# Brazilian municipalities and their own expenditures on health: some associations

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**Abstract** *In a context that combines decentralization and underfunding of public health policy, Brazilian municipalities expressively extend their spending in this sector, allocating a proportion of their own revenues (direct taxation added to the mandatory intergovernmental transfers from the Union and the states) at levels above the ones that are constitutionally determined. However, there have been incipient studies investigating the expenditure composition on health in these federative units, in order to describe its main characteristics and explanations. In order to contribute to eliminating this gap, this article explores some associations between attributes of the municipalities (population size, region of the country, the proportion of older adults, child mortality, hiring private services and SUS transfer) and health expenditure implemented with the municipalities' own recipes. The study used descriptive statistics and multiple linear regressions in order to investigate such associations with data for 2010. The results point to tax inequities in the sector when comparing municipalities of different population groups and socioeconomic conditions, including the perception of important differences in terms of per capita spending on the analyzed expenditure items.*

**Key words** *Public health policy, Decentralization, Health expenditures, Local government*

The debate regarding the effects of decentralization has divided opinion around two polar positions. On the one hand, normatively oriented conceptions favorable to decentralization emphasize benefits such as greater ability to adapt to the preferences of citizens, efficiency in the composition of costs from the chance to explore local and greater efficiency advantages in the management and participation of citizens on the topics of interest[1-3]. On the other hand, there are those that associate decentralization to worsening/furthering inequality, rising levels of corruption, losses in economies of scale and vulnerability of local governments to negative lateral externalities[4,5]. The latter generally points to two alternatives: maintaining certain tasks and centralized structures or building mechanisms of vertical and horizontal coordination that can minimally compensate the negative effects intrinsic to the decentralized system.

Two important effects of health policy in Brazilian decentralization were the universalizing care and reducing regional disparities in the provision of services[6]. Therefore, the coordination exercised by the Union was relevant, making use of both constitutional and legal constraints on how much and how to allocate funds within the sector, as well as arenas of intermanagement pacts, standardization of planning and programming instruments and the induction of adopting actions and programs by sub-national governments via constitutional fund transfers.

However, if successful adhesion to recent policies meant largely incorporating new sources of revenue to already dependent local governments, the other paradoxically brought them to bear even more substantially with the financial sector[7-9]. This has occurred under circumstances of instability and uncertainty regarding public funding not being remedied[10,11].

Increased participation of states and municipalities in financing the Unified Health System through binding of minimum fundraising resources of each federative entity on Public Health Actions and Services (ASPS) has become one of the main alternatives to solve, or even remedy, underfunding[12]. The inflow of public revenues on health has been expanded since the 2000s, especially after the adoption of Constitutional Amendment 29, which stipulated a minimum spending of 15% of the revenues from municipalities on health. In the case of municipalities, this occurred at the expense of large budget imbalances due to compromising much of their budgets to the sector.

Unlike other public policies, municipal health expenditure showed relatively high levels of convergence in terms of budget proportions aimed at healthcare, an important factor for national uniformity in service provision. When added to the redistributive nature of conditional transfers in this area, this partly offset the concentrated or merely distributive nature of other municipal sources of revenue, such as their own tax revenues or the return of part of the ICMS revenue and automobile taxes (IPVA) by the states.

However, if on the one hand the states and especially the municipalities gradually increased their contributions to the health budget, on the other, there was a decrease of Union involvement [9,12-14]. If the process of revenue decentralization was accompanied by the decentralization of very expressive charges, it was exactly at the municipal level that the latter was more sharply affected, making the municipality the federation unit that most contributed to the health sector in proportion to their revenue[15,16].

This assertion needs to consider the specificities of subnational units. Studies have shown variations between municipalities regarding budget allocation in the health sector, especially given the socioeconomic diversity and the different liability profiles assumed by them regarding service provision, producing inequalities between them[9,11,12]. Data from municipalities of Mato Grosso indicate that the general budget composition of municipalities varies widely according to their size, especially with regard to revenues generated from their own taxation and Union transfers[17]. In a state in northeastern Brazil, it was observed that the funds allocated to primary healthcare have a greater representation in municipal spending, but without homogeneity in its application[13].

From reports in municipalities of São Paulo, it was noticed that the budgets from small municipalities were the most burdened from the SUS decentralization process due to the lack of scaling services[11]. In that same federal unit, average and especially high complexity care modalities consumed most of the funds available for the healthcare of large urban centers[15]. Nevertheless, in São Paulo, the standard of financing and expenditure on primary healthcare in municipalities with over 100 thousand inhabitants relates to different models of primary healthcare, levels of efficiency and effectiveness of the municipal health systems, as well as a level of commitment to average and high complexity services, among other factors[18].

Despite the knowledge produced by this investigation field, little is still known about the different element formation patterns of municipal expenditure on health, in particular regarding expenditure of its own revenues resulting from direct municipal taxation and mandatory intergovernmental transfers by constitutional or legal force, arising from the Union or (other) states. If the case for expenditure with revenues generated from conditional fund to fund transfers or SUS transfers, the spending is previously defined given its link to the funding, and in some cases, capital expenditure destined for federal actions and programs; in the case of municipal revenues, little is known about their destination regarding covered levels of care or the commitment levels, for example, of personnel costs or medication. Also, there is little information about health expenditure regarding the socioeconomic profile of subnational units in their entirety.

Given this gap, this study aims at investigating the establishment of Brazilian municipalities' own costs, with different population sizes and socio-economic inclusion, considering the assumption that any inequities may compromise uniformity in provision of services to each and every Brazilian citizen, who, regardless of their municipality of residence is vested with the same rights and duties. The procedures used in exploring associations between profiles of municipalities and their own revenues with health spending patterns are described in the next section.

## Methods

These results were obtained by a quantitative, exploratory, descriptive and retrospective study in which the behavior of the selected variables for the year 2010 was verified. The selection of the latter (year) was due to the need to isolate a period in which sectoral rules for the establishment of healthcare revenues and expenses in the municipalities were relatively stabilized, considering that on the one hand, the regulation of conditional transfers by the Pact for Healthcare policies implemented by the Ministry of Health (MH) Ordinance 399, 2006 and amended by Ordinance MH 204, 2007; and on the other hand, the Constitutional Amendment 29/2000, whose implementation by Law number 141/2012 was guided only by Resolution 322/2003 of the National Health Council.

Three data sources were used in constructing the database: the Information System on Public Health Budgets (SIOPS/DATASUS); the research "Medical and Sanitary Care" (*Assistência médico-sanitária* – AMS) and the Census, both conducted by the Brazilian Institute of Geography and Statistics (IBGE), respectively referring to 2009 and 2010; and finally, the Atlas of Human Development in Brazil, 2013, prepared by the United Nations Development Program (UNDP). The database included 5,526 municipalities, where 39 municipalities were excluded as they did not declare any expenditure to the SIOPS. Of these 39 municipalities, 24 had up to 20,000 inhabitants; 10 between 20,001 and 50,000 inhabitants; two between 50,001 and 100,000 inhabitants; two between 100,001 and 200,000 inhabitants; and one municipality above 400,000 inhabitants.

We considered the per capita expenditure on healthcare from municipal governments' own revenues as the dependent variable in order to account for the specific per capita expenditure for various factors involved in the production of health services - such as labor force, capital investments, cost items (materials, maintenance, pharmaceuticals); as well as in the complementary purchase of services – medical and laboratory services, court decisions, etc., affected by the population size and socioeconomic conditions of the municipalities. The values used in the database were all related to involved costs. It is important to note that the nature of the information in SIOPS in the year in question was declaratory, which enables underreporting of their own expenses. Independent variables included the demand for health services and the size of the installed healthcare network, in addition to population size and socioeconomic conditions of the municipalities.

The population size variable is justified by the fact that the population size leads to different demands on local health policy in terms of complexity and range of services, including actions in bigger municipalities that are not viable in most of them. For constructing this variable, IBGE data and the same SIOPS category were used for the relative distribution of the resident population by size classes of the municipalities' populations.

Socio-economic conditions of the municipalities was a variable operationalized by the election of macro-regional integration as a proxy able to capture the regional differences, which manifest themselves as different capacities of capturing and implementing budgets for healthcare. Historically, municipalities inserted in the

Southeast and South regions retain higher levels of their own revenues; they also account for more professionals and services, offering more competitive markets and more alternatives to make purchases and contracts. Despite strategies for reducing inequalities triggered by the SUS, regional inequalities still persist[19].

The variable demand for health services was represented by using the proportion of older adults and infant mortality rate (IMR), available at UNDP. As it is known, chronic conditions generate significant economic impact on municipalities due to the long periods in which they manifest themselves, and in some cases tend to last permanently. As the prevalence of chronic diseases is higher among older adults, the proportion of older adults per one hundred people was used as an indicator; and by specifying the number of children who will not survive the first year of life per one thousand live births, IMR is presented as one of the best standard of living indicators and social well-being of a population[20].

Regarding the installed healthcare network variable, two pieces of information were used for its representation. One is binary and indicates if there is at least one private health service contract run exclusively with municipal funds. These contracts are made exclusively from their own funds, and possibly include those made outside the SUS Table values, as well as resorting to providers from other municipalities, indicating the inexistence of such services in the SUS network of that area. The other variable referring to the network of services was identified from the amount of funds transferred from the Union to the municipal healthcare funds, being built and categorized from information also contained in the SIOPS.

After identifying the variables, health spending from municipalities' own funds was described from the types of expenses selected in SIOPS. Next, we sought to identify the associations between this variable and the selected independent variables. The Ordinary Least Squares Method (OLS) was applied to estimate the multiple regression parameters that help to more accurately understand oscillation of the dependent variable[21]. The possible endogeneity of the model was not addressed due to a lack of suitable instruments indicated in the literature. Thus, all analyzes in the results section were in terms of associations rather than causalities.

## Results

A first analysis of per capita expenditure on healthcare with municipalities' funds reveals some funding usage patterns (Figure 1). Considering twelve types of expenditures arising from the municipal budget in 2010, the median per capita expenditure was R$228.89. Expenses using the payment of "personnel and payroll charges" showed a median of R$173.71, which represented 75.9% of total expenditure on healthcare, indicating a strong prevalence of such charges in the municipalities' expenditures using their own funds. "Medical, hospital, dental and laboratory services", i.e. expenses for the payment of contracted services with the SUS under municipality management represented a second type of expense that was highlighted, however, with a median of only R$16.38; well below the main value previously analyzed.

Table 1 provides a relationship between the five major types of per capita expenditure listed in Figure 1 and the population size. The median expenditure per capita for "Personnel and payroll charges" of the municipalities up to 20,000 inhabitants is relatively very high, being close to the expenditure of those over 400,001 inhabitants (R$186.09 and R$185.53, respectively), noting that the former has greater variation among municipalities of this population size. With the exception of municipalities with up to 20,000 inhabitants, the trend was the increase in median as there was an increase in population size.

Municipalities with up to 20,000 inhabitants also showed greater median expenditure per capita for all other components analyzed, except for "medical, hospital, laboratory and dental services." For this, municipalities with up to 20,000 inhabitants only had higher expenditures than municipalities with 20,001 to 50,000 inhabitants. Those with a population greater than 400,001 inhabitants had a median of R$87.25, almost double the median of the municipalities with the second highest expenditure on payment services.

For the expenditure of "medication", the median decreases up until the municipalities with 200,000 inhabitants, gradually rising in the remaining population sizes. This same distribution is not observed in relation to spending on "distribution of free medication". We highlight the expenditures of small municipalities (R$9.42) and a certain similarity in expenditures of the others,
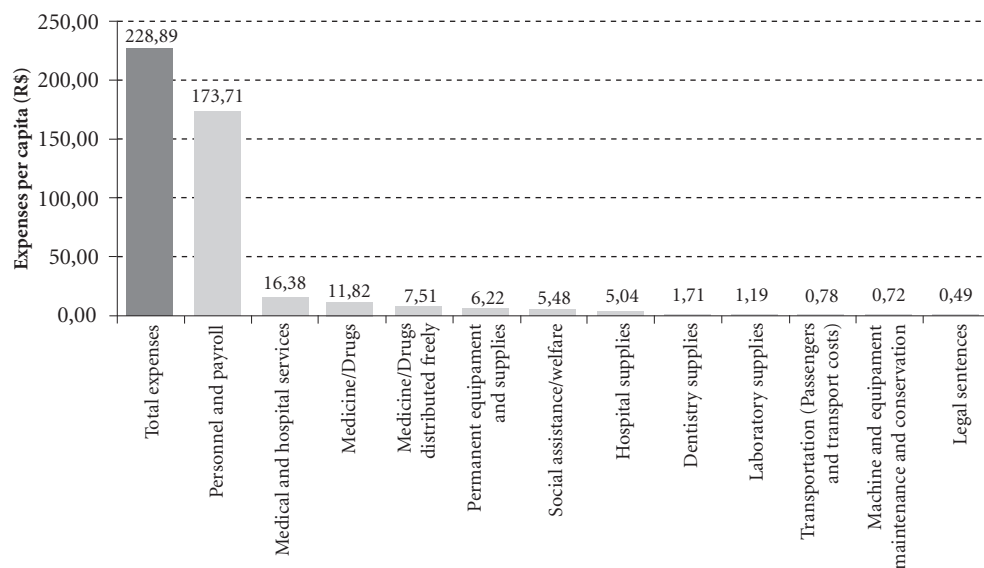
**Figure 1.** Median health expenditure per capita by expense type using the municipalities' own funds, Brazil, 2010.

Source: SIOPS, 2010

with a sharp decline in per capita expenditure in those with more than 400,001 inhabitants. A close distribution is also observed in expenses for "permanent equipment and supplies", with higher median per capita and variation in smaller municipalities.

When analyzing the total expenditure of municipalities' own resources on health according to the population size (Table 2), it is observed that it decreases as the population decreases. Again, the exception is municipalities up to 20,000 inhabitants, representing 70.80% of Brazilian municipalities. Those with populations between 200,001 and 400,000 inhabitants and over 400,001 inhabitants represent only 1.44% and 0.95% of the municipalities, respectively, but they concentrate the majority of population and the most specialized network of healthcare service. The median expenditure of the former is R$264.69, while the latter was R$291.88.

Table 2 also relates other variables for the description of the per capita expenditure on health originating from municipal revenues, including: region of the country, the proportion of older adults, child mortality, presence of hiring private services exclusively with their own funds and transfers of union resources.

As for the variable "proportion of older adults", it was observed that the highest expenditures per capita on healthcare by municipalities are concentrated on those with a higher proportion of this population. The greatest need of attention for the older adult is probably due to the higher prevalence of chronic diseases, and therefore seems to directly affect the spending levels made with the municipalities own revenues. However, the relationship was inversely proportional for the "child mortality" variable; the lower the child mortality rate, the higher the per capita expenditure of their own revenues on health. The municipalities whose rate ranged up to 9.9% (1.61% of total) had a per capita median of R$290.15; a figure that is 55.4% higher than the median spending of municipalities with the highest child mortality rates (greater than 20 deaths per thousand live births).

Regarding the presence of "hiring private services exclusively with their own funds", only 23.66% municipalities did not need to hire private services exclusively with their own revenues to complement public services. Moreover, the higher the per capita amounts arising via "SUS transfers", the higher the municipalities' health expenditures using their own funds, except in

**Table 1.** Central and Variation Measures by Type of Expenditure Per Capita Funded by Brazilian Municipalities' Own Funds by Population Size, 2010.

| Type of expenditure | Population Size | N | % | Median | Standard deviation |
|---|---|---|---|---|---|
| Personnel and payroll | Less than 20,000 | 3.889 | 70,4 | 186,09 | 101,80 |
| | 20,001 – 50,000 | 1032 | 18,7 | 146,36 | 86,81 |
| | 50,001 – 100,000 | 323 | 5,8 | 147,85 | 89,17 |
| | 100,001 – 200,000 | 148 | 2,7 | 149,30 | 93,68 |
| | 200,001 – 400,000 | 81 | 1,5 | 173,48 | 82,70 |
| | More than 400,000 | 51 | 0,9 | 185,53 | 91,82 |
| | *Total* | 5.524 | 100 | 173,71 | 99,87 |
| Medical, hospital, dental and laboratory services | Less than 20,000 | 1.870 | 69,4 | 15,89 | 49,10 |
| | 20,001 – 50,000 | 464 | 17,2 | 11,12 | 47,88 |
| | 50,001 – 100,000 | 178 | 6,6 | 25,14 | 75,30 |
| | 100,001 – 200,000 | 100 | 3,7 | 23,31 | 77,34 |
| | 200,001 – 400,000 | 50 | 1,9 | 45,24 | 104,53 |
| | More than 400,000 | 33 | 1,2 | 87,25 | 90,27 |
| | *Total* | 2.695 | 100 | 16,38 | 56,02 |
| Medication | Less than 20,000 | 3.883 | 70,5 | 13,82 | 23,53 |
| | 20,001 – 50,000 | 1.032 | 18,8 | 9,05 | 12,97 |
| | 50,001 – 100,000 | 323 | 5,9 | 7,38 | 12,75 |
| | 100,001 – 200,000 | 144 | 2,6 | 7,17 | 14,17 |
| | 200,001 – 400,000 | 79 | 1,4 | 8,13 | 8,87 |
| | More than 400,00 | 44 | 0,8 | 9,72 | 8,56 |
| | *Total* | 5.505 | 100 | 11,82 | 21,31 |
| Free of charge medication | Less than 20,000 | 1.159 | 69,2 | 9,44 | 26,24 |
| | 20,001 – 50,000 | 314 | 18,8 | 5,67 | 10,82 |
| | 50,001 – 100,000 | 106 | 6,3 | 5,50 | 8,01 |
| | 100,001 – 200,000 | 48 | 2,9 | 7,27 | 9,08 |
| | 200,001 – 400,000 | 32 | 1,9 | 5,85 | 6,07 |
| | More than 400,000 | 15 | 0,9 | 1,54 | 4,63 |
| | *Total* | 1.674 | 100 | 7,50 | 22,93 |
| Permanent equipment and supplies | Less than 20,000 | 3.776 | 70,3 | 8,13 | 17,75 |
| | 20,001 – 50,000 | 1.009 | 18,8 | 4,52 | 6,95 |
| | 50,001 – 100,000 | 318 | 5,9 | 4,22 | 4,86 |
| | 100,001 – 200,000 | 141 | 2,6 | 4,04 | 4,53 |
| | 200,001 – 400,000 | 81 | 1,5 | 3,74 | 3,45 |
| | More than 400,000 | 45 | 0,9 | 3,17 | 4,56 |
| | *Total* | 5.370 | 100 | 6,22 | 15,65 |

Source: SIOPS, 2010; IBGE, 2010.

cases with the highest transfers (which only represent 0.19% of the total).

Given these results, Table 3 seeks to refine the associations between variables in order to enhance understanding. To this end, the model of Ordinary Least Squares Method was used.

In this case, the final sample consisted of a total of 5,466 municipalities, as 60 municipalities

**Table 2.** Percentage Distribution of Municipalities and Median Per Capita Expenditure on Health originating from municipal revenues by Variable Category in Brazilian Municipalities, 2010.

| Independent variables | Categories of independent variables | Percentage distribution of municipalities | Median Per Capita Expenditure by variable (R$) |
|---|---|---|---|
| **Region of the country** | North | 7,99 | 181,62 |
| | Northeast | 32,11 | 189,62 |
| | Midwest | 8,38 | 280,65 |
| | Southeast | 29,99 | 250,20 |
| | South | 21,53 | 287,57 |
| **Size of Municipalities** | Up to 20,000 inh. | 70,80 | 245,52 |
| | Between 20,001 and 50,000 inh. | 19,03 | 187,50 |
| | Between 50,001 and 100,000 inh. | 5,84 | 195,45 |
| | Between 100,001 and 200,000 inh. | 2,51 | 205,62 |
| | Between 200,001 and 400,000 inh. | 1,45 | 264,69 |
| | Equal or higher than 400,001 inh. | 0,38 | 291,88 |
| **Proportion of Older Adults** | Up to 0.499 | 7,72 | 194,35 |
| | From 5.00 to 9.99 | 67,22 | 221,64 |
| | From 10.00 to 14.99 | 24,44 | 259,71 |
| | Over 15.00 | 0,62 | 478,58 |
| **Child mortality** | Up to 9.9‰ | 1,61 | 290,15 |
| | From 10‰ to 14.9‰ | 33,13 | 269,35 |
| | From 15‰ to 19.9‰ | 28,61 | 255,51 |
| | Over 20‰ | 36,66 | 186,75 |
| **Hires Private Services exclusively from their own funds** | Yes | 76,34 | 235,33 |
| | No | 23,66 | 210,53 |
| **SUS transfers** | Up to 100 | 30,54 | 214,42 |
| | From 101 to 150 | 43,17 | 221,35 |
| | From 151 to 200 | 17,55 | 248,93 |
| | From 201 to 300 | 7,20 | 284,14 |
| | From 301 to 500 | 1,36 | 390,88 |
| | At or above 501 | 0,19 | 308,52 |

Source: SIOPS, 2010; IBGE 2009, 2010; UNDP 2013.

presenting outlier cases were excluded; due to being influential cases, they alter the parameter value estimation. All analyzes were individually performed for each factor and considering the other provisions (*ceteris paribus* effect).

Model 1 shows that the per capita expenditure of municipalities using their own funds is lower in the North and Northeast, and higher in the South and Midwest in relation to the Southeast. The relations remain when adding the variable "population size" (model 2). There is a trend in comparison with the municipalities up to 20,000; a progressive increase in the difference between the other municipality sizes in spending funds from municipal collections as the population grew, with the exception of municipalities between 200,001 and 400,000 inhabitants.

Model 3 considers two other variables, which are related to contextual factors: "logarithm of child mortality" and "proportion of older adults" in the municipality. This transformation is used to obtain ratio elasticity. An increase of 1% in child mortality is associated with a lower per capita expenditure by Municipalities using their own funds, while 1% increase in the proportion of older adults is positively associated with per capita expenditure of municipalities using their own funds. This confirms the data from Table 2. In an opposite direction, the more that is invested in health, the greater the chances that a child born alive completes the first year of age; an explanation that would support the fact that municipalities which allocate less of their own resources to health are precisely those with high-

**Table 3.** Coefficients and standard errors estimated by ordinary least squares models for the dependent variable "logarithm of Expenditure on Health Funded by Brazilian Municipalities' own funds", Brazil, 2010.

| Independent variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|
| Constant | 5,6228*** | 5,6228*** | 6,3191*** | 5,0276*** | - |
| | (0,0111) | (0,0111) | (0,1115) | (0,1168) | |
| Region of residence | | | | | |
| Southeast | Reference | Reference | Reference | Reference | Reference |
| North | -0,3566*** | -0,3368*** | -0,2099*** | -0,2823*** | -0,1615 |
| | (0,0234) | (0,0228) | (0,0270) | (0,0259) | |
| Northeast | -0,3258*** | -0,3160*** | -0,1466*** | -0,1914*** | -0,1885 |
| | (0,0149) | (0,0146) | (0,0227) | (0,0215) | |
| South | 0,1094*** | 0,0885*** | 0,0308* | 0,0260 | 0,0226 |
| | (0,0166) | (0,0162) | (0,0171) | (0,0162) | |
| Midwest | 0,0578** | 0,0438* | 0,0594** | -0,0678*** | -0,0396 |
| | (0,0230) | (0,0223) | (0,0231) | (0,0224) | |
| Size of the Municipality | | | | | |
| Up to 20,000 inh. | | Reference | Reference | Reference | |
| Between 20,001 and 50,000 inh. | | -0,2405*** | -0,2524*** | -0,2414*** | -0,1998 |
| | | (0,0148) | (0,0153) | (0,0145) | |
| Between 50,001 and 100,000 inh. | | -0,1838*** | -0,2178*** | -0,2708*** | -0,1339 |
| | | (0,0246) | (0,0255) | (0,0242) | |
| Between 100,001 and 200,000 inh. | | -0,2168*** | -0,2597*** | -0,3305*** | -0,1090 |
| | | (0,0367) | (0,0378) | (0,0359) | |
| Between 200,001 and 400,000 inh. | | -0,0164 | -0,0680 | -0,1683*** | -0,0424 |
| | | (0,0480) | (0,0491) | (0,0465) | |
| At or above 400,001 inh. | | -0,5845*** | -0,6520*** | -0,7812*** | -0,1019 |
| | | (0,0923) | (0,0923) | (0,0874) | |
| Child Mortality Logarithm | | | -0,2967*** | -0,3632*** | -0,2657 |
| | | | (0,0324) | (0,0307) | |
| Proportion of older adults logarithm | | | 0,0555** | -0,0103 | -0,0069 |
| | | | (0,0226) | (0,0215) | |
| SUS Transfers Logarithm (per capita) | | | | 0,3428*** | 0,3066 |
| | | | | (0,0134) | |
| Hires Private Services | | | | 0,0278** | 0,0249 |
| | | | | (0,0132) | |
| R² | 0,1608 | 0,2104 | 0,2249 | 0,3091 | 0,3091 |
| Adjusted R² | 0,160 | 0,209 | 0,223 | 0,307 | 0,307 |
| F test | 261,6*** | 161,5*** | 143,8*** | 187,6*** | 187,6*** |
| Sample size (n) | 5.466 | 5.466 | 5.466 | 5.466 | 5.466 |

Note: *** Significant at 99% confidence level; ** Significant at 95% confidence level; * Significant at 90% confidence level.
Obs: Standard errors in parentheses. No problems in the estimation were found when using the Variance Inflation Factors (VIF) test for determination of multicollinearity (Greene, 2011).
Source: SIOPS, 2010; IBGE 2009, 2010; UNDP 2013

er child mortality rates. However, given the diversity of exogenous variables that affect child mortality, this explanation is not attributed a status that goes beyond a hypothesis.

In Model 4, the variables "logarithm of SUS transfer per capita" and "hiring private service exclusively with their own revenues" are included. Municipalities that hire services had higher expenditures, as well as those with higher SUS transfers. For this model, the variable "proportion of older adults logarithm" was not statistically significant, while the others followed the same direction in relation to the models 1 to 4.

Finally, model 5 relates to model 4, but is standardized. This allows us to observe which terms had greater contribution to understand-

ing the variance of the term to be explained. In this study, the main variables were "SUS transfers logarithm per capita" and "Child Mortality logarithm", in addition to population size.

## Discussion

Faced with an underfunding context of the health sector, the combination of demanding final objectives - such as universality and equality of access to public health services - and the decentralization of the means necessary for achieving it have been challenging the shared management between three spheres of government that articulate the Unified Health System. Normative centralization and the institutionalization of coordination structures have created important counterweights in the direction that the second element does not compromise the achievements of the first. However, municipalities have very different specific conditions to fulfill their role in the health system.

According to the presented data, revenue allocation from their own municipalities is mostly geared towards remunerative nature of expenses resulting from effective exercise of offices, positions or actions of trust, and various types of labor obligations being of employer responsibility. This probably arises from the very decentralization and needs of municipalities to generate effective conditions of policies in their territory. The decentralization process has reserved the function of "managing and implementing public health services" (Article 18, item I of Law no. 8080/90) for municipalities in a sector with intensive use of a professionalized workforce, and therefore despite the different transfer modalities to fund SUS services, it gave them the task of ultimately ensuring the effective conditions of policies in the territory.

Municipalities have notable and distinct difficulties in several regions of the country to recruit and hire superior to average level personnel; especially doctors, which could be a contributing factor to the deteriorating relations and management of healthcare work. Given that personnel costs (including costs) are difficult to compress, at the same time they are limited by provisions of Art.18 of the Fiscal Responsibility Law, the frequent outputs of subnational units are the creation of social organizations, partnerships with OSCIP and temporary hiring of autonomous and contracted persons, among others, which leads to weakening relations with health professionals.

As for per capita expenditure presented by small municipalities, it was observed that they equaled or were superior to those with over 200,000 inhabitants, which includes State capitals. One possible similarity between such different territorial units can happen for multiple reasons. Among possible explanations, the first could be higher per capita spending due to difficulties in capturing funds, recruiting and maintaining professionals, particularly doctors, and charge for average and high complexity procedures, as well as economies of scale problems. The highest levels of per capita spending on inputs and capital investments reinforce this perception, in addition to the personnel expenses discussed above. Municipalities with more than 200,000 inhabitants are reference for the local and regional population for installation of more specialized and complex care networks, representing the main recipients of intergovernmental transfers from the SUS. Therefore, it would be expected that small municipalities received a lower volume of SUS transfers versus the larger municipalities due to having a care network of less technological complexity, but this would not be the case as allocators of their own revenues.

However, caution is recommended regarding the claim that smaller municipalities have a similar allocation to the larger municipalities, as models only measure only associations. As a result of this study, per capita spending tends to decrease with the increase in population. Nevertheless, further research to confirm and explain these expenditure differences on health between municipalities with different sized populations is still needed, judging by the great diversity among municipalities categorized as small (up to 20,000 inhabitants), representing over 70% of all municipalities in the country.

The study of variables related to contextual factors (child mortality and the proportion of older adults) produced convergent results with the expectations that the highest proportion of older adults in the population tends to put pressure on local expenditures due to the accumulation of chronic health problems and complex treatments. However, the variable was not statistically significant in the final model. The negative association between child mortality and per capita expenditure of their own revenues suggests that greater capacity of municipalities to increase their health spending favors an improvement in people's living conditions. In addition, it enhances awareness to the importance of the variable socioeconomic condition of the municipality, as

those with lower availability of their own revenues are inserted in less economically developed and worse social conditions.

The positive association between higher levels of per capita expenditure of their own revenues on health and performing at least one contract with private services made exclusively by payment provided with their own funds was expected.

The assumption is that such contracts can make it difficult for small municipalities to have access to regionalized services of average and high complexity, as payment for services will incur high unit costs. But here we also suggest caution about the claims derived from the association between this variable and per capita expenditure levels, as less than a quarter of municipalities do not hire private services with their own resources, as per capita spending differences between them and the others could be very low; a situation that has not been possible explore in this study.

Another problem is the analysis of "transfers from SUS logarithm per capita." The positive correlation could be explained in two ways, but lacks deeper investigation. On the one hand, it is possible that transfers to fund specific services are insufficient, and then end up being terminated due to increasing counterparts by municipal managers for their maintenance. On the other hand, in the case of medium and large sized cities, their physical and financial limits of regional reference may also be insufficient to cover spending on average and high complex procedures, requiring greater consideration of their own funds.

This already characterizes a situation of inequity from a tax standpoint facing residents in other municipalities.

The combined findings of this study suggest the need for progress in evaluating public spending patterns on health, especially considering the quality of the management decentralization process that gave the municipalities a central role in the provision of health services. The first step suggested is longitudinal analysis of their own health spending, focusing on the variation in the amount and composition of spending over time and the changes in management, which will further improve the understanding of the causal relationships between the proposed variables.

It is also important to consider the municipal difference in health regions because, despite there being a public policy with strong federal regulation and being subject to multiple mechanisms of federal coordination, expenses are not immune to inequities in economies of scale related to the population size of the municipalities and health responsibilities. In the latter case, research is necessary to examine the extent to which health region organization and formalization of regional pacts, especially in terms of Decree 7.508/2011, may or may not be affecting the implemented expenditure with their own funds, as described herein.

Finally, this work demonstrates an expenditure pattern whose key elements present tax inequities and the need to deepen solutions to prevent reproducing the inequalities and break uniformity in providing health services.

## Collaborations

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