Health policy 152 (2025) 105240

Contents lists available at ScienceDirect

Health policy

journal homepage: www.elsevier.com/locate/healthpol

The role of socio-economic determinants in the interregional allocation of healthcare resources: Some insights from the 2023 reform in the Italian NHS☆

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ARTICLE INFO

JEL Codes:
I18
H51, H75
Keywords:
Healthcare
Resource allocation
National Health Service
Italy

ABSTRACT

This paper discusses a reform recently implemented in the Italian National Health Service, aimed at adding some socio-economic indicators to the criteria adopted for allocating healthcare funding to Regions. The reform is based on international experience in healthcare financing in decentralized settings and provides a case study of special interest since Italy is a country with significant territorial disparities and severe budget constraints. The paper first discusses the long-standing debate between Italian Regions which led to the reform. Second, it reviews the main features of the reform which provides for the inclusion of socio-economic indicators via a simplified formula. Moreover, a possible revision of the reform is proposed, fully exploiting the information on the heterogeneity of health needs according to age and socio-economic indicators. By integrating the information on deprivation inside the risk adjustment mechanism, the weight of the different drivers is determined by the distribution of needs and not on a discretionary basis. Simulating the proposed revision suggests that more resources could be allocated to the Regions with higher levels of deprivation compared to a scenario that closely replicates the reform.

1. Financing and resource allocation in the Italian National Health Service

The Italian National Health Service (INHS) has recently introduced a significant innovation in the mechanism for allocating overall financial resources to Regions by including the territorial distribution of a set of socio-economic indicators among the criteria driving the interregional allocation of funding.

This reform is based on international experience in the issue of financing healthcare assistance in decentralized countries. It is generally recognized that social status affects health status [1–5] and the international comparison shows that, in countries where lower tiers of government are responsible for healthcare, resource allocation mechanisms often include social conditions indicators among the allocation criteria [6]. For example, in Spain the incidence of households supported by social assistance is considered in the index of needs used to distribute the Fundamental Public Services Guarantee Fund to the Autonomous Communities [7]; in New Zealand healthcare funding is distributed to districts according to several criteria, including socio-economic groups [8]; in Denmark, funding for healthcare to regions and municipalities is adjusted according to demographic and social differences [7,9]; in Australia the General Revenue Assistance program is allocated on the basis of adjusted populations accounting for socio-demographic factors, including the presence of indigenous people, socio-economic status and the remoteness of different areas [10–12]. In NHS England the allocation of funding to the local service providers (Clinical Commissioning Groups) takes into account socio-economic indicators such as additional needs (health status, morbidity and deprivation), health inequalities and unmet needs (premature mortality) [13,14]. Italy is evidently a latecomer in this landscape. However, the introduction of socio-economic criteria in the allocation of healthcare funding in a country characterized by large territorial disparities and severe budget constraints provides a case study of particular interest.

Before going through the main elements of the reform, we set out, albeit briefly, the INHS financing mechanism. The funding of the INHS is based on a top-down setup in which the overall amount of public

☆ The views expressed in this paper are those of the authors and do not represent the institutions with which they are affiliated.

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https://doi.org/10.1016/j.healthpol.2024.105240
Received 12 October 2023; Received in revised form 12 June 2024; Accepted 18 December 2024
Available online 27 December 2024

resources for healthcare is determined *ex-ante* within the general framework of annual budget planning at the national level and then allocated to Regions, responsible for the actual provision of health services. This top-down mechanism allows the central government to maintain control over spending.

The total financing (128.9 billion euros in 2023) includes several components: 1) the nationwide "overall financial needs" (*fabbisogno indistinto*), by far the largest share (123.8 billion euros); 2) some minor funds (about 4,4 billion euros) earmarked for specific purposes and apportioned according to *ad hoc* criteria:; 3) an "incentive component" (*quota premiale*, equal to 0.5 % of the overall budget, 644 million euros, in 2023), introduced to encourage Regions to adopt efficient policies in healthcare provision, but actually allocated "at the margin" according to criteria agreed among the Regions which are generally not disclosed.

The nationwide "overall financial needs" (120.7 billion euros in 2023, not including some minor items) is then shared between Regions, applying a formula-based allocation mechanism to derive standard "financial healthcare needs" at the regional level (Legislative Decree 68/2011). For each Region, the financing of the corresponding "financial healthcare needs" is guaranteed, regardless of its regional tax resources (fiscal capacity). The central government estimates the revenue each Region is expected to raise from two regional taxes: a regional business tax on corporations operating in the regional jurisdiction (IRAP – *Imposta regionale sulle attività produttive*), and a regional surcharge on national personal income tax (*Addizionale regionale sull'Imposta su reddito delle persone fisiche*). For each Region, the gap between its "financial healthcare needs" and its fiscal capacity is filled in full by transfers from the central government, financed by a share of the revenues from Value Added Tax collected at the national level (Legislative Decree 56/2000) [15].

Returning to the calculation of the standard "financial healthcare needs" for each Region, the mechanism provides for the application of specific criteria to different areas of healthcare: population weighted by age groups for specialist medical care (including diagnostic tests) and for half of the total amount assigned to hospital services, unweighted population (simple capitation) for the other areas except pharmaceutical assistance (where the budget is allocated according to the shares resulting from all the other areas). Overall, this mechanism means that 40 % of the total budget is allocated according to the weighted population criterion and the remaining 60 % according to simple capitation. For health assistance areas where the weighted population criterion is applied, the weighting associated with each age group reflect specific healthcare consumption indices, standardized at the national level.

The allocation mechanism described above is the end result of several revisions introduced since the inception of the INHS in 1978, reflecting the permanent debate between Regions to obtain more resources. In particular, Law 662/96 required considering not only the population, but also healthcare consumption by age and gender, mortality rates, indicators related to particular territorial situations connected to health needs and territorial epidemiological indicators. This law has never been fully implemented. Legislative decree 68/2011, aimed at determining standard costs and requirements in the health sector, provided for a review of the allocation criteria after a transitional period. On the one hand, the inclusion of the weighting specified in Law 662/96, reflecting the poor socio-economic conditions of the South, was to offset the advantage that the consideration of the sole criterion of age provided to Northern Regions, where the population is older. On the other hand, Northern Regions have requested the introduction of a quality-related parameter to reward their greater management skills. However, although the 2014 agreement between the Government and Regions (the so-called 2014–2016 Pact for healthcare) confirmed this approach, only age continued to be considered. In 2022 the president of Campania Region went so far as to appeal to the administrative justice against the non-implementation of the new weight system provided for by Law 662/96.

The central government's objective has always been to reach a solution that is as shared as possible, to avoid that reactions contrary to more clearly oriented arrangements could be used to justify the budget overruns of some Regions. As regards public opinion in general, citizens appear to be fairly uninterested in the debate over the allocation of healthcare resources, since it involves technical issues that are not easy to follow. However, in recent years, the issue of healthcare financing has emerged more strongly from the ongoing debate on so-called "asymmetric decentralization", i.e., following constitutional reform in 2001, the ability of individual Regions, should they so wish, to ask for additional legislative and administrative responsibilities beyond those currently assigned [16]. This perspective has soured relations between some Regions in Northern Italy, eager to grab for themselves new powers and funding, and other Regions, especially in the South, who fear a reduction in central government grants and seek more equality in the allocation of resources in order to guarantee uniform levels for the provision of public services everywhere. This new source of friction between Regions has contributed to placing the issue of interregional allocation of healthcare resources under the spotlight. For example, newspapers have widely reported the initiative of the President of the Campania Region in this regard.

2. The 2023 reform of the allocation mechanism

In December 2022, an agreement between central government and Regions established the new socio-economic indicators to be applied in the regional allocation scheme, starting in 2023 [17]. All the Regions agreed to this revision as part of an overall package dealing with a number of different issues.

The reform follows a very simplified scheme. The revised mechanism provides for a small quota of the total funds to be attributed to the Regions on the basis of the new socio-economic indicators: 0.75 % according to premature mortality (deaths occurring before the age of 75) and the remaining 0.75 % on the basis of a composite index comprising three indicators, the relative poverty rate, the incidence of poorly educated people and the unemployment rate, equally weighted. Note that premature mortality is generally associated with social exclusion or deprivation [18,19]. The rest of the funding (98.5 %) continues to be allocated according to the criteria adopted in previous years. This means that the additional indicators operate simply as a marginal correction of the territorial allocation based on the criteria used up to now.

The new scheme was applied to the interregional allocation of resources for 2023 by the central government-Regions agreement in November 2023 [20]. Table 1 shows the amounts allocated to various Regions (*Reform scenario*) starting from the overall financial needs, excluding some minor items, totalling about 120.7 billion euros. This allocation is compared with what it would have been under the previous regimen based on capitation, partly weighted by age (*Pre- Reform scenario*).

Overall, the reform redistributes an amount of resources totalling 219 million euros. A clear divide emerges between northern Regions, penalized by the reform, and southern Regions, who benefit, and this obviously reflects the impact of the additional criteria on Regions. The largest redistributive effect is produced by the deprivation index, with premature mortality less significant for the reallocation of resources between Regions [21]. In the main Regions in Southern Italy (apart from Sardinia) the introduction of the new criteria partially offsets the effects of considering the age composition of regional populations in the allocation mechanism, which penalizes Regions with less elderly populations, especially Campania and Sicily, compared to a pure capitation criterion.

To complete the picture, it is worth considering the distribution of the "incentive component", allocated "at the margin" and based on bargaining between Regions. It is likely that the allocation of the "incentive component" reflects the bargaining power of individual Regions and is established to compensate, at least to some extent, for the effects of the revision of the criteria applied to the allocation of the bulk

Table 1
The effects of the 2023 reform on the regional allocation of healthcare resources.

	Distribuition of resources (billion euros)		Differences (million euros)	Distribuition of *quota premiale* (million euros)
	Pre-reform scenario	Reform scenario	Reform vs Pre-reform	
Piedmont	8.862	8.849	−12.5	17.0
Aosta Valley	0.254	0.253	−0.8	0.0
Lombardy	20.259	20.188	−71.1	155.0
Trentino Alto Adige	2.156	2.144	−12.0	0.0
Veneto	9.934	9.902	−32.7	46.9
Friuli-Venezia Giulia	2.500	2.493	−6.3	0.0
Liguria	3.206	3.201	−5.4	107.5
Emilia-Romagna	9.102	9.071	−30.4	38.6
Tuscany	7.624	7.608	−16.3	31.6
Umbria	1.791	1.788	−3.1	17.7
Marche	3.083	3.077	−6.2	12.0
Lazio	11.630	11.608	−22.4	53.0
Abruzzo	2.632	2.633	1.1	6.6
Molise	0.607	0.610	2.6	3.2
Campania	11.167	11.251	83.9	130.9
Apulia	7.985	8.030	44.9	15.8
Basilicata	1.112	1.113	1.4	4.1
Calabria	3.766	3.787	20.9	4.4
Sicily	9.765	9.821	55.6	0.0
Sardinia	3.302	3.311	8.9	0.0
Total	**120.736**	**120.736**		**644.346**
Interregional redistribution	–	–	**219.3**	

of the fund. Table 1 (last column) shows that the distribution of the "incentive component" in some cases provides gains that are larger than those resulting from application of the new criteria (e.g. in Campania or Apulia), while in other Regions (Lombardy, Liguria and Lazio) it more than compensates for the losses brought about by the reform.

3. Exploiting full information to include socio-economic indicators in the allocation mechanism

The simple solution adopted by the reform to include socio-economic indicators in the allocation mechanism of financial resources to Regions conflicts with the accurate application of the risk adjustment method [22], based on estimating the anticipated healthcare expenditure of different people according to their needs. This calculation is made after proper consideration of the relevant personal characteristics, aiming to ensure equity in access and macroeconomic efficiency [6]. In this Section we try to evaluate whether the simplified formula adopted by the reform is adequate to fully exploit the information gain that the consideration of these new drivers would allow.

Hence, we simulate the interregional allocation of financial resources resulting from an approach closely replicating the reform (*Simulation of the Reform scenario*) and then compare it with a scenario in which, in line with a risk adjustment perspective, data on the heterogeneity of health needs according to age and socio-economic indicators are jointly considered *(Simulation of the Full information scenario*). In the latter case, a matrix of consumption weights, measured at the national level, is developed to account for the impact of the two variables on health needs (each element of the matrix measures the weight associated with an individual identified by a specific couple of values of age and socio-economic status).

Micro-data are taken from the sample survey "Aspects of daily life" carried out annually by the Italian Statistical Office (ISTAT) [23]. This dataset refers to 2019 and includes 19,536 households and 45,555 individuals. The survey provides a wide array of information on the Italian population, in particular age (in 15 groups), socio-economic conditions and healthcare consumption. We partially follow the Agenas [24] methodology, updated and developed. Since health needs are neither observable nor measurable, consumption of health services can be used as a proxy for health needs, although some problems may arise because the translation of needs into consumption is not always complete (access restrictions, lack of perceived needs, inappropriate treatment). We consider information on the use of healthcare services regardless of the type of facility, public or private, which provides them. Since in the pre-reform scheme weighting by age group is applied to hospital care and specialist care, in both these areas we extend the analysis by taking socio-economic indicators into account.

First of all, a deprivation index (DI) [25] is derived on the basis of the survey data, as a proxy for the new socio-economic indicators under the reform. As shown below, the variables used to compute DI are closely related to the indicators established by the reform (in brackets below). In particular, DI is computed via five economic and social dimensions: the level of educational attainment (poorly educated people); employment status (unemployment rate); household type and dwelling in terms of both size and ownership (relative poverty rate). It is assumed that each variable has only two modes ("deprived" or "not deprived") and that the DI derived from the combination of these variables has three modes ("severe deprivation", "mild deprivation" or "no deprivation"). The level of deprivation is assigned to everyone in the survey according to the following rule: those experiencing two or more conditions of deprivation out of five are assumed to be in "severe deprivation"; those with just one condition of deprivation are considered to be in "mild deprivation"; and those who do not suffer from any condition of deprivation are in "no deprivation".

As far as hospital services are concerned, Fig. 1 shows the distribution of weighting by age groups and deprivation levels considered jointly and a comparison with the case of "Omitted deprivation", i.e. when only age is considered. It is clear that in most age groups the inclusion of the different levels of deprivation causes considerable variability in consumption. The impact of age reveals the expected trend, with a decrease in consumption after the first years of life and a gradual increase from about 50 years of age. The effect of deprivation is also evident, with higher consumption in the case of mild or severe deprivation than in the case of no deprivation, at least in the age groups which experience higher rates of hospitalization. Obviously, if the variability of consumption within the same age groups associated with different levels of deprivation varies across Regions, this affects the regional allocation of INHS funding.

The case of specialist medical care services shows a different pattern. Those in "no deprivation" make a more intensive use of health services in almost all age groups and the opposite is true for the most deprived. Consumption could be strongly determined by the fact that some people are unable to adequately meet their healthcare needs, partly due to long waiting lists for public services and high co-payments. Accounting for unmet needs, via a number of questions in the survey on forgoing medical treatment, non-deprived people still have higher consumption than the deprived, in most age groups, although with a smaller difference. Given the well-established relationship between social condition and health status, it is to be assumed that, in the case of specialist care, consumption is not a good proxy for need, even when unmet needs are accounted for, possibly due to different attitudes toward prevention and care in different social groups and the induction of demand by supply. These considerations are less relevant in the case of hospital services, often dictated by urgent and severe needs. Ultimately, we decided to limit the inclusion of deprivation to assess healthcare consumption solely to the case of hospital services and to continue to refer to weighting by age in the case of specialist care services.

As stated above, we simulated two different scenarios for the allocation of financial resources to Regions: the *Simulation of the Reform scenario*, which closely replicates the simplified formula used by the reform since deprivation considered alone is used to allocate 1.5 % of resources, and the *Simulation of the Full information scenario*, where the matrix of consumption weights for each combination of age and

Fig. 1. Hospital services: weighting by age and deprivation index (ratio to the national average).
Source: our processing based on the ISTAT survey "'Aspects of daily life".

deprivation level is used to allocate resources corresponding to hospital services.

Table 2 shows the outcomes of the application of the two scenarios on the total amount of healthcare resources in 2023 and compares them with the allocation to Regions under the previous regime. Overall, the introduction of socio-economic indicators, whatever the approach adopted, produces some redistribution across the Regions. However, the *Simulation* of *the Reform scenario* and the *Simulation of the Full information scenario* turn out to have different impacts: a summary indicator of interregional redistribution – measured by the sum of absolute gains (or, equivalently, losses) – compared to the *Pre-Reform scenario* shows that the *Simulation of The Reform scenario* relocates about 64 million euros whereas the *Simulation of the Full information scenario* redistributes more than twice that amount (140.9 million euros). The table shows the gains/losses of each Region: whatever the approach adopted, the reform penalizes the central and northern Regions (with the exception of Lazio), characterized by lower levels of deprivation, and favours southern Regions (with the exception of Abruzzo and Molise, and Apulia and Sardinia in only one scenario). Moving from the *Simulation of the Reform scenario* to the *Simulation of the Full information scenario* generally increases both gains and losses, with very few Regions (Apulia and Sardinia) showing a reversal from gain to loss or vice versa. In particular, Campania, the Region with the highest level of deprivation, gains a great deal moving to the *Simulation of the Full information scenario*.

To further clarify the impact the reference to frequencies of individuals by age group and levels of deprivation as jointly considered can have on the interregional allocation of healthcare resources, Fig. 2 directly compares the *Simulation of the Full information scenario* with the *Simulation of the Reform scenario*. Diverging from the simplified formula adopted by the reform relocates about 86 million euros in favour of some southern Regions, in particular Campania, Apulia and Calabria (44.1, 24.5 and 17.5 million euros, respectively) whereas all central and northern Regions are penalized, especially Veneto (−24.1 million euros), Piedmont (−9.9 million euros) and Lombardy (−9.6 million euros).

Table 2
Regional allocations of healthcare resources under different simulation scenarios.

	Distribuition of resources (billion euros)			Differences (million euros)	
	Benchmark scenario	Simulation Reform scenario	Simulation Full information scenario	Reform vs Benchmark	Full information vs Benchmark
Piedmont	8.891	8.887	8.877	−4.1	−14.0
Aosta Valley	0.248	0.248	0.248	−0.2	−0.5
Lombardy	20.239	20.219	20.210	−19.8	−29.4
Trentino Alto Adige	2.129	2.125	2.120	−4.5	−9.4
Veneto	9.760	9.749	9.725	−11.4	−35.5
Friuli-Venezia Giulia	2.454	2.448	2.442	−6.1	−11.4
Liguria	3.175	3.174	3.172	−0.2	−3.1
Emilia-Romagna	9.043	9.041	9.034	−1.5	−8.7
Tuscany	7.500	7.494	7.494	−5.7	−6.1
Umbria	1.694	1.690	1.685	−3.5	−8.7
Marche	3.048	3.047	3.041	−1.3	−7.1
Lazio	11.748	11.756	11.751	8.5	2.7
Abruzzo	2.549	2.545	2.544	−3.2	−4.6
Molise	0.603	0.601	0.600	−1.2	−2.1
Campania	11.372	11.407	11.452	35.0	79.1
Apulia	8.054	8.053	8.077	−1.6	22.9
Basilicata	1.083	1.084	1.085	1.2	1.7
Calabria	3.820	3.822	3.840	2.4	20.0
Sicily	10.009	10.025	10.024	15.4	14.4
Sardinia	3.318	3.320	3.318	1.8	−0.2
Total	**120.736**	**120.736**	**120.736**	–	–
Interregional redistribution	–	–	–	**64.4**	**140.9**

Source: our processing based on the ISTAT survey "Aspects of daily life".

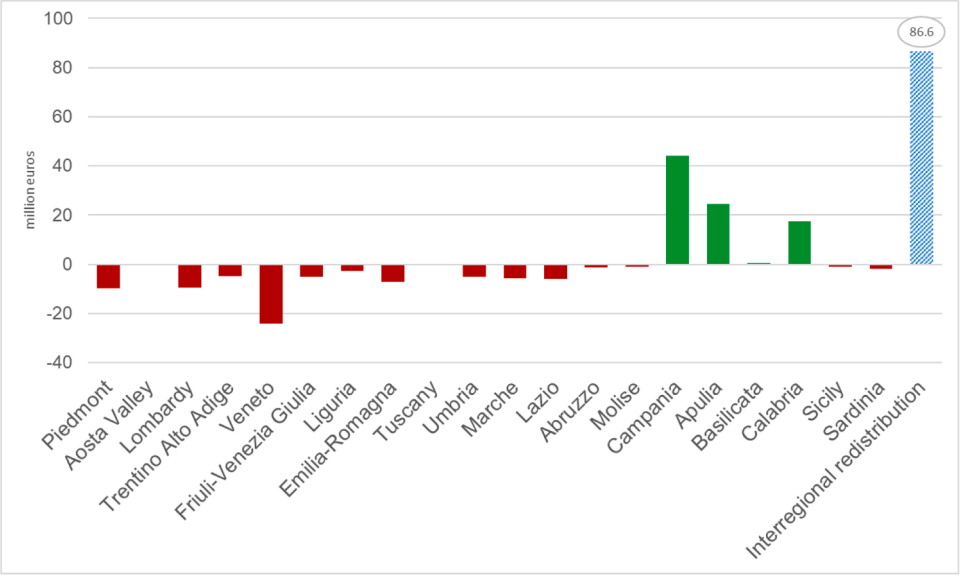

Fig. 2. *Simulation of the Full information scenario* vs *Simulation of the Reform scenario*: gains and losses and interregional redistribution indicator (million euros). *Source*: our elaborations based on the ISTAT survey "Aspects of daily life".

4. Concluding remarks

The reform recently implemented in the INHS sought to include some socio-economic indicators in the allocation of healthcare funding to Regions. Nevertheless, the amount to be redistributed to the Regions according to the new criteria is discretionary, via a simple allocation mechanism allowing the actors involved (central government and Regions) to control the distributional effects. Moreover, the impact of the reform has been at least partially offset by the discretionary assignment "at the margin" of a minor component of funding (the "incentive component") according to criteria which have not been disclosed.

By fully integrating deprivation information in the allocation mechanism, according to a risk adjustment approach, the weight of the different drivers is determined by the distribution of needs and not in a merely discretionary manner. By simulating the application of this approach and comparing it with a scenario that closely replicates the reform, it turns out that more resources would be allocated to the Regions with greater deprivation than under the simplest allocation formula specified in the reform.

To render the approach suggested here operational would require an effort to evaluate the weighting of deprivation, as well as age, for regional populations, based on administrative data (and not on survey data as here for illustrative purposes). The databases on healthcare benefits and their costs, available to Italian government departments, could be used for this purpose. This would require a number of developments and adjustments, as these databases would have to be linked to those on the economic condition of patients, such as tax data, social security data, and data on the Equivalent Economic Situation Indicator (which describes the economic condition of those applying for benefits and facilities), whilst taking care to comply with privacy regulations. However, this seems feasible and indeed is already partially carried out by the Italian tax authorities in order to provide taxpayers with precompiled tax returns, in which tax credits for healthcare expenses are incorporated. The obstacles to the adoption of this approach come on the one hand from the difficulties of collecting and managing information, including privacy obligations, and on the other from the consequent restrictions on the discretionary control of policymakers over resource allocation.

CRediT authorship contribution statement

Roberto Fantozzi: Conceptualization, Formal analysis, Methodology. **Stefania Gabriele:** Conceptualization, Formal analysis, Methodology. **Alberto Zanardi:** Conceptualization, Formal analysis, Methodology.

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