment. The net interregional mobility of one region is measured as the difference between the total revenue that the region receives from all the regions whose patients are cured in this region, minus the money that the region gives to those regions where its patients are treated. In the year 2003 the regions with highest positive interregional mobility are Lombardia and Emilia Romagna, while the regions with highest negative interregional mobility are Campania, Sicilia and Calabria (see Ministero dell'Economia e delle Finanze, 2004).

3 Methods for measuring the public health transfer in kind

In order to provide an evaluation of the effects of health related in kind benefits on the income distribution, one needs both to quantify the value of these benefits and to allocate the corresponding amount to individuals.

For the first problem, the most common way to assess the value of health benefits in kind is to use the costs incurred to produce the corresponding health care services. We hypothesize that the marginal costs borne by the provider for producing these goods are equal to the marginal benefits received by the agent that asks for the goods, neglecting any possible inefficiency in the production process (for additional discussion we refer to Smeeding et al., 1993, and to Aaberge and Langørgen, 2006).

To allocate to each recipient her portion of health expenditure, two main methods are applied in the literature.

The first approach is the so called actual use method, which imputes to each individual a transfer (based on the costs) according to her effective use of the health care service; as a result, individuals are well differentiated from each other. There exist, however, difficulties in finding data sets that include information both on income and on the use of the health care services, as well as in finding unitary costs for the different kind of health services. Examples of applications are provided for Italy in Citoni (2001), Baldini, Bosi and Pacifico (2007) and Bordignon, Fontana and Peragine (2006).

[2]Health expenditure is defined in Ministero dell'Economia e delle Finanze (2003, 2004) as the sum of all the costs for the specific welfare services and net costs for the extraordinary management and for the private health care provided in public health structures (named "intramoenia").

The second approach is the insurance-based approach (that in this paper will be named *traditional insurance-based approach*), which is easier to implement, since it does not require information on individual actual use of health care services. It simply assigns health benefits to individuals proportionally to some socio-demographic characteristics, such as gender and age. The transfer is considered as the premium that an individual should have paid in order to be insured against the risk of illness. The amount of this premium depends on the probability of loosing good health, which is a function of the observable variables age and gender. This approach has the main disadvantage of not taking into account the individual's actual differences in health condition and needs nor income; within this context individuals differ from each other only according to their age and gender. Examples of the application of the insurance-based approach are provided by Marical et al. (2006), Baldini, Bosi and Pacifico (2007) and Aaberge and Langørgen (2006).

In this paper we propose an alternative version of the insurance-based approach, which is based on more realistic assumptions. In particular, according to the method that we propose the probability of getting ill is a function not only of the age and gender but also of the income of each individual, since empirical evidence has shown that health status depends significantly on income (see for example Zheng, 2006).

The new method moreover takes advantage of the information on self-reported health status included in many recent surveys on household income or expenditure, and exploits information on health conditions (analogously to the actual usage approach but differently from the traditional insurance approach). In particular, information on personal self-declared health status is employed for the weights used to defined the health benefits, that are not exogenously defined as in the traditional approach but rather depend directly on the actual needs of health care.

Before introducing the new method, we first illustrate in detail the traditional insurance-based method. In Section 3.2 we then discuss the new method proposed, that will be named the *alternative insurance-based approach*.

3.1 The traditional insurance-based approach

In order to obtain the health care benefits for each individual according to the traditional insurance-based approach, information on costs for public health care services is first required. Due to the central role played by the regions within the Italian health care system, we employ data on the regional costs for health care system, which are yearly available from the Italian Ministry of Economy and Finance. The information on regional costs is available in the following categories of expenses: staff, services and commodities, extraordinary costs, general medicine, drugs, specialists, rehabilitation, prostheses, hospitals and other kinds of health assistance.

We split the total expenses for commodities and services and for staff into the main types of health services, according to the estimations provided by Ministero dell'Economia e delle Finanze (2003);[3] therefore, we rearrange the previous categories into the following classes of health care expenditure:

[3]It has been estimated that 75% of the expenses for commodities and services and for staff are for the public expenses, 85% of which are for hospital and 15% of which are for health care of

1. Hospital expenses, given by expenses for hospitals plus 85% of the 75% of expenses for commodities and services plus 85% of the 75% of expenses for staff, plus administrative costs (proportional to the share);

2. Expenses for specialists, given by the entire specialists-related expenditure plus 15% of the 75% of commodities and services expenses plus 15% of the 75% of expenses for staff plus administrative costs (proportional to the share);

3. Pharmaceutical expenses, given by the total costs for drugs plus administrative costs (proportional to the share);

4. General medicine and other assistance, which are general medicine-related costs plus expenses for rehabilitation plus expenses for prostheses plus other kinds of assistance plus administrative costs (proportional to the share);

5. Expenses for prevention, that are 40% of the 25% of the expenses for commodities and services plus 30% of the 25% of expenses for staff plus administrative costs (proportional to the share);

6. Expenses for national health assistance, given by 40% of the 25% of expenses for commodities and services plus 30% of the 25% of expenses for staff plus administrative costs (pro-rata);

7. Extraordinary expenses, that are extraordinary expenses plus administrative costs (proportional to the share).

In order to take into account the interregional mobility of patients, we subtract from the health care expenditure of each region the corresponding total mobility; in particular, we partition the total amount of net mobility into the seven categories of health expenditure listed above, according to the corresponding share of total expenditure, as follows:

$$M_{rh} = \frac{E_{rh}}{E_r} M_r$$

where M_{rh} is the net mobility of region $r, r = 1, \ldots, 20$, corresponding to the kind h of health expenditure, $h = 1, \ldots, 7$; M_r is the total net mobility of region r; E_{rh} is the total health expenditure of region r for health care of type h, while E_r is the overall expenditure for health care of region r.

The health expense net of mobility for each kind of health care $h = 1, \ldots, 7$, and each region $r = 1, \ldots, 20$ is given by

$$E^*_{rh} = E_{rh} - M_{rh}.$$

specialists. The remaining 25% of expenses for staff is partitioned into: 40% for administrative costs, 30% for costs for prevention and 30% for health assistance. The remaining 25% of expenses for commodities and services is partitioned into: 40% for prevention, 40% for health assistance and 20% for administrative costs.

Table 1: Weights specific for age and gender classes.

			WEIGHTS		
CLASSES	**AGE**	**GENDER**	**DRUGS**	**HOSPITAL**	**SPECIALIST**
1)	**< 1**	**all**	1.000	2.390	0.0518
2)	**1 to 4**	**all**	0.969	0.379	0.0518
3)	**5 to 14**	**all**	0.695	0.264	0.0518
4)	**15 to 44**	**male**	0.693	0.396	0.0534
5)	**15 to 44**	**female**	0.771	0.564	0.0534
6)	**45 to 64**	**all**	2.104	1.002	0.0580
7)	**65 to 74**	**all**	4.176	2.125	0.0850
8)	**>75**	**all**	4.290	3.111	0.0640

Source: Ministero della salute (2006)

Very small changes in the total expenditure of each region occur when we include into the analysis the interregional mobility; in particular, Lombardia, Emilia Romagna and Lazio regions, which are characterized by high mobility, show the highest decrease in expenditure when the mobility is taken into account; the highest increases occur, instead, for Campania, Calabria and Sicilia regions. For additional details, see D'Ambrosio and Gigliarano (2007).

If we assigned to each individual living in region r the regional per capita expenditure of the specific health service h, with $h = 1, \ldots, 7$, i.e. $t_{rh} = E^*_{hr}/n_r$, where n_r is the number of inhabitants of region r, we would assume that each individual benefits from the public health system at the same level.

The traditional insurance-based approach instead allocates to each individual living in region r the corresponding portion of E^*_{rh}, for each $h = 1, \ldots, 7$, by weighting the per capita expenditure t_{rh} according to the individual age and gender.

Analogously to Baldini, Bosi and Pacifico (2007), we use the weights chosen exogenously by the Italian Ministry of Health for allocating the financial resources among regions (see the"Accordo Stato-Regioni" discussed in Section 2) that differ according to the kind of health care: pharmaceutical, hospital care and specialist care.[4] These weights are illustrated in Table 1. Note that they give more importance to the very young individuals and to the elderly; moreover, different weights according to gender are considered only for the age class that corresponds to the period of female fertility, that is [15-44].

Since specific weights are not available for each of the seven types of health care, we perform the approach of Mapelli (1994) as follows. For each region, the health expenses of kind 5. and 7. (see the above list) are allocated to individuals per capita. For health costs of type 1., we employ the weights for hospital expenses indicated in Table 1; for health costs of type 2., 4. and 6. we use the weights for specialist shown in Table 1; finally, for costs 3. we use the weights for drugs expenses.

The individual health related benefit specific for type h of health care, with $h =$

[4]The weights concerning the pharmaceutical and the hospital expenses are available from Ministero della Salute (2006). In particular, the weights on the pharmaceutical expenses are the same employed by OSMED (2005) and are obtained from studies aimed at splitting the ex-FSN and other transfers from the central government among regions. The weights for the hospital expenses are periodically updated from the discharge cards ("Schede di Dimissione Ospedaliera").

$1, \ldots, 7$, for age and gender class $j = 1, \ldots, 8$ (defined in Table 1)[5] and for region r, $r = 1, \ldots, 20$, is then computed as

$$a_{jrh} = t_{rh} \cdot \frac{w_{jh}}{\sum_j p_{jr} w_{jh}} \tag{1}$$

where t_{rh} is the per capita expenditure of region r for health care type h; w_{jh} is the weight for age and gender group j and health expenditure of type h; p_{jr} is the population share of individuals living in region r that belong to age and gender group j.

Finally, the total individual health transfers in kind is obtained by summing up the seven types of per capita health expenses defined in equation (1):

$$b_{rj} = \sum_{h=1}^{7} a_{jhr}. \tag{2}$$

As formulas (1) and (2) show, the traditional approach imputes an identical amount of health related transfer to each individual living in the same region and belonging to the same age and gender class, thus implicitly assuming that individuals in the same region, age and gender class have the same need of health care services, independently of their actual health condition and of their income. The individual health benefits are obtained by weighing the per capita regional expenditure with weights that are higher for the youngest and the oldest individuals (independently of the gender) and for the women between 15 and 44 years old, since they are assumed to have the greater needs of health services. Note, moreover, that these weights are equal for each Region.

3.2 An alternative insurance-based approach

Richer people are more likely to be healthier (for references of this evidence, see among others Zheng, 2007). The new method that we here propose aims at introducing this other characteristic when estimating the health care individual need.

Moreover, while the weights used in the traditional approach are exogenously (and therefore arbitrarily) chosen and remain constant across regions, the weights of the new approach are defined as a function of individual self assessed health status, thus including into the analysis the actual health conditions of the population. In particular, the weights are defined as the average health status of each group identified by region, income, age and gender; in this way the weights are region specific, taking into account the eventual differences in health status across the Italian regions.

Only if the health status mean is the same for every region the weights are the same for every region, otherwise they remain region specific.

[5]Since in Table 1 only one age class, that is [15-44], is differentiated according to gender, we have preferred to keep the notation simple, by using a sole partition that summarizes age and gender and that is indicated by $j = 1, \ldots, 8$. For example, $j = 1$ means the group of individuals less than 1 year old, while $j = 4$ means the group of male between 15 and 44 years old.

Table 2: Average age and income and confidence interval at significance level 5%, by Italian region

	AGE			INCOME		
	mean	95% Conf.Int.		mean	95% Conf.Int.	
Piemonte	44.1	43.4	44.8	16790	16407	17173
Val d'Aosta	43.0	41.7	44.3	18127	17374	18880
Lombardia	42.2	41.7	42.8	17592	17238	17947
PA Bolzano	39.4	38.2	40.5	16967	16492	17443
PA Trento	41.5	40.2	42.9	16740	16172	17308
Veneto	41.9	41.3	42.5	15802	15538	16067
Friuli Venezia Giulia	44.6	43.7	45.4	16844	16482	17205
Liguria	46.8	45.9	47.7	15660	15274	16046
Emilia Romagna	44.5	43.9	45.2	18376	17994	18758
Toscana	44.6	44.0	45.3	16699	16408	16991
Umbria	44.2	43.4	45.1	15609	15202	16017
Marche	43.8	43.0	44.6	15585	15194	15977
Lazio	42.1	41.4	42.7	15700	15379	16021
Abruzzo	42.8	41.6	43.9	14386	13759	15013
Molise	42.9	41.5	44.2	12668	12247	13089
Campania	38.4	37.7	39.1	11426	11126	11727
Puglia	39.9	39.1	40.7	11194	10906	11483
Basilicata	41.2	40.0	42.4	11142	10824	11460
Calabria	40.4	39.4	41.5	10734	10290	11178
Sicilia	40.1	39.3	40.9	10872	10594	11149
Sardegna	41.3	40.3	42.2	13300	12867	13733

Source: Own computations from IT-SILC 2004

The reason why we employ in the alternative approach also income and age and not simply health status is clearly shown in Table 2, which reveals that the Italian regions show different averages of individual income and age. Consequently, the regional expected health status could be affected by these differences in age and income; for example, a region may show lower health status mean mainly because the age mean is higher and the income mean in lower than other regions. Therefore, in order to control for possible dependence of health status on average age and income, we need to take into account also these differences.

More formally, we consider a society having L health categories with $2 \leq L < \infty$, each indicated by $g_l, l = 1, \ldots, L$, such that $g_1 \leq \ldots \leq g_L$ are all positive values, g_1 stands for a very good health while g_L for a very bad health. Let us moreover partition individuals into I income classes and into J age and gender classes.[6]

Analogous to Zheng (2006), we denote by α^r_{ijl} the conditional probability that an individual of region r in income class i and age and gender class j has health status l, i.e. $\alpha^r_{ijl} = Pr\{health = g_l | income = i, age\ and\ gender = j, region = r\}$ such that $\sum_{l=1}^{L} \alpha^r_{ijl} = 1$, for each $i = 1, \ldots, I, j = 1, \ldots, J, r = 1, \ldots, 20$.

We consider a set of 20 matrices, one for each region, whose rows represent age and gender classes and columns are income classes; each cell includes the average health

[6]For the partition based on age and gender, we refer to the comments in footnote 5.

status for the corresponding income class and age and gender class. The matrix of conditional expected health status given the income, age and gender classes, for region r is of the type

$$\mathbf{M_r} = \begin{bmatrix} e^r_{11} & \dots & e^r_{1I} \\ \vdots & \ddots & \vdots \\ e^r_{J1} & \dots & e^r_{JI} \end{bmatrix}_{J \times I}$$

where e^r_{ij} is the expected health status of individuals with income i and age and gender j in region r, i.e. $e^r_{ij} = \sum_{l=1}^{L} \alpha^r_{ijl} g_l$.

Note that if each of the conditional probabilities α^r_{ijl} of region r is equal to each of the conditional probability α^s_{ijl} of region s (i.e. if $\alpha^r_{ijl} = \alpha^s_{ijl}$ for all i, j, l), then each of the conditional expected health status e^r_{ij} of region r is equal to each of the conditional expected health status e^s_{ij} of region s (that is $e^r_{ij} = e^s_{ij}$ for all i, j).

We then define the health-related regional public transfers analogously to the expression in (1), where we substitute w_{hj} with e_{ij}. Note that in Section 3.1 we have calculated the individual health transfer specific for each type h of health care service, with $h = 1, \dots, 7$, since the literature provided us with weights that are specific for that. In the alternative approach we do not disaggregate the overall regional expenditure into the seven specific categories of health service, since the weights depend only on personal health conditions.

The health related transfer for individuals with income in class i, age and gender in class j and living in region r is thus given by

$$c_{ijr} = t_r \frac{e^r_{ij}}{\sum_{i=1}^{I} \sum_{j=1}^{J} e^r_{ij} p_{ijr}}, \tag{3}$$

where t_r is the per capita expenditure of region r; p_{ijr} is the proportion of individuals living in region r whose income belongs to class i and whose age and gender are in class j.

If we compare expression in (1) with expression in (3), we note that in the traditional approach individuals are considered identical (from the health point of view) within each age and gender class, while in the alternative approach these groups are refined by taking into account also income. The variability of health care needs across these groups is explained by exogenous and arbitrary weights in the traditional approach, while it depends directly on the average health status of each group in the alternative approach.

From expression in (3) we note that if an individual belongs to a cell of the matrix M_r that has better average health status (i.e. with low values of e_{ij}) she receives lower health-related transfer than an individual belonging to a matrix M_r's cell with worse average health status, for any $r = 1, \dots, 20$.

Moreover, the amount of transfer that is assigned to each individual could differ depending on the region of residence for two components. According to the alternative method this amount depends both on the regional per capita expenditure (t_r) as in the traditional approach, and on the differences in regional conditional health status means given income, age and gender (e^r_{ij}).

In particular, if the set of ratios $e^r_{ij} / \sum_{i=1}^{I} \sum_{j=1}^{J} p_{ijr} e^r_{ij}$, for each $i = 1, \ldots, I$ and each $j = 1, \ldots, L$, is the same for each region, then only the differences in per capita expenses across regions affect the transfer. On the other hand, if the per capita expenses were the same for all regions, then only differences in average health status across regions would matter.

Therefore, in order to determine whether the weights in expression (3) differ across regions, one has to determine whether the distribution of health status conditional on age, gender and income is affected by the region of residence.

Checking the (in)dependence in mean between the region of residence and the self assessed health condition recalls the concept of Equality of Opportunity (henceforth, EOp), which measures whether individuals belonging to different socio-economic backgrounds are endowed with same opportunities. More specifically, equality of opportunity assumes that an individual outcome (that could be income, education, health) is determined by two classes of variables: circumstances, which include all the factors outside the individual responsibility, and effort, which includes factor for which individuals are responsible for. There exists equality if opportunity if the distribution of the outcome of interest is independent of the circumstances; otherwise, if the outcome distribution differs across circumstances, we have inequality of opportunity. For a review of this literature we refer, among others, to Peragine and Serlenga (2007), Fleurbaey (2007), Zheng (2006).

The recent literature on EOp has focused mainly on education and income, while few attempts have analyzed the EOp within the health context. In particular, Zheng (2006) was interested in measuring health opportunity, motivated by the idea that the real concern of a society should not focus on trying to equalize health levels of the individuals but rather on trying to reduce the health inequality due to an unequal socio-economic structure.

Health status depends on many factors, among which the individual responsibility (lifestyle, health consciousness), responsibility of the society (easy access to medical services) and some that cannot be controlled (such as genetics). The societal responsibility has been interpreted by Zheng (2006) as the "easy access to medical services" in terms of financial means of the individuals, that is income necessary to pay the medical care services. Therefore, he carried out an equality of opportunity analysis using health status as outcome and income as circumstances. He measured to what extent the societal health inequality is due to unequal socioeconomic structure, by carrying out an analysis of the inequality in the average health status over the income distribution: equality of health opportunity would exist if the same health status mean existed for all income classes.

In our analysis of equality of health opportunity, we consider as outcome the average self-assessed health status given age, gender and income classes, as circumstances the Italian regions, and as effort the individual responsibilities for health status as well as genetic factors and individual incomes. The following hypotheses are assumed: the climatic differences across regions do not affect the analysis, and the distributions of genetic defects and of biological individual characteristics are the same across regions.

Therefore in order to verify whether weights in expression (3) are different across regions, we have to measure the equality of health opportunity, by verifying if the

conditional distribution of health status given age, gender and income is independent in mean of the Region of residence; in other words, verifying if the health status means given income, age and gender classes are the same for each region.

More formally, given a set $\mathcal{R}$ of Regions, there is Equality of Opportunity if for any pairs $r, s \in \mathcal{R}$, neither r is preferred to s (according to a given dominance criterion) nor s is preferred to r.

Different kinds of dominance can be considered; here we focus on dominance criteria that are similar to the ones proposed in Zheng (2006), which have been properly modified for our context.

The first definition of EOp that we propose is the most restricted one; it requires that individuals belonging to same income, age and gender classes face on average identical health status regardless of the region of residence:

Definition 3.1 (Strong EOp)**.** *There is EOp if and only if for each pair of regions r and $s \in \mathcal{R}$*

$$e_{ij}^r = e_{ij}^s \ \forall i \in \{1, \ldots, I\}, \forall j \in \{1, \ldots, J\}. \tag{4}$$

Definition 3.1 affirms that there is EOp if the expected health status matrix M is the same for each region. Weaker EOp definitions are the following:

Definition 3.2 (Rank Dominance EOp)**.** *Given a set of regions $\mathcal{R}$, we say that region $r \in \mathcal{R}$ dominates in sense of Rank Dominance region $s \in \mathcal{R}$ ($r >_R s$) if and only if*

$$e_{ij}^r \leq e_{ij}^s \ \forall i \in \{1, \ldots, I\}, \forall j \in \{1, \ldots, J\}, \tag{5}$$

with $e_{ij}^r < e_{ij}^s$ for some j and some i.

There is EOp if neither $r >_R s$ nor $s >_R r$ for all pairs of regions $r, s \in \mathcal{R}$.

According to Definition 3.2, there is EOp if none of the regions dominates another region according to the rank dominance, that is none of them shows lower health status mean for each combination of income, age and gender than another region.

Note that if the set of region $\mathcal{R}$ satisfies the strong EOp of Definition 3.1, then it satisfies also the Rank Dominance EOp of Definition 3.2, while viceversa is not true.

Definition 3.3 (Rowwise Generalized Lorenz EOp)**.** *Given a set of regions $\mathcal{R}$, we say that region $r \in \mathcal{R}$ dominates region $s \in \mathcal{R}$ in sense of Rowwise Generalized Lorenz Dominance($r >_{RGL} s$) if and only if*

$$\sum_{i=1}^{k} e_{ij}^r \pi_{i|j}^r \leq \sum_{i=1}^{k} e_{ij}^s \pi_{i|j}^s \ \forall k = 1, \ldots, I \text{ and } \forall j \in \{1, \ldots, J\}, \tag{6}$$

with $\sum_{i=1}^{k} e_{ij}^r \pi_{i|j}^r < \sum_{i=1}^{k} e_{ij}^s \pi_{i|j}^s$ for some j, where $\sum_{i=1}^{I} \pi_{i|j}^r = 1$.

There is EOp if neither $r >_{RGL} s$ nor $s >_{RGL} r$ for all pairs of regions $r, s \in \mathcal{R}$.

In Definition 3.3, region r dominates region s according to the rowwise Generalized Lorenz dominance,[7] if the average health status of the poor within each age and gender class (i.e. within each row) is better in region r than in region s.

Note that if $\pi^r_{i|j} = \pi^s_{i|j}$ for all pairs of regions, then Definition 3.2 implies Definition 3.3.

A definition of EOp based on inequality dominance instead of on welfare comparison is the following:

Definition 3.4 (Rowwise Lorenz EOp)**.** *Given a set of regions $\mathcal{R}$, we say that region $r \in \mathcal{R}$ dominates region $s \in \mathcal{R}$ in sense of Rowwise Lorenz Dominance ($r >_{RL} s$) if and only if*

$$\frac{\sum_{i=1}^{k} e^r_{ij}\pi^r_{i|j}}{\sum_{i=1}^{I} e^r_{ij}\pi^r_{i|j}} \leq \frac{\sum_{i=1}^{k} e^s_{ij}\pi^s_{i|j}}{\sum_{i=1}^{I} e^s_{ij}\pi^s_{i|j}} \text{ and } \forall k = 1, \ldots, I \ \forall j \in \{1, \ldots, J\},$$

with a strict inequality for some j, where $\sum_{i=1}^{I} \pi^r_{i|j} = 1$, .

There is EOp if neither $r >_{RL} s$ nor $s >_{RL} r$ for all pairs of regions $s, r \in \mathcal{R}$.

According to Definition 3.4, region r dominates region s based on the rowwise Lorenz dominance if the cumulative proportion of average health status of the poorer individuals is lower, that is if the health status of the poor is better, in the former than in the latter region. When this kind of dominance does not hold for any pair of regions then we have EOp.

Note that in the rowwise dominance of Definition 3.4 we measure the concentration of average health ordered by income classes inside each age and gender class; we do not apply the same analysis within each age and gender class, since it is not so obvious whether we should give more weight to the youngest or to the oldest individuals.

There are some advantages and drawbacks of using a measure of health status which is self-reported. According to Allison and Foster (2004), one of the advantages is that the evaluation of the relative importance of various levels of health is determined by the individuals, rather than assigned arbitrarily through a set of weights; moreover, there exists empirical evidence in favor of the self-assessed health status as a good predictor of objective indicators of health (see, among others, Grant, Zdzisiaw and Chappell, 1995). The main drawback is constituted, on the other hand, by the qualitative nature of the health status variable, characterized by ranked modalities, such as from "very good" to "very bad" health status. As a consequence, the choice of a scale that assigns numerical values to each health category introduces arbitrariness and subjectivity. Moreover, the mean of this categorical variable is highly affected by the choice of the health status values g_l.

In order to overcome this problem, Allison and Foster (2004) suggested to replace the mean health status with the median health status, since the latter is less affected by the arbitrary chosen values of health status. For that reason, in the alternative method that we have proposed one may replace the average health status conditional on age, gender and income (e^r_{ij}) with the median health status conditional on age, gender and income.

[7] For a review on rowwise dominance, we refer to Marshall and Olkin (1979).

4 Results from the empirical applications

The data set that we employ is the "IT-SILC XUDB 2004-versione Febbraio 2006", which contains the Italian data of the European Survey of Income and Living Conditions (EU-SILC).

This data set (henceforth, IT-SILC 2004) includes information on income that refers to the year 2003, while information on living conditions and on health status refers to the moment of the interview, i.e. the year 2004. The cash income variable considered as the baseline income for the empirical analysis is total disposable income, given by the sum, for all household members, of gross personal income components, gross cash benefits (self-employment, sickness, survivor, unemployment, disability), income from rental of property, family allowances, housing allowance, interests and profits from capital investments, minus taxes on income, wealth, social insurance contributions. This baseline income includes all the direct public transfers related to health condition, if any. In order to take into account the differences in needs among households with different sizes, we apply the modified OECD scale both for disposable income and for health transfer in kind.[8]

The self-assessed health status included in IT-SILC 2004 is expressed through an ordinal variable that assigns a cardinal number to each health category: 1 for "very good health status", 2 for "good health status", 3 for "fair health status", 4 for "bad health status", 5 for "very bad health status".

The IT-SILC 2004 sample is composed of 24,204 households and 61,429 individuals living in 731 municipalities. However, health status is asked only to individuals 16 or more years old; therefore, in order to be able to make comparisons between the traditional and the alternative approach, units of our analyses will be individuals 16 or more years old and living in private households with strictly positive income, that correspond to 52,246 sampled individuals.

Finally, sampling weights are applied in both analyses, so to obtain a representative sample of the Italian non-institutionalized population 16 or more years old.

Data on regional expenditure for health care services for the year 2003 are instead available from Ministero dell'Economia e delle Finanze (2003, 2004), while data on the net interregional mobility in 2003 are available in Table SA3 in "Relazione Generale sulla situazione economica del Paese" by Ministero dell'Economia e delle Finanze (2004).

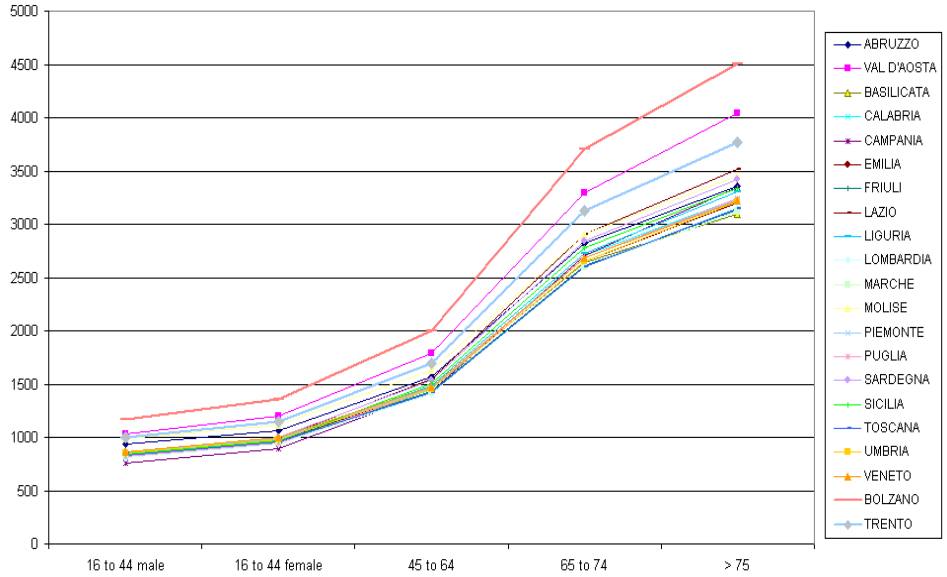
In the rest of this section, an extended income is obtained for each individual 16 or more years old, by adding to the cash income (that is the equivalent disposable income) a monetary value of the health benefits, according both to the traditional and to the alternative insurance-based approach; the effects on income distribution are then discussed.

[8] Different equivalence scales have been applied, in the literature, for health related transfers; see, e.g. Citoni et al. (2006).

4.1 The traditional approach

The health benefit for each individual is here defined by the expression in (1). We calculate the per capita expenses b_{rj} for each age and gender group and for each region and we assign the corresponding amount to each individual. Note that here we consider only the age and gender classes $j = 4, \ldots, 8$ of Table 1, since, as already pointed out, we want to keep the empirical analyses of the two insurance approaches comparable. Figure 1 shows the amount of b_{rj} for each region and age and gender class. The regions assigning higher per capita weighted amount of health transfers are the autonomous provinces of Bolzano and of Trento and the Valle d'Aosta region, while the Campania region has the lowest per capita weighted transfer.

Figure 1: Health care amounts per capita per age and gender groups (Euro) for the year 2003.



Source: Own computations from IT - SILC 2004

When we add health care transfers to the cash income of each individual, the overall disposable income obviously increases; the degree of this increment, i.e. the health related transfers relevance, is described in Table 3. We note that after the transfer the share of income increases for the three lowest quintiles and reduces for the two highest quintiles. Therefore, health transfers in kind reduce the overall dispersion in the income distribution. Table 3 shows, moreover, that the percentage increase in income due to health transfers decreases drastically with income: the health transfers increase the baseline income at higher proportion for the poor than for the rich. In particular, when health transfers are added only to the group of individuals between 16 and 44 years old, which is about 40% of the population, the entire society benefits more than

Table 3: Relevance of health related transfers in kind. Traditional approach

	INCOME SHARE		% INCREASE IN INCOME DUE TO TRANSFERS TO PERSONS IN AGE GROUP					MEAN TRANSFER DUE TO TRANSFERS TO PERSONS IN AGE GROUP				
Q.LE	**A**	**B**	**16-44**	**45-64**	**65-74**	**75+**	**ALL**	**16-44**	**45-64**	**65-74**	**75+**	**ALL**
1	7.6	8.9	15.8	8.7	6.1	6.6	37.2	888	486	345	368	2087
2	12.8	13.8	8.4	5.3	4.6	5.5	23.9	797	507	436	525	2266
3	17.2	17.6	6.2	4.4	3.1	3.7	17.4	786	562	398	477	2223
4	22.6	22.3	4.8	3.9	1.9	2.3	12.8	802	654	324	383	2163
5	39.8	37.3	2.6	2.4	1.0	0.9	7.0	791	722	309	275	2097
ALL	100.0	100.0	5.3	3.9	2.4	2.7	14.2	812	590	361	404	2168

Note: Q.LE means disposable cash income quintile.
Source: Own computations from IT-SILC 2004

in case of health transfers added to the other groups. In absolute terms, similar results hold when looking at the absolute equivalized health transfer mean, shown in the last columns of Table 3. When health benefits are transferred either to the youngest group or to the older groups, the absolute mean transfer decreases with income, because young and old people are mainly located in the lowest quintiles; for the middle-aged individuals, the average amount of the transfers increases with income, revealing that this group is mainly located in the highest quintiles. When the health transfers in kind are added to the entire population, this amount slightly increases when moving from the lowest to the middle-income quintiles and then reduces from the middle to the highest income quintile.

It is interesting now to decompose the percentage increase of income by subgroups, partitioning the population according to different socio-economic characteristics; Table 4 reveals, in particular, in which subgroups of the population the health transfers in kind have greater impact. Among the groups based on the socio-economic conditions of the household head, the unemployed and the pensioners benefit the most from health care transfers, the former mainly because their baseline income mean is very low and the latter because they are older than the other type of households, in particular than the white collar or self employed. According to the education level, the least educated household heads show the greatest increase in income; the main reason is due to the fact that the household head with high level of education are younger on average that the households with very low level of education and income mean. When the population is split into age groups, we observe, in both data sets, that the elderly are the most affected by the health transfers in kind, followed by the group of the below25 years old; this is due both to the shape of the health care amount per capita per age group and to the fact that the elderly have on average lower income. We observe in particular that the highest increase in relative income position (defined as the ratio of the income mean of the subgroup over the overall income mean) before and after adding health related transfers to the entire population is in correspondence to the older individuals, while a slight decrease in income position occurs for young and middle-aged individuals.

The geographical partitions, finally, show that the south of Italy and the smallest villages register the highest health transfers relevance; the reason of this result is mainly due to the lower income mean of these beneficiaries groups.

Table 4: Change in income mean by groups. Traditional approach

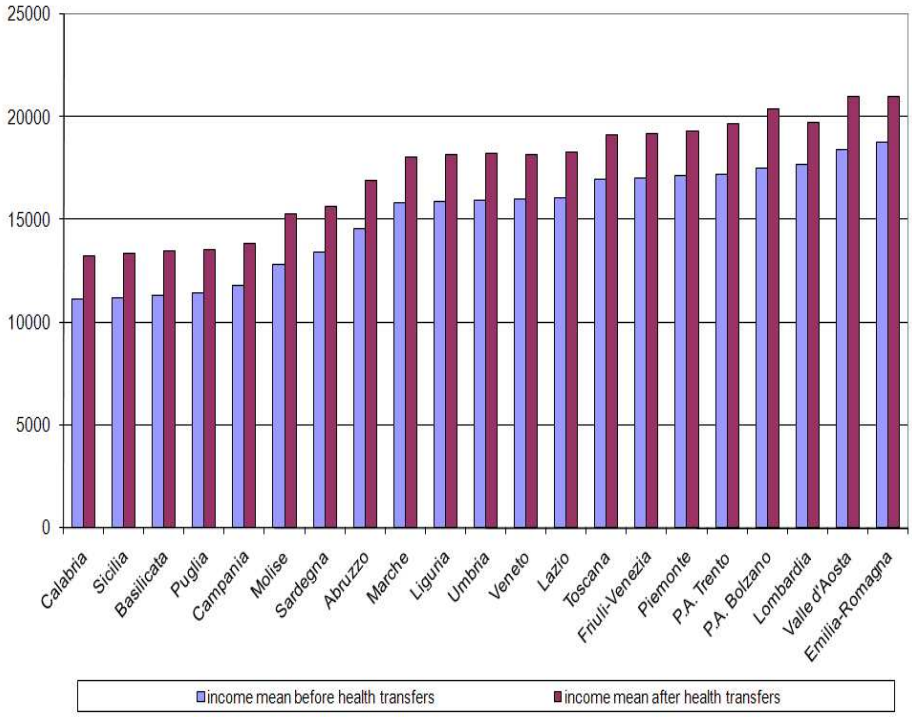
Characteristic of household or household head	Pop. share in %	Baseline Income Mean	% increase in income	Income position	
				Baseline	Extended
Socioeconomic group of HH head					
Blue collar worker	18.9	12518	13	82	82
White collar worker	17.0	17991	9	118	113
Self-employed	16.0	18692	10	123	118
Unemployed	2.8	8324	20	55	58
Pensioner	33.5	15146	19	100	103
Other	11.8	12590	19	83	86
Educational level of HH head					
Tertiary education	8.6	24135	8	159	150
Upper secondary education	27.6	17157	11	113	110
Lower secondary education	28.8	13896	14	91	91
Primary education or less	35.1	12579	21	83	88
Age of HH member					
Below 25	11.5	13442	13	88	88
25-64	65.8	15845	11	104	102
Over 64	22.7	14251	24	94	101
Area					
North	45.9	17314	12	114	112
center	19.5	16278	14	107	107
south+islands	34.6	11813	18	78	80
City size					
>50000 inhabitants	41.9	16158	13	106	105
2000-50000 inhabitants	39.6	15049	14	99	99
<2000 inhabitants	18.6	13403	17	88	90
ALL	100.0	15207	14.2	100	100

Source: Own computations from IT-SILC 2004.

A disaggregated analysis by region is shown in Figure 2 where regions are ordered according to their income mean before the health transfers; the poorest regions are located in the south of Italy (Calabria, Sicilia and Basilicata), while the richest are in the north (Lombardia, Valle d'Aosta and Emilia Romagna). After health transfers in kind, almost every region maintains the same rank, with a re-ranking between Lombardia and the autonomous province of Bolzano.

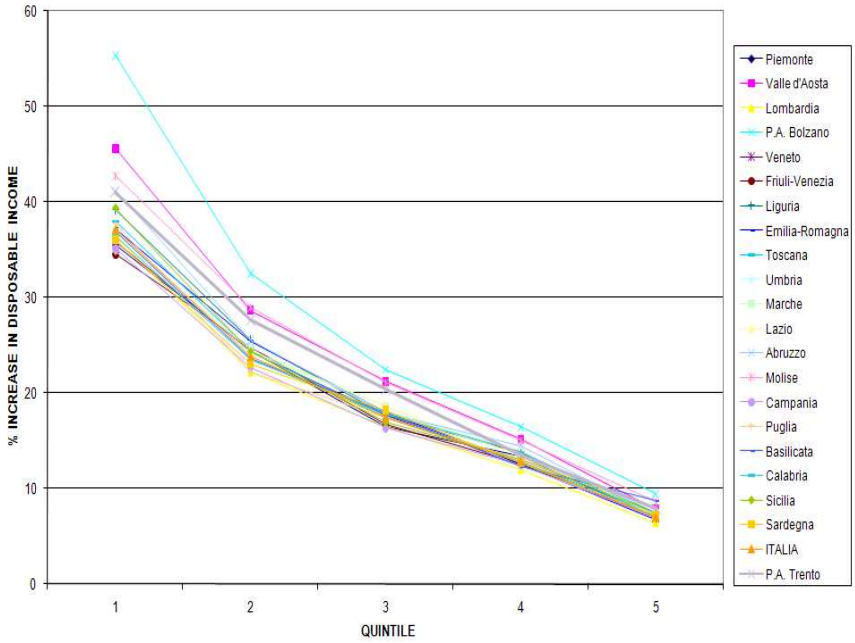
Figure 3 finally shows the percentage increase in disposable income by cash income quintile, for each region. In correspondence to the lowest quintiles, there exist huge differences in the proportions of income increase among regions; the poorest inhabitants of the autonomous province of Bolzano, of the regions Valle d'Aosta and Molise, in particular, receive a much higher relative increase in their income mean than the poorest inhabitants of the other regions do. More similar levels, among regions, of the percentage increase in income are observed for the highest income quintiles. For all the regions, the percentage increase in income mean decreases with income.

Figure 2: Regional mean income before and after health transfers (weighted by age). Traditional approach.



Source: Own computations from IT-SILC 2004

Figure 3: Regional increase (in %) in disposable income, by quintile. Traditional approach.



Source: Own computations from IT-SILC 2004

4.2 The alternative approach

We now turn to the empirical application of the new method proposed in Section 3.2. The distributional effects of health benefits depend now on whether equality of health opportunity (as defined in Section 3.2) exists. Therefore, we first carry out an empirical analysis aimed at verifying each of the definitions of EOp in Section 3.2, in order to determine whether the weights of expression (3) are different across regions.

The data set IT-SILC 2004 considers 5 health status (from 1="very good health" to 5="very bad health"). We consider a small number of income classes and of age and gender classes so that the conditional probabilities α_{ijl} for calculating e_{ij} are positive for each region; we split income into 3 equally sized classes and age and gender into the following groups: [16,44] male, [16,44] female, [45, 64], [65,).[9]

Table 5 shows the results of checking EOp dominance in terms of Definition 3.1: for each pair of regions, we test for the equalities defined in (4). We note that there is not strong EOp, since almost all of the pairs of regions show significantly different average health status by income, age and gender.

Table 5: Equality of expected health status given income, age and gender between pairs of regions.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Piemonte	.	≠	≠	≠	≠	=	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
2	Val d'Aosta	.	.	≠	≠	≠	≠	≠	≠	=	≠	=	=	≠	≠	≠	≠	≠	≠	≠	≠	≠
3	Lombardia	.	.	.	≠	=	=	=	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
4	P.A. Bolzano	.	.	.	.	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
5	P.A. Trento	.	.	.	.	.	≠	=	=	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
6	Veneto	.	.	.	.	.	.	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
7	Friuli V. G.	.	.	.	.	.	.	.	≠	≠	=	=	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
8	Liguria	.	.	.	.	.	.	.	.	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
9	Emilia R.	.	.	.	.	.	.	.	.	.	≠	=	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
10	Toscana	.	.	.	.	.	.	.	.	.	.	≠	≠	≠	=	≠	≠	≠	≠	≠	≠	≠
11	Umbria	.	.	.	.	.	.	.	.	.	.	.	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
12	Marche	.	.	.	.	.	.	.	.	.	.	.	.	≠	≠	≠	≠	≠	≠	≠	≠	≠
13	Lazio	.	.	.	.	.	.	.	.	.	.	.	.	.	=	≠	≠	≠	≠	≠	≠	≠
14	Abruzzo	.	.	.	.	.	.	.	.	.	.	.	.	.	.	=	≠	≠	≠	≠	≠	≠
15	Molise	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	≠	=	≠	≠	≠	≠
16	Campania	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	≠	≠	≠	≠	≠
17	Puglia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	≠	≠	≠	≠
18	Basilicata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	≠	≠	≠
19	Calabria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	≠	≠
20	Sicilia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	≠
21	Sardegna	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: "=" means that the t-test does not reject the hypothesis of equality of the two health distributions, while "≠" means that the t-test rejects the hypothesis of equality of the two health distributions, at a significance level of 5%.
Source: Own computations from IT-SILC 2004

Table 6 shows the results from applying the EOp defined in Definition 3.2; that there is not Rank Dominance EOp among the Italian Regions, since a rank dominance exists for some pairs of regions; in particular, Emilia Romagna, Calabria and Sardegna are the regions mostly dominated by the other regions.

[9]Note that the groups created according to age and gender are almost identical to the ones in the traditional approach; here, in order to have cells with positive frequencies, we have not split individuals 65 or more years old into 2 groups.

Table 6: Rank dominance of expected health status conditional on income, age and gender across regions

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Piemonte	.	0	C	0	0	0	0	0	0	0	R	R	0	0	0	0	0	0	R	0	R
2	Val d'Aosta	.	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Lombardia	.	.	.	0	0	R	0	0	0	R	R	R	0	0	0	0	0	0	R	0	R
4	PA Bolzano	.	.	.	.	0	0	0	0	0	0	0	0	0	R	R	R	R	R	R	R	R
5	PA Trento	.	.	.	.	.	R	0	0	0	0	R	R	0	0	0	0	0	0	R	0	R
6	Veneto	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	0	R	0	R
7	Friuli V. G.	.	.	.	.	.	.	.	0	0	0	R	R	0	0	0	0	0	0	R	0	R
8	Liguria	.	.	.	.	.	.	.	.	0	0	0	R	R	0	0	0	R	0	R	0	R
9	Emilia R.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	0	0	0	R
10	Toscana	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	0	R	0	R
11	Umbria	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	0	R	0	R
12	Marche	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	0	R	0	R
13	Lazio	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0	R	0	R
14	Abruzzo	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	R	0	0
15	Molise	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	R	0	R	R	0
16	Campania	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	R	R	0
17	Puglia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	R	0	0
18	Basilicata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	R	R	0
19	Calabria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0
20	Sicilia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
21	Sardegna	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: "C" means that the column dominate the row; "R" means that the row dominates the column; "0" means that neither the row is dominated by the column or the column is dominated by the row.
Source: Own computations from IT-SILC 2004

Moving to Definition 3.3 and 3.4, neither in terms of inequality nor in terms of welfare, there is equality of health opportunity across regions since several pairwise dominance results emerge from Tables 8 and 7. In particular, Lombardia, Friuli Venezia Giulia, Piemonte, Emilia Romagna, Toscana e Marche dominate almost all of the remaining regions in terms of inequality, showing higher proportion of good expected health status in correspondence of the poor within each age and gender class. In terms of welfare, instead, the autonomous province of Bolzano dominates most of the Southern regions, while Calabria and Sardegna are dominated by most of the other regions.

We hence conclude that in Italy in the year 2003 there exists inequality of health opportunity, in sense that the health status means conditional on age, gender and income depend on the region of residence. The weights e^r_{ij} used in expression (3) will therefore be different across regions.

We then assign to each individual the corresponding transfer c_{ijr} defined in (3) according to her region of residence, her age and gender and her income. Tables 9 and 10 illustrate the distributional effects of adding these health related transfers to the cash income of all individuals 16 or more years old.[10]

Table 9 shows that, after adding health transfers in-kind to cash income, income share increases for the three lowest income quintiles and decreases for the two highest quintiles. Note that this result is very similar to what is obtained for the traditional approach.

[10]Very similar results are obtained when we use median health status instead of mean health status. For the sake of brevity, the results are not shown.

Table 7: Rowwise Generalized Lorenz ordering of expected health status conditional on income, age and gender across regions

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Piemonte		0	*C*	0	0	0	0	0	0	0	*R*	*R*	0	0	0	0	0	0	*R*	0	*R*
2	Val d'Aosta			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*R*
3	Lombardia				0	0	*R*	0	0	0	0	*R*	*R*	0	0	0	0	0	0	*R*	0	*R*
4	PA Bolzano					0	0	0	0	0	0	0	0	0	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*
5	PA Trento						*R*	0	0	0	0	0	*R*	0	0	0	0	0	0	*R*	0	*R*
6	Veneto							0	0	0	0	0	0	0	0	0	0	0	0	*R*	0	*R*
7	Friuli V.G.								0	0	0	*R*	*R*	0	*R*	0	0	0	0	*R*	0	*R*
8	Liguria									0	0	0	0	*R*	*R*	0	0	*R*	0	*R*	0	*R*
9	Emilia R.										0	0	0	0	0	0	0	0	0	0	0	*R*
10	Toscana											0	*R*	0	0	0	0	0	0	*R*	0	*R*
11	Umbria												0	0	0	0	0	0	0	*R*	0	*R*
12	Marche													0	0	0	0	0	0	*R*	0	*R*
13	Lazio														*R*	0	0	0	0	*R*	0	*R*
14	Abruzzo															0	0	0	0	*R*	0	0
15	Molise																0	*R*	0	*R*	*R*	0
16	Campania																	0	0	*R*	*R*	0
17	Puglia																		0	*R*	0	0
18	Basilicata																			0	*R*	0
19	Calabria																				0	0
20	Sicilia																					0
21	Sardegna																					

Note: "*C*" means that the column dominate the row; "*R*" means that the row dominates the column; "0" means that neither the row is dominated by the column or the column is dominated by the row.
Source: Own computations from IT-SILC 2004

Table 8: Rowwise Lorenz ordering of expected health status conditional on income, age and gender across regions

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Piemonte	.	0	C	0	0	0	0	0	0	0	0	R	R	R	R	0	R	R	R	R	R
2	Val d'Aosta	.	.	0	0	0	R	0	R	0	0	R	R	0	R	R	0	R	R	R	R	R
3	Lombardia	.	.	.	0	0	R	0	R	0	0	R	R	R	R	R	0	R	R	R	R	R
4	PA Bolzano	.	.	.	.	0	0	0	0	0	0	0	0	0	R	R	0	R	R	R	R	0
5	PA Trento	.	.	.	.	.	R	0	0	0	0	0	R	0	0	R	0	R	R	R	R	R
6	Veneto	.	.	.	.	.	.	C	0	C	C	0	0	0	0	R	0	R	R	R	R	R
7	Friuli V. G.	.	.	.	.	.	.	.	R	0	0	R	R	R	R	R	0	R	R	R	R	R
8	Liguria	.	.	.	.	.	.	.	.	C	0	0	0	0	R	R	0	R	R	R	R	R
9	Emilia R.	.	.	.	.	.	.	.	.	.	R	R	R	R	R	R	0	R	R	R	R	R
10	Toscana	.	.	.	.	.	.	.	.	.	.	R	R	R	R	R	0	R	R	R	R	R
11	Umbria	.	.	.	.	.	.	.	.	.	.	.	0	0	R	R	0	R	R	R	R	R
12	Marche	.	.	.	.	.	.	.	.	.	.	.	.	0	0	R	0	R	R	R	R	R
13	Lazio	.	.	.	.	.	.	.	.	.	.	.	.	.	0	R	0	R	R	R	R	R
14	Abruzzo	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	R	0	R	R	0
15	Molise	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	R	0	R	R	0
16	Campania	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0	0
17	Puglia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0	0
18	Basilicata	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0	0
19	Calabria	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	0
20	Sicilia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
21	Sardegna	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Note: "*C*" means that the column dominate the row; "*R*" means that the row dominates the column; "0" means that neither the row is dominated by the column or the column is dominated by the row.
Source: Own computations from IT-SILC 2004

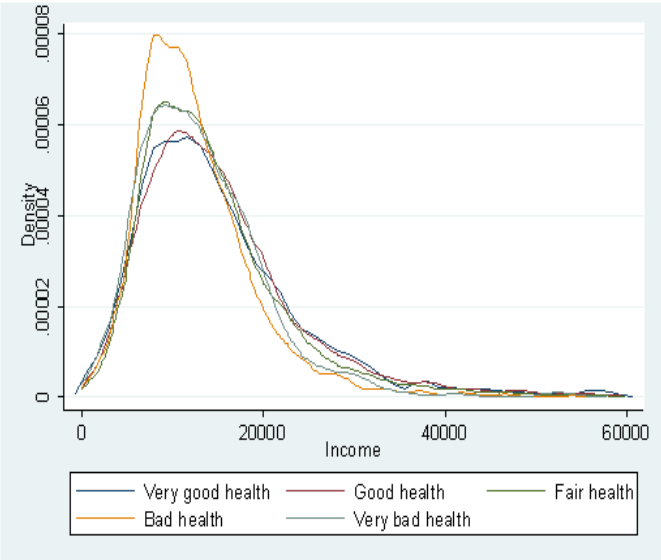
Table 9: Relevance of health transfers in kind. Alternative approach

	INCOME SHARE		% INCREASE IN INCOME DUE TO TRANSFERS TO PERSONS IN HEALTH GROUP						MEAN TRANSFER DUE TO TRANSFERS TO PERSONS IN HEALTH GROUP					
Q.LE	**A**	**B**	**1**	**2**	**3**	**4**	**5**	**ALL**	**1**	**2**	**3**	**4**	**5**	**ALL**
1	7.6	9.1	5.4	14.6	12.6	4.5	1.1	38.4	310	841	726	261	65	2203
2	12.8	13.8	2.8	8.7	8.2	2.9	0.5	23.2	272	851	801	283	52	2260
3	17.2	17.6	2.2	6.8	6.0	1.8	0.4	17.2	282	888	791	236	57	2254
4	22.6	22.3	1.6	5.7	4.2	1.1	0.3	12.9	278	982	720	182	55	2217
5	39.8	37.3	1.1	3.4	2.2	0.4	0.1	7.2	341	1020	681	111	33	2187
ALL	100.0	100.0	2.0	6.0	4.9	1.4	0.3	14.7	297	917	744	215	53	2229

Note: Q.LE means disposable cash income quintile; 1 means "persons with very good health status", 2 means "persons with good health status" and so on.
Source: Own computations from IT-SILC 2004

When health transfers are assigned to all individuals, the percentage increase in income reduces with respect to income quintile. When adding health transfers only to specific health categories, the greatest percentage increases occur for people with good and fair health status (mainly because they are the majority of population). The absolute mean transfers due to health benefits in kind increases with income for the group of individuals with better health status and decreases for the less healthy individuals. This means that the healthier people are more likely to be richer whereas the ill individuals are more likely to be poorer. This is confirmed by Figure 4 that shows that the income distribution of the least healthy individuals are strongly concentrated at low income values, while income distribution of the healthy is much more dispersed and characterized by very few people at the lowest income levels.

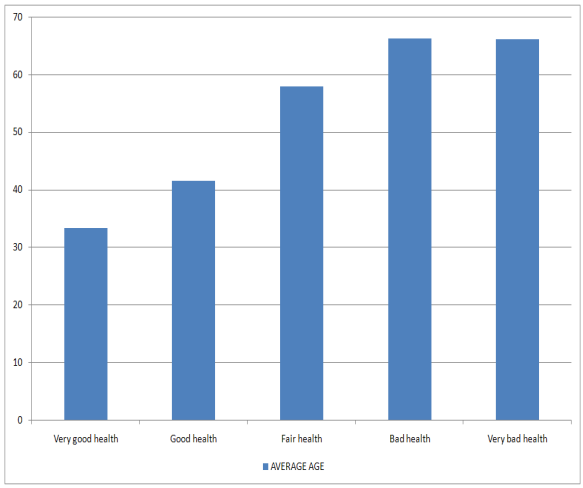
Figure 4: Kernel estimation of income distribution, by health categories.



Source: Own computations from IT-SILC 2004

Finally, a disaggregated analysis by groups is contained in Table 10, which shows

Figure 5: Mean of average, by health categories.



Source: Own computations from IT-SILC 2004

very similar results as the ones obtained from the traditional approach analysis. The groups of households that are mostly affected by health benefits are the ones with unemployed, pensioner and blue collar household heads, with a less educated head, and the ones living in the south of Italy and in small villages. The monetary transfers simulated in this exercise, however, do not modify the ranking of the household groups within each of the considered partitions.

In conclusion, we have obtained very similar results from both insurance-based approaches; one of the reasons is explained by Figure 5, which shows that age increases considerably as the health status worsens. Therefore, individuals that are highly weighted in the traditional approach are also highly weighted in the alternative approach.

The latter method, however, appears to be much more flexible, since it is based on weights that are not fixed exogenously, but are rather region specific and depend directly on the self declared health status of the individuals.

Table 10: Change in income mean by groups. Alternative approach

Characteristic of household or household head	**Pop. share in %**	**Baseline Income Mean**	**% increase in income**	**Income position**	
				Baseline	**Extended**
Socioeconomic group of HH head					
Blue collar worker	18.9	12518	15.6	82	83
White collar worker	17.0	17991	10.9	118	114
Self-employed	16.0	18692	10.9	123	119
Unemployed	2.8	8324	23.9	55	59
Pensioner	33.5	15146	17.1	100	102
Other	11.8	12590	18.3	83	85
Educational level of HH head					
Tertiary education	8.6	24135	8.4	159	150
Upper secondary education	27.6	17157	12.0	113	110
Lower secondary education	28.8	13896	15.1	91	92
Primary education or less	35.1	12579	19.9	83	87
Age of HH member					
Below 25	11.5	13442	17.0	88	90
25-64	65.8	15845	13.0	104	103
Over 64	22.7	14251	18.7	94	97
Area					
North	45.9	17314	12.6	114	112
Center	19.5	16278	13.8	107	106
South+islands	34.6	11813	19.3	78	81
City size					
>50000 inhabitants	41.9	16158	13.6	106	105
2000-50000 inhabitants	39.6	15049	14.7	99	99
<2000 inhabitants	18.6	13403	17.1	88	90
ALL	100.0	15207	14.6	100	100

Source: Own computation from IT-SILC 2004

5 Concluding remarks

This paper has considered the valuation of publicly provided health care services and the distribution of these benefits to individuals in Italy for the year 2003. We have converted into monetary amounts the benefits in kind related to the public supply of health care, by accounting for the regional expenditure for health care services; the allocation of these benefits to individuals has been justified by an insurance approach, according to which potential recipients derive benefits in proportion to their probability of becoming ill. The traditional insurance based approach mostly applied in the literature considers this probability to be a function of the individual age and gender, regardless of the actual health condition and of income.

We have overcome this limitations by proposing an alternative insurance-based approach that defines the probability of loosing good health status as function also of income. Moreover, information on self declared health status has been taken into account in the alternative approach, by defining weights that reflect more realistically the health care needs.

According to both approaches, we were therefore able to obtain an accurate value of personal income that takes into account also the benefits from the publicly provided health care service.

The main conclusions of the empirical applications are not significantly affected by the method of allocation, since the two different analyses lead to very similar results. We underlined in particular which are the groups that are the most affected by public intervention, comparing their final income distributions. From both our analyses it emerged that the highest increases in disposable income occur for the over65s and the households with unemployed, pensioner or less educated household heads. Moreover, the disaggregation by regions showed that, after the health related transfers in kind, a very slight re-ranking of the regions occurs, in term of income position.

In this paper we have assumed that the regional differences in health related services are completely assessed by the regional expenditures; however, this proxy may produce misleading results, since this approach does not take into account regional differences in costs nor regional capacity to produce a given health service for a given income budget. An alternative approach may follow the method proposed in Aaberge and Langørgen (2006), by accounting for the variation across regions in unit costs for producing health care public services and by estimating region-specific costs of attaining minimum standard of health services.

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