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Governance in managing public health resources in Brazilian municipalities

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This study contributes to the health governance discussion by presenting a new data set that allows for comparisons of the management of health resources among Brazilian municipalities. Research on Brazil is particularly important as the provision of health services was decentralized in 1988 and since then municipalities have been given greater responsibilities for the management of fiscal resources for public health service provision. Based on detailed information on corruption practices (such as over-invoicing, illegal procurement and fake receipts) from audit reports of health programmes in 980 randomly selected Brazilian municipalities, this study deepens understanding of the relationship between health governance institutions and the incidence of corruption at the local level by exploring the extent to which horizontal and vertical accountabilities contribute to reducing the propensity of municipal government officials to divert public health resources for private gain. The results of our multiple regression analysis suggest that the experience of health municipal councils is correlated with reductions in the incidence of corruption in public health programmes. This impact is significant over time, with each additional year of health council experience reducing corruption incidence levels by 2.1% from baseline values. The findings reported in this study do not rely on the subjectivity of corruption measures which usually conflate the actual incidence of corruption with its perception by informants. Based on our results, we provide recommendations that can assist policy makers to reduce corruption.

Keywords Brazil, governance, corruption, decentralization, accountability, elections, health councils

KEY MESSAGES

- With detailed information on corruption practices (such as over-invoicing, illegal procurement and fake receipts) from audit reports of health programmes in 980 randomly selected Brazilian municipalities, our study finds that there is an important relationship between health governance institutions and the incidence of corruption at the local level.
- A new institution created following the decentralization launched by the 1988 Constitution, the municipal health council, seems to be significant in reducing corrupt practices in the local management of health services.
- For each additional year of existence of the health council, the percentage of federal health grants to municipalities that were subject to corrupt practices fell by 2.1% from their baseline value.
- The analysis suggests that the existence of a council may be responsible for a 21% decrease in corruption practices over 10 years.

Introduction

In recent years, governance has been at the centre of discussions about the performance of health systems in addressing problems of inefficiency and low-quality services.[1] Among many issues, corruption is considered the most pervasive threat to good governance. The negative effects of corruption on citizen welfare are revealed in the decreased ability of health systems to provide basic services, such as immunization, or achieve universal goals, such as reducing infant mortality. Moreover, the diversion of resources caused by corruption not only reduces the level of service delivery but also the efficiency of health programmes. Not surprisingly, some authors have argued that the level of corruption can be considered as a reasonable proxy for the quality of health governance performance (Lewis 2006).

The health sector is more vulnerable to corrupt practices for a number of reasons. The large amounts of money involved in the sector; the number, dispersion and power differentials among actors (drug companies, professional unions, etc.) and the basic information asymmetry that characterizes the relationship between health professionals and their patients are some of the most common reasons. 'No other sector ... has the specific mix of uncertainty, asymmetric information and large numbers of dispersed actors that characterize the health sector' (Savedoff and Hussmann 2006: 5).[2]

Health governance debates have also focused on the relationships among corruption, decentralization of services and accountability of health officials. Though empirical analyses of the effects of decentralization on corruption have been inconclusive, decentralization is considered to be a means to enhance democratic governance and reduce corruption (Fisman and Gatti 2002). More decentralized health systems, the argument goes, should yield greater efficiencies when decision-making and management are in the purview of local actors. Yet, this expectation relies on at least two key assumptions that may not be easily fulfilled. First, it supposes that local bureaucrats are qualified to take over a new and enlarged 'decision space' with only limited supervision from the central government.[3] This is a debatable assumption, particularly in developing countries where high-quality local bureaucracies are often lacking.

The second assumption is that it is relatively easy to hold local authorities accountable as high-quality information is readily available to both citizens (vertical accountability) and government institutions at the local level to check on the performance of other public agencies and branches (horizontal accountability) (O'Donnell 1994). Again, this assumption is questionable. Numerous studies have documented that health systems are plagued by widespread information problems (Lewis 2006; Savedoff and Hussmann 2006; Savedoff 2007). In developing countries, including those in Latin America, the weak and intermittent quality of horizontal accountability has been identified as one of the stumbling blocks to the realization of representative democracy (O'Donnell 1994, 2003).

For these reasons, the transfer of resources and decision-making to local levels may (potentially) increase, rather than decrease, the scope for corruption in the health sector (Bossert 2008). The extent to which corruption will be a significant consequence of decentralization will be contingent on accountability devices that enable monitoring of local decision-making both horizontally and vertically. Earlier attempts to assess the effects of health decentralization on corruption have been restricted to in-depth case studies or to region-specific quantitative analysis. Due to lack of data, there are few comparative studies focusing on corrupt practices in the management of health spending at the municipal level.

This study seeks to contribute to the health governance discussion by presenting a new data set that allows for comparisons of health resources management in Brazilian municipalities.[4] With detailed information on corrupt practices (such as over-invoicing, illegal procurement and fake receipts), we generate a measure that detects objective evidence of corruption, thus overcoming the greatest shortcoming in corruption studies: measurement subjectivity. We undertake a preliminary analysis to estimate the relationship between health governance institutions and the incidence of corruption at the municipal level, enabling a deeper comprehension about how these institutions work at micro levels. In particular, we seek to elucidate the extent to which a new institution, the municipal health council, has been able to increase accountability, thereby deterring corruption with respect to health expenditures.[5]

Based on analysis of audit reports of federal health grants management in 980 Brazilian municipalities,[6] our analysis shows that health municipal councils with a lengthier term of existence are associated with reductions in the incidence of corruption in public health programmes. We interpret the years of experience of the municipal health council as a proxy for the quality of this institution. Consequently, our results indicate that the health council plays a relevant role in increasing the accountability of local governments in a decentralized setting.

In addition to the introduction, this article has four sections. The next section describes the methods employed for detecting municipal corruption in the management of health resources. The third section presents the model used to estimate the effects of local governance on corruption. The results of the model estimation are then discussed. Finally, the last section offers some policy recommendations and suggestions for future research.

Methods

The data used in this study were obtained from the random audit programme implemented by the *Controladoria Geral da União* (CGU, the Office of the Comptroller General). The programme audits how federal grants are managed by municipal governments. The CGU randomly selects 60 municipalities with <500 000 inhabitants three times per year.[7,8] The selection of municipalities is done on a regular basis through a public lottery. Once a municipality is selected, it is visited by a team assembled and trained by the CGU. The team closely scrutinizes the use of federal public funds transferred to the municipality during the preceding 2 years, the conditions of the local infrastructure and the quality of the services provided. The CGU audit programme was started in May 2003 and is still in operation. The CGU makes the information collected by the audits public on its website.[9]

This study is based on a sub-sample of those audits undertaken for the period between 2004 and 2010 that track

how federal grants to municipalities for health-related programmes were utilized. For this period, there were a total of 33 public lotteries, which selected 1821 municipalities for auditing. Of these, we analyse 1077 cases.[10] Due to the lack of information on some covariates, and the limited number of health-related federal grants received in some municipalities,[11] the final sample comprises 980 municipalities.

The CGU audits analyse all funds transferred from the federal government to the selected municipality, including those for health programmes. The detailed reports provide valuable information on the management of health grants by local authorities and give a reliable picture of how health decentralization is performing at the municipal level. Each of the federal grants received by the lottery-selected municipality generates an *ordem de serviço* (service order, hereafter OS), a memo detailing the main characteristics of the funds that were transferred to the municipal government and the instructions for the auditor on the tasks to be undertaken during the on site evaluation. For each OS, the auditor files one or more 'evidence reports' (*constatações*) depending on how many irregularities are identified. The detection of an irregularity may be due to a problem with the municipal health council (composition, regularity of meetings and effectiveness); human resources in health care delivery (payment, hiring and training); drug stocks (absence of pharmaceutical drugs, inventory control and storage conditions); infrastructure conditions (unfinished public works and unaccomplished goals) or documentation (absence of records, incorrect forms, etc.).

Thus, the CGU audit reports provide objective evidence of corrupt practices in those municipalities that were randomly selected for an audit.[12] Using the data reported by auditors to measure corruption overcomes a problem that is frequently one of the greatest shortcomings in corruption research: the subjectivity of the indicators used to measure corruption. Most measures are based on subjective assessments using informant perceptions to estimate corruption levels.[13] Detecting corruption in a highly complex environment such as the health system is a difficult task. In many cases, detected irregularities are due to poor management and innocent mistakes vs abuse and self-enrichment actions.[14] Following Ferraz and Finan (2008, 2011), we selected three types of irregularities that clearly constitute cases of corrupt behaviours: (i) fraud in procurements; (ii) diversion of public funds for private gain and (iii) over-invoicing for goods and services.

Based on the tabulated data from the audit reports, we created a 'numeric corruption index', where the numerator is the number of health-related OSs with at least one type of corruption irregularity (as defined above) and the denominator is the total number of health-related OSs in the same municipality. The formula is as follows:

$$Y_i = \frac{\sum_j 1[\mathrm{OS}_{i,j} = \text{corrupt}]}{\sum_j \mathrm{OS}_{i,j}}$$

$\mathrm{OS}_{i,j}$ represents the jth OS on municipality I, and $1[\mathrm{OS}_{i,j} = \text{corrupt}]$ is an indicator function that will be 1 if $\mathrm{OS}_{i,j}$ is classified as corrupt. Consequently, our dependent variable is a continuous variable between zero and one representing the proportion of corruption incidents relative to the total number of OSs as a measure of the overall level of corruption in the administration of health programmes by the municipal government. For this numeric index, all incidents are by definition assigned the same weight.[15]

In our sample of randomly selected, audited municipalities, the mean population was 25 351 inhabitants. On average, ~20% of the health-related OSs have at least one case of corruption as defined above. The total amount of federal grants audited per municipality averaged R$ 1 748 656 (~US$ 771K) and the amount of these grants with at least one corruption irregularity averaged R$ 390 526 (~US$ 172K). Evidence of at least one case of corruption was identified in 602 municipalities (55.9%)—a quite worrisome result.

Model and variables

In order to estimate the effects of governance on mismanagement and corruption in health-related federal grants among Brazilian municipalities, we use a cross-section multivariate regression. The model is defined by the following econometric specification:

$$Y_i = \beta_1 \text{Council Age}_i + \beta_2 \text{Political Competition}_i + \beta_3 \text{Grants}_i + \beta_4 E_i + \beta_5 M_i + \varepsilon_i$$

In the model, the outcome variable (Y_i) represents the numeric corruption index in municipality i as defined above.[16] The final term (ε_i) represents the error term with the usual (desired) characteristics.

The logic behind this specification draws from Becker's (1968) seminal article on crime and the studies which have adapted this model to analyse corruption (Goel and Nelson 1998). According to Becker's model, pursuit of crime depends (directly) on the gains from crime and (inversely), the size of the punishment (the value of the fine, number of years in prison, etc.) and the likelihood of being caught. As our main purpose in this study is to analyse the effects of governance on corruption in managing local health resources, we are particularly interested in the insights these models offer showing that institutions and public policies that make crime more costly are effective in deterring individuals from engaging in corruption. We believe that well-established municipal health councils are likely to increase the probability of detection of corrupt practices and our regression model seeks to test this hypothesis.

We examine the effects of accountability as its dimensions have been argued to be particularly salient in explaining the performance of governments in Latin America. To measure horizontal accountability, we focus on the management capacity of municipal health councils, which is measured by the cumulative age of the health council up until the year of the audit.[17] We decided to use this measure to capture municipal capacity because we believe local governments acquire expertise to manage the health system over time and each additional year represents a marginal gain in local capacity. There were 881 municipalities in the sample that had established a health council prior to or during the audit year (data on the year of establishment of the health council were missing for 99 municipalities). The average age of the councils in these municipalities is 11 years.

To capture vertical accountability, we focus on the effect of political competition, as a mechanism of electoral control (Ferejohn 1986). To account for the likelihood that a mayor with poor performance will be thrown out of office in the next election, we used the margin of victory between the mayor and the runner up measured in percentage points.[18]

As mentioned above, decentralization might increase local accountability; yet, accountability might need some specific conditions to work (Brinkerhoff 2004). Authorities elected to serve at the municipal level, who are empowered to make health policy decisions, might pursue objectives that differ from the ones targeted by federal grants, particularly, in cases where re-election is not possible, shortening the political horizon. To account for these cases, we include a variable that identified re-elected mayors who are in their second term.

The hypotheses behind these last two variables are derivations from the literature on democratic accountability: greater political competition implies the presence of a strong opposition to monitor government actions, and this should lead to a better use of resources. Mayors in their second term—not able to run for re-election—should be more prone to diverting public resources for private benefit.[19]

To increase accountability at the local level, municipalities that receive health grants from the federal government are required to establish a municipal health council.[20] The functions of the health council are to define basic priorities for the sector and to oversee local provision of health services in the municipality. In particular, councils approve the municipal health budget (ex-ante) and monitor expenditures (ex-post). The councils are permanent bodies that meet regularly and whose elected members include citizens, representatives of social movements, health service providers and professionals. Here, we are particularly interested in the role performed by these organizations as horizontal accountability actors.

Although federal law mandated the creation of councils as a pre-condition for receiving grants, not all municipalities established these bodies at the same time. Based on data collected and published by the Ministry of Health (http://formsus.datasus.gov.br/cns/), we created a variable to measure the age of the council (council age) which equals the number of years from the establishment of the council up until the audit year. In our regression model, we will employ this variable as a proxy for the quality of the council based on a 'learning-by-doing' argument in which more experienced councils are assumed to be better informed regarding health issues and actors, better equipped to hold local governments to account, and thereby more effectively deter corruption in the public delivery of health services.

Since we are also concerned about decentralization and fiscal accountability, we include a variable that measures the extent to which municipal local health expenditures rely on inter-governmental grants. In Brazil, municipal health expenditures are financed from a combination of resources and grants transferred to local governments from the state and federal governments. In municipalities that rely primarily on inter-governmental grants, government officials might be less careful in their expenditure decisions, as local taxpayers will not bear the full costs of their mistakes.[21] Alternatively, local governments may have an incentive to be more careful due to an expectation of a federal government audit in those localities that receive a large share of resources from Brasilia. Due to these equally valid, but competing explanations, the impact of decentralization on corruption cannot be determined a priori. To investigate this issue empirically, we use the share of health grants relative to the municipal health budget as a measure of the dependence of the local health budget on grants from the federal and state governments.

A common assertion in the literature is that not all types of health expenditures are equally prone to corrupt practices; therefore, the vector 'E' is a set of variables that control for the share of local health expenditures on different spending categories. We seek to examine whether payments to health service providers or drug procurement are more prone to corruption as compared to payments to local personnel, whose salaries are indexed and closely monitored. Both spending on services and pharmaceuticals offer local government purchasers greater discretion in the prices paid and quantities ordered of specific goods and services. We include the share of the municipal health budget that is dedicated to expenditures on personnel, drug procurement, investments and health providers each as a separate variable. The source of information for municipal health expenditures is the SIOPS (*Sistema de Informações sobre Orçamentos Públicos em Saúde*).[22]

The vector 'M' is a set of municipal characteristics. We employ two variables to control for differences in local social conditions that may influence the capacity of local actors to evaluate how the municipal government manages its health resources. The first variable is the percentage of the population below the poverty line. The reasoning here is that municipalities with higher rates of poverty tend to have higher shares of the electorate with lower levels of education, and thus have reduced capacity to access information that can be used to monitor public health service delivery.[23] The second variable is the log of the local population, which incorporates the assumption that knowledge of wrongdoing by local authorities will circulate more easily among smaller populations. These variables were retrieved from IPEADATA (www.ipeadata.gov.br), a government statistical reporting agency. Appendix 1 presents a summary of all of the variables used in the regressions and data sources. Appendix 2 presents the summary statistics for each of these variables.

We concentrate our analysis on the effects of vertical and horizontal accountability on reducing corruption. We compare municipalities with similar size and degree of economic development that differ in terms of degree of political competition, health council age, dependence on federal transfers to finance health expenditures and distribution of types of health expenditures. This analysis aims to identify the factors that may help to explain corruption patterns across Brazilian municipalities.

Results

Table 1 presents the results of our regressions to explore whether older (and consequently more established) health councils and more competitive local elections decrease corruption using the numeric index of corruption as the dependent variable.[24] Prior to discussing the results, we note one issue

Table 1 The effect of governance and health expenditure distribution on corruption (dependent variable = numeric index of corruption)

	(1)	(2)	(3)	(4)	(5)	(6)
Council age	−0.004*** (0.001)	−0.004*** (0.001)	−0.005*** (0.002)	−0.004*** (0.001)	−0.004*** (0.001)	−0.005*** (0.002)
Margin	0.001 (0.000)	0.001 (0.000)	0.001 (0.000)	0.001 (0.000)	0.001 (0.000)	0.001 (0.000)
Re-elected	−0.016 (0.017)	−0.019 (0.017)	−0.012 (0.019)	−0.016 (0.017)	−0.014 (0.017)	−0.012 (0.019)
Federal grants	0.014 (0.052)	0.017 (0.053)	0.031 (0.054)	0.016 (0.053)	0.021 (0.053)	0.042 (0.056)
Log(population)	0.030*** (0.007)	0.030*** (0.007)	0.032*** (0.008)	0.029*** (0.007)	0.031*** (0.007)	0.033*** (0.008)
Poverty	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
Personnel		−0.064 (0.047)				−0.067 (0.059)
Drug procurement			0.145 (0.142)			0.113 (0.152)
Investment				0.137 (0.143)		0.110 (0.166)
Providers					−0.082 (0.058)	−0.104 (0.074)
Constant	−0.148** (0.071)	−0.119* (0.072)	−0.172** (0.076)	−0.146** (0.073)	−0.147** (0.071)	−0.129 (0.084)
Observations	865	865	736	846	865	723
R^2	0.071	0.073	0.079	0.073	0.072	0.084
Root mean square error	0.200	0.200	0.197	0.201	0.200	0.198

Ordinary least square estimation; robust standard errors in parentheses: ***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

with respect to our dependent variable. The variance in our index of corruption depends on the number of OSs. For instance, if there is just one OS, the numeric index will be either one or zero. If there are two OSs the index will be 1, 0.5 or 0. As a result, the variance in the numeric corruption index decreases with the number of OSs. To address this problem, we eliminated observations with less than two OSs and weighted the regression by the number of OSs in the results reported in Table 1. The coefficient estimates for these weighted least squares regressions are essentially the same as the ordinary least squares results, and our reported results are also unchanged when cases with two or less OSs are included.[25]

The results reported in Table 1 offer confirmation of our hypothesized role that municipal health councils play in increasing accountability in health management at the local level. The coefficient for the age of the health council is negative and statistically significant at conventional levels suggesting that there is a negative relationship between the age of the municipal health council and the level of corruption in Brazilian municipalities. Across all specifications reported in the table, the magnitude and significance of the coefficient is consistently negative in sign, suggesting that those municipalities with older health councils have fewer incidences of corruption than municipalities with newer councils (or with none). Each additional year of experience of the health council is predicted to decrease the corruption index by 0.4 percentage points. We consider this a relatively high figure since the average value of the numeric corruption index is 19%. Using this average as a baseline, an average municipality with 19% rate of corruption incidences is predicted to decline to a 15% rate over a 10-year period. In other words, if the impact were linear, the corruption index would be reduced by 21% (4 divided by 19)—a quite considerable impact.

A more robust test of health councils' role in decreasing corruption levels would include a variable that permits further differentiation of health council types and quality. Although the audits are undertaken only in cities with <500 000 inhabitants, we do not believe that councils of the same age are necessarily equally effective in monitoring health programme delivery across municipalities. Moreira and Escorel (2009) suggest, for example, that municipal health councils perform more poorly in cities with <50 000 inhabitants. With better measures to capture differences among municipal health councils, we could further explore the effect of council quality on corruption incidence.[26]

The regression results also indicate a possible relationship between electoral competition and the propensity of municipal governments to exhibit higher levels of corruption in the management of health funds, although the precise nature of that relationship is not clear. Theory would suggest that mayors elected to office with closer margins will be more closely monitored by opposition parties and therefore less likely to engage in corrupt behaviour. Across all specifications in Table 1, the coefficient for the margin of victory between the mayor and the runner-up is positive, but not statistically significant at conventional levels. The coefficient for the variable measuring whether a mayor is in a second term is negative in sign, but imprecisely estimated. The sign of this variable, however, is unexpected, since theory would suggest that second-term mayors are more likely to engage in corrupt behaviours as they are not eligible for re-election.

Our results also suggest that diversion of public resources is more likely to occur in municipalities whose budgets depend on inter-governmental grants. The estimated coefficient for the share of grants relative to the total municipal health budget is positive, but not statistically significant in all six models of Table 1. Since we are controlling for the level of political competition and the age of the council, we are comparing municipalities with similar governance institutions. If these variables were good proxies for all governance institutions in the municipality, the results would mean that, controlling for governance institutions, decentralization of expenditures does not seem to significantly impact corruption. If we drop the variable for the council age from our regressions, the coefficient

for federal grants is still positive, but significant at 5–10% (depending on the specification). One interpretation of this result is that vertical imbalance may increase corruption in health. The good news is that municipalities with more experienced health councils (and therefore, greater levels of horizontal accountability) may be able to offset this shortcoming.

Finally, our results suggest that there is no correlation between the health expenditure type and the incidence of corruption. In specifications (2) through (5), we add a variable measuring the share of health expenses for each macro component of the health budget to the general specification. In specification (6), we add all components except investment (otherwise we would have perfect multicollinearity). The sign and magnitude of the effects remained even when we dropped the variable for council age from the regressions and repeated the regressions. We might expect that more corrupt governments would bias their spending portfolios towards types of expenditures where irregularities are more easily concealed (Shleifer and Vishny 1993). For instance, there has been significant attention directed at documenting the frequency of corruption in drug procurement (McPake *et al*. 1999; Lewis 2000). Although the coefficients on drug procurement and infrastructure are always positive (consistent with the literature), neither is statistically significant. Overall, our findings do not support the contention that certain types of health expenditures are more likely to be associated with corruption than others.

Discussion

This article contributes to research on corruption and its connection to decentralization and accountability. Assuming that decentralization results in expenditures that are better targeted to local demands, we have sought to investigate whether efficient accountability institutions are needed to assure that local officials follow through on those spending choices, and to constrain their engagement in corrupt practices. Furthermore, we explore the extent to which horizontal and vertical accountability may each contribute distinctly to reducing the propensity of municipal governments to divert public health resources for private gain.

Our analysis overcomes two important shortcomings common in the literature on corruption and crucial to advancing our understanding of how accountability works in a decentralized setting. Our results do not rely on the subjectivity of corruption measures, which usually conflate the actual incidence of corruption with its perception by informants. This issue is particularly salient in studies of health systems, where it is difficult to distinguish corruption from honest mistakes in a very complex environment. We also overcome a second shortcoming, which is the virtual absence of micro-level analyses based on a large number of observations in the study of corruption. We use a new data set based on objective evidence reported in audits of expenditures made by Brazilian municipalities and use these more precise measures of corruption to study what factors may help explain incidence levels.[27]

The Brazilian public health system is a good case to study. The 1988 Constitution launched the decentralization of health services, which culminated in the creation of the SUS (Unified Health System). Municipalities gained responsibility for a larger share of health service delivery and spending. In addition, there is a great deal of social and economic variation across Brazilian municipalities, a feature that enhances the potential for comparative research on these cases to provide a solid evidence base for hypothesis testing.

Our findings provide some potential guidance to public authorities on where efforts aimed at reducing corruption should be directed. To conclude, we briefly recap our key findings and discuss their policy implications. First, the accumulated experience of health councils gained over time seems to matter in reducing the incidence of corruption in public health expenditures at the municipal level. The literature on local accountability rarely pays attention to the 'learning by doing' process that may contribute to health councils becoming more effective in overcoming the usual problems associated with monitoring health expenditures, such as complexity, lack of transparency and information asymmetry. An important policy recommendation stemming from our research is that policy makers should attempt to identify policies and programmes to speed up the learning process so that council members can acquire greater expertise in monitoring health expenses in a shorter time period.

Second, in terms of vertical accountability, though not statistically significant at conventional levels, our findings suggest that national authorities would be well served in continuing to work to guarantee that local elections are fair and competitive. Consistent with the literature, the discipline imposed by an open electoral process, along with an active opposition, may help to deter corruption at the local level.

Third, our findings imply that municipalities that are highly dependent upon federal and state grants may exhibit a higher incidence of corruption. However, our results also suggest that increased horizontal accountability, exercised by local governance institutions, in this case a municipal health council, may serve as a counter-balance. Thus, while federal audits are an important centrally driven anti-corruption tool, complementary effective local oversight is critical to holding municipal officials to account and to reducing corruption.

All in all, if local accountability is not to become a mere buzzword (Brinkerhoff 2004), greater attention should be directed at building the capacity of local governance institutions to exercise effective oversight of municipal officials. This need is particularly salient in monitoring health spending and avoiding corruption. The findings from this study offer some empirical evidence in support of our recommendations. We hope that they will contribute to policies and practices that can improve governance in decentralized health systems.

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Conflict of interest

None declared.

Endnotes

[1] See Brinkerhoff and Bossert (2008) for a more detailed discussion of the issues raised by the recent health governance debate.

[2] See Transparency International (2006). This report has a special focus on corruption and health and discusses the general problems found in most systems around the world. On this topic, see also Lewis (2006).

[3] See Bossert (1998, 2008) for a discussion of the concept of 'decision space' and its applicability to the health governance debate.

[4] Brazil's federal system assigns important political authority to municipalities. As a result, mayors have significant policy making and implementation authority in their jurisdictions. The 1988 Constitution delegated responsibility for the implementation of important public policies including education and health to municipalities with resources provided to local governments by federal grants.

[5] Brinkerhoff (2004) distinguishes between three types of accountability: financial, related to the allocation of financial resources; performance, which focuses on agreed upon performance targets and political, which focuses on assessment of the government by voters.

[6] We have data coded for more than 1000 Brazilian municipalities. Due to missing data and, mainly, a more technical problem discussed later, the final sample is for 980 municipalities.

[7] The total number of lotteries per year and the number of municipalities selected in each lottery has varied. In 2003 and 2004, there were 7 lotteries and 681 municipalities were audited. In 2005, there were 5 lotteries and 300 municipalities were audited. In 2006 and 2007, there were 3 lotteries and 180 municipalities were reviewed each year. In 2008, 120 municipalities were audited in two lotteries. In 2009 and 2010, three lotteries took place and 180 municipalities were reviewed.

[8] There are 5525 municipalities in Brazil—out of 5564—who meet this criterion.

[9] See www.cgu.gov.br. See also Ferraz and Finan (2008) for a more detailed description of CGU audit reports.

[10] The results reported in this study are for the sub-sample of audit reports selected randomly from those audits available on the CGU website.

[11] Municipalities that had had two or fewer OSs were excluded (see below).

[12] Ferraz and Finan (2008) report that CGU officials have stated that there has never been an incident in which auditors were offered bribes.

[13] For a recent reviews of the literature on measuring corruption, see Svensson (2005) and Treisman (2007). For works that discuss corruption in health systems, see Lewis (2006), Savedoff and Hussmann (2006), Savedoff (2007) and Vian (2008). For other works on corruption in the administration of Brazilian inter-government grants based on the CGU reports, see Ferraz and Finan (2008, 2011).

[14] See Savedoff (2007) for a more detailed discussion of this point.

[15] We also created a 'monetary corruption index'. The monetary index is defined as the amount in R$ of OS with at least one type of corruption irregularity divided by the total monetary amount of OS related to health audits in the municipality. We decided to use the numeric index for three reasons. First, the numeric index better captures the overall level of corruption. Second, the amount associated with an OS may have no correlation with the amount of public money actually deviated for private purposes. Finally, there were some OSs for which specific transfer amounts were not reported resulting in a lower sample size (935 municipalities).

[16] We have information at different points in time, but there are very few municipalities in our sample that were audited more than once during our period of analysis. Therefore, we treat data as a cross-section assuming that the structure of these municipalities is constant over the elapsed time period. The covariates are compatible with the year of the audit.

[17] An alternative measure for municipal capacity would be to include a measure determined by whether the local government has full local health management control (*Gestão Plena*). As this status is restricted only to larger cities that have the capacity to offer a wide range of health services including moderate to high complexity health services, there were only 117 municipalities who fulfilled this criterion in the sample. The results we report in this article were confirmed when the same model was tested using a dummy variable to code for those municipalities with full health management control, but the statistical significance of the coefficient for municipal capacity (as measured by only those municipalities who had full management control) was reduced.

[18] Elections are held in October every 4 years. We use electoral results from the 2000 elections when an audit was undertaken in 2004; from the 2004 elections when the audit year was undertaken in 2005 and from the 2008 elections when the audit year was either 2009 or 2010.

[19] Ferraz and Finan (2011) present robust evidence that Brazilian mayors are more likely to engage in corruption in their second term (after re-election). Mayors are prohibited from running for a third consecutive term.

[20] Several recent studies present helpful summaries of the evolution and role of municipal health councils in Brazil including Labra and Figueiredo (2002), Moreira and Escorel (2009), Coelho *et al.* (2010) and Landerdhal *et al.* (2010).

[21] This is known in the literature of fiscal federalism as 'vertical imbalance' defined as the potential of decentralization to aggravate common pool fiscal problems. See Stein (1999) for more details.

[22] The SIOPS (Information System on Health Public Budgets) data was retrieved at: siops.datasus.gov.br. These data come from reports filed by all Brazilian state and municipal governments.

[23] For a more detailed argument about the relationship between poverty and information asymmetry in the health sector, see Savedoff (2007) and Keefer and Khemani (2005).

[24] We also tested the same regression model with the monetary index of corruption discussed above as the dependent variable. These results were qualitatively similar as the sign of the coefficients was the same, but the magnitudes were weaker.

[25] The complete results are available upon request from the authors.

[26] Councils may not be as relevant in very small municipalities that have not attained a critical mass of knowledge thereby enabling them to improve the accountability of local government (Goel and Nelson 2011). We hope to test this question in future research.

[27] The data set also allows the incidence rate of corruption to be compared for different types of health programmes, an objective that, again, would go well beyond the scope of this article.

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Appendix

Appendix 1 Econometric model: variables definition and sources

Variable	Variable description	Years	Source
Governance variables			
Margin	Electoral margin of winning mayoral candidate in first runoff election	2000, 2004 and 2008	TSE
Re-elected	Dummy variable if mayor was re-elected to a second term	2000, 2004 and 2008	TSE
Council age	Number of years from the year of the health council establishment until the year of the audit	1988–2010	Ministério de Saúde
Vector 'E' (health expenditure variables)			
Federal grants	Health grants/total health expenditures	2004–2010	SIOPS
Personnel expenditures	Personnel expenditures/total municipal health expenditures	2004–2010	SIOPS
Procurement expenditures	Pharmaceutical drug expenditures/total municipal health expenditures	2004–2010	SIOPS
Provider expenditures	Service providers expenditures/total municipal health expenditures	2004–2010	SIOPS
Vector 'M' (municipal variables)			
Poverty	Percentage of individuals below poverty line	2000	IBGE/IPEA
Population	Number of municipal inhabitants	2004–2010	IBGE

Notes: TSE = Tribunal Superior Eleitoral; SIOPS = Sistema de informações sobre orçamentos públicos em saúde; IBGE = Instituto Brasileiro de Geografia e Estatística; IPEA = Instituto de Pesquisa Econômica Aplicada.

Appendix 2 Summary statistics

Variable	Number of observations	Mean (SD)
Corruption		
Total number of health programmes audited in the municipality	980	5.55 (2.16)
Numeric corruption incidence (number of health-related OS with at least one corruption irregularity/total number of health-related OS audited in the municipality)	980	0.195 (0.213)
Monetary corruption incidence (amount of resources with incidents of corruption in R$/ total amount of resources audited in R$)	935	0.215 (0.286)
Total amount of audited resources in R$	935	1 828 220 (4 245 133)
Governance		
Council age (years)	881	10.99 (4.70)
Electoral margin of mayor (%)	980	0.174 (0.195)
Dummy if re-election of mayor (%)	980	0.303 (0.459)
Municipal characteristics		
Population	980	23 703 (46 580)
Poverty (%)	974	0.474 (0.231)
Distribution of health expenditures		
Federal government grants as a share of total health expenditures in the municipality (%)	966	0.376 (0.164)
Proportion of health expenditures on personnel expenses	966	0.527 (0.150)
Proportion of health expenditures on drug procurement expenses	826	0.074 (0.063)
Proportion of health expenditures on investment expenses	941	0.054 (0.061)
Proportion of health expenditures on providers expenses	966	0.166 (0.148)