FISCAL DECENTRALISATION AND INFANT MORTALITY RATES:  
THE COLOMBIAN CASE

Victoria Eugenia Soto †‡, Maria Isabel Farfan Θ and Vincent Lorant †

ABSTRACT

There is a paucity of research analysing the influence of fiscal decentralisation on health outcomes. In Colombia, health resources have been completely decentralised since 1993. This decentralisation has, however, been uneven, depending on local institutional capacities for managing health resources. As a result, it is unclear whether fiscal decentralisation has had the expected effect on public health outcomes. The aim of this study is to assess the effect of fiscal decentralisation of health expenditure on infant mortality rates in Colombia.

Infant mortality rates for 1,080 municipalities over a 10-year period (1998-2007) were related to decentralised public health expenditure by using an unbalanced fixed-effect regression model with robust errors. The effect of fiscal decentralisation was measured as the locally controlled health expenditure as a proportion of total health expenditure. We also evaluated the effect of transfers from central government according to the degree of institutional health capacity of the municipalities for allocating those fiscal resources. In addition, we also compared the effect of fiscal decentralisation by municipal levels of poverty level. In addition,

The results of this study suggest that fiscal decentralisation decreased infant mortality rates in Colombia, although this effect was highly mediated by municipal levels of poverty. The elasticity of fiscal decentralization on infant deaths over all municipalities was low and equal to -0.06. However, this effect translated into strong differenced effect for poor and non-poof municipalities, -0.064 and -0.126, respectively. Surprisingly, the effect of transfers from central government managed by municipalities with institutional health capacity did not have a differential negative effect on infant deaths.

We conclude that devolving the allocation of responsibilities to municipalities decreased infant mortality rates across municipalities. However, this effect depended greatly on the socio-economic conditions of the localities in order to achieve greater effects on this health outcome.

Keywords: fiscal decentralisation, infant mortality rate, municipal socio-economic conditions, Colombia.

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INTRODUCTION

Colombia has one of the most decentralised\(^1\) health systems in Latin America (Bossert et al, 2003). Colombia is divided for administrative purposes into 32 states, known as departments, which in turn are divided into 1,120 municipalities. The reassignment of government functions and responsibilities for providing health services across different levels of government began in 1993. The Colombian decentralisation process has been recognised as a successful one, bringing about a substantial improvement in access to health services (Bossert et al, 2003). The percentage of Colombians covered by health insurance rose dramatically between 1992 and 2005, from 27% to 70% (Pinto and Hsiao, 2006). Insurance coverage was extended to the most vulnerable sections of the population: children and mothers who are heads of a household, the poorest older adults, and people in rural areas (Pinto and Hsiao, 2006).

During this process, municipal authorities have acquired an increasingly prominent role in the provision of primary health services (Bossert et al, 2002). Municipal governments have also been given responsibility for allocating some resources in the health sector (Plaza et al, 2001). More than 30% of public health resources are allocated by municipalities (DNP, 2008). This municipal power to allocate resources raises the question of the effect of this policy on the performance of the health system. In theory, increased local responsibilities should translate into improved access to health care.

\(^1\) Decentralisation in general is a complex process. It has been characterised by transfers of power between political levels (devolution), between administrative levels (deconcentration), and from political to relatively independent institutional levels (delegation) (Saltam et al, 2006). In this study, decentralisation is synonymous with devolution, as our interest is in studying the effect of political reforms that promote autonomy at municipal level.
services and ultimately, into a better health status for the population (Saltman et al, 2006). The transfer of responsibilities to municipal authorities is based on the assumption that locally managed services should be better suited to meeting divergent local needs than centrally managed services (Oates, 1972). For example, decentralisation might help reduce inequalities within municipalities, as municipal authorities are more knowledgeable about the local context and hence better placed to respond to the priority needs of their communities.

However, the assumption of the effectiveness of decentralisation in improving the provision of health services and health outcomes remains a contentious topic. Local management capacity depends on the type of services as well as the local institutional context that authorities have to face. The provision of some health services is characterised by the presence of market failures; such as externalities, spillover behaviours, time preferences, which might affect their provision (Foster and Enikolopov, 2001). Moreover, adequate institutional capacities allow authorities to effectively respond to local priorities (Bossert and Mitchell, 2011). Those capacities might include administrative, technical, organizational, financial and human dimensions across of health sector institutions. However, previous studies showed that drawbacks associated with governance, such as low local expertise in management, poor accountability and local participation, capture by vested interests, low local degree of choice over different functions and use of funding, and limited fiscal resources; among the problems these drawbacks can lead to inefficiencies in the allocation of resources (Mello and Barestain, 2001; Bossert and Mitchell, 2011). This might translate into limited provision and thus undermine the effect of decentralisation on health outcomes.
Much of the literature has focused on the evaluation of subnational provision of health services, and few studies have tested the likely consequences of decentralisation for health status (Jiménez-Rubio, 2010). The existing empirical literature has found a positive effect of decentralisation – mainly measured in fiscal terms as the percentage of total expenditures or revenues accounted for by local government – on health outcomes. Habibi et al (2003) showed that infant deaths have a negative association with two measures of fiscal decentralisation by using a large panel of Argentine provinces over the period 1970-1994. In addition, this study also found that disparities in regional infant mortality rates have declined significantly over the period after decentralisation reforms were undertaken. Robalino et al (2001) found the same relationship by using panel data for low- and high-income countries during the period 1970 to 1995. In this study, the results also suggested that the marginal benefits from fiscal decentralisation were noticeably higher for poor countries. Asfaw et al (2007) tested the impact of fiscal decentralisation on rural infant mortality rates in India between 1990 and 1997. The results of this study also indicate that the effectiveness of fiscal decentralisation was strongly linked to the level of political decentralisation. Cantero and Pascual (2008) and Jiménez-Rubio (2010) also showed fiscal decentralisation was inversely related to infant mortality rates in the Spanish regions and Canadian provinces, respectively. However, it should be noted that only the last two studies used a health care measure related to fiscal decentralisation, such as the ratio of subnational health expenditure to the total, instead of overall indicators of public sector decentralisation.

The purpose of this paper was to assess the effect of Colombian fiscal decentralisation on infant mortality rates. We seek, in general, to contribute to the emerging empirical literature that tries to measure this effect, and in particular, to analyse a specific
developing country experience. One particular reason for this approach is that most studies of fiscal decentralisation in Latin American countries have focused on the budgetary constraints facing local government and how these can affect macroeconomic stability (Habibi et al, 2003).

Colombia has experienced a significant decrease in infant mortality rates, and in parallel, an increasing decentralisation of health resources. The most specific health competences shifted to the municipalities lie in the domains of promotion, health education, and preventive health care. In this way, municipalities were encouraged to channel local resources to meet their new responsibilities at local level (DNP, 2008). In figures, local health resources as a proportion of total health spending increased from 1.1% in 1994 to 6.1% in 2003 (Baron, 2007). In addition, other legislative mandates defined municipal functions along with resources for financing health services provision. However, budgetary control of transfers from central government at local level relies on administrative institutional capacities. With regard to this budgetary control, a few municipalities, the bigger and more developed ones, were defined as decentralised since they met these institutional requirements. This showed that the decentralisation process in Colombia has been unequal across municipalities, depending on local management capacity and also on institutional and socio-economic conditions. As a result, the effect of decentralisation on health outcomes is unclear across municipalities.
DATA AND METHODS

DATA

This study was carried out using a panel of 1080 municipalities over a 10-year period (1998-2007). Municipality is the smallest political-administrative unit in Colombia. We excluded from the analysis 40 municipalities (over the total equal to 1120), because the data was unavailable.

Dependant Variable: Infant mortality rates were used as a measure of health outcome. The infant mortality rate is considered to be a complete indicator of population health, and also reflects both children’s health and pregnant women’s health (Jiménez-Rubio, 2010). This health indicator is also known to be a sensitive outcome of health system reforms (Hutton, 2000). Data on infant mortality rates was obtained from the national census and vital statistics collected by the National Administrative Department of Statistics.

Independent variables

Fiscal Decentralisation Variable: We measure fiscal decentralisation as locally controlled health expenditure as a proportion of total health expenditure. This is the most common measure of fiscal decentralisation (Cantero and Pascual, 2008). This ratio is a proxy measure that quantifies the activities of local authorities arising from their

\[ \text{Fiscal Decentralisation} = \frac{\text{Locally Controlled Health Expenditure}}{\text{Total Health Expenditure}} \]

In order to correct some possible bias of under-registration, infant mortality rates were adjusted according to department infant mortality rates for the period 1998-2005. According to the Demographic Health Survey, birth registration is high in Colombia: in 2000 it was 83.95% of all births and in 2005 this percentage increased to 91.43% of all births. Despite the high level of birth registration, there are large differences across departments. According to the same source, in 2005 birth registration on the Pacific Coast was 66%, on the Atlantic coast it was 75%, while in the central departments and the capital, registration was over 96%. For the years 2005-2007 the infant mortality rate utilised was estimated directly by the National Administrative Department of Statistics.
autonomous decisions. Locally controlled health expenditure included resources for local tax, credits, budget assigned to local authorities for any local requirements, and others sources. In addition, another major source of health expenditure was analysed: the health transfers from central government. This variable included the health fiscal resources distributed between municipalities on the basis of the population served, population for attending, poverty levels, and other indicator at municipal level. All data on health fiscal resources came from the National Planning Department.

**Institutional capacity** A municipality's institutional capacity to manage resources and decide on their allocation to the health sector was measured on the basis of its certified status. This status is granted by the Health Minister, who first granted the certificates in 2001. The data came from the Health Minister. The municipality’s certification depends on administrative, technical, and fiscal conditions that have to be met for it to receive transfers directly from central government. These conditions include: functional information systems, the adoption of a developing local health plan, the creation of a local health fund and local health bureau, and agreement with the Health Ministry on institutional arrangements. Only certified municipalities can directly manage transfers from central government. These municipalities take on responsibility for health service provision and the organisation and administration of human resources. If the municipalities cannot meet these conditions, then departments were required to take on health sector responsibilities, and were, therefore, the authority for allocating health resources at local level. After being certified, the municipality’s mayor becomes the head of the municipal health system, with the obligation of developing local health plans integrated into the municipal plans. Certified status is used as a proxy indicator of institutional capacity for performing appropriate of management of health resources.
Other local independent variables: In order to analyse municipal socio-economic conditions, we used the percentage of households with unsatisfied basic needs. This indicator included inadequate access to housing, lack of access to services such as water, electricity, and sanitation, high levels of economic dependence, and school-age children not attending school (DANE, 2005). This data came from the National Administrative Department of Statistics, and so has been widely used as a proxy of municipal socio-economic conditions as it indicates the percentage of households considered to be poor (Alvis et al, 2008). Other local variables include the level of urbanisation and an indicator of school enrolment for the population between 7 and 12 years of age. These data came from the population census and the National Planning Department.

METHOD

We followed the theoretical framework developed by Aswaf et al (2007), which relates decentralisation to health outcomes and takes account of fiscal and political decentralisation. We tested the hypothesis that shifts towards more fiscal decentralisation in health services would be associated with improvements in infant mortality rates by using an unbalanced fixed effects model with robust errors. This relationship was described as follows:

\[ Y_{mt} = \alpha_{mt} + \beta_1 X_{1mt} + \beta_2 X_{2mt} + \beta_3 C_{mt} + \beta_4 C_{mt} \times X_{2mt} + L' \delta_{mt} + \mu_{mt} \quad (1) \]

Where \( Y_{mt} \) is the infant mortality rate in the municipality m and year t; \( \alpha_{mt} \) is municipal specific effect; \( X_{1mt} \) corresponds to the locally controlled health expenditure as a
proportion of total health expenditure, $X_{2mt}$ refers to the health transfers from central
government as a proportion of total health expenditure; $C$ is a binary variable equal to
one if the municipality at year $t$ was certificated as capable of directly managing health
resources on the basis of local institutional capacity; $L$ is a vector of local structural
indicators and $\mu_{mt}$ is equal to $\mu_m + \nu_{mt}$, where $\mu_m$ is the municipal-specific unobserved
effects. Dummy variables for each year were included to control for any unobserved
changes that might similarly affect all provinces in a given year, such as a national
vaccination programme launched by the central government. Table 1 presents summary
statistics.

The effect fixed models with robust standard error were estimated using Stata 9, which
took within-municipalities changes into account in the estimation process reducing the
bias of omitted variable (Verbeek, 2004). Health resources were lagged three years to
deal with possible endogeneity problems in the model estimation. In our case,
endogeneity may arise from a reverse causality problem since not only has the level of
health expenditures an effect on infant deaths, but municipal governments may decide
upon the budget for health partly on the basis of the current or expected level of infant
mortality. Using a three years lag for expenditure on health solves the possible
endogeneity problem, as the decisions in question cannot be determined by the current
infant mortality rate but the relationship between health expenditure and health outcome
is maintained.

Existing evidence on decentralisation and infant mortality has shown greater benefits
from decentralisation in poor countries/regions (Habibi et al, 2003; Robalino et al,
2001). So we tested the relationship described in (1) by non-poor and poor
municipalities. In order to identify the non-poor and poor municipalities in our sample, we searched and classified in our first-year panel, 1998, those municipalities that presented a percentage of households with unsatisfied basic needs lower/higher than the median value (49.5) of this percentage of households in 1993. Subsequently, we divided our entire sample into two groups of municipalities; hereafter those groups will be referred to as non-poor and poor municipalities, respectively. We used the percentage of unsatisfied basic needs in 1993 to split the sample, as that was the year the fiscal decentralisation process started. This allowed us to identify the municipalities that started the decentralisation process with better socio-economic conditions than others.

RESULTS

The Colombian infant mortality rate has been falling since the 1980s (DANE, 1998). The indicator passed from 32 per 1,000 births in 1986 to 16 per 1,000 births in 2007 (see Graphic 1). In spite of this significant decrease in infant deaths, enormous differences across municipalities remain. In 2007 infant mortality rates ranged from a minimum of 8.9 per 1,000 births to a maximum of 110.9 per 1,000 births.

Regarding fiscal decentralisation variables, municipalities gained an increasing role in the distribution of health expenditure. While municipalities accounted for 3.8% of total health expenditure in 1995, their share was 4.7% in 2007, with a peak of 9.6% in 2001. However, one important aspect of the health decentralisation process in Colombia was the extent to which municipal authorities depended on transfers from central government. As can be seen from Table 1, for the period 1998-2007 such transfers accounted for 75% of total municipal health expenditure.
Turning to the local institutional context: in 2001 the first year the certification process was in operation, only 35.4% of municipalities acquired this status. This percentage increased to 56.16% in 2002, but fell again to 44.9% in 2007. On average, certified municipalities were certified for two consecutive years during 2001-2007 (see Table 1). Certified status was kept for at least six years by 34.6% of the municipalities. Most of those municipalities were capitals of departments and had populations of over 60,000 habitants. In other words, they were the biggest and most developed municipalities. For the period 2001-2007 certified municipalities showed lower infant mortality rates than non-certified ones (see Graph 5). When the certification law came into effect, the difference between certified and non-certified municipalities was statistically significant and equal to 6.6. That is, the infant mortality rate per 1,000 births in the former municipalities was 38.5 and in the latter ones was 45.1. For 2007 the same difference decreased to 5.1; 38 and 32.9 per 1000 births, respectively.

Table 2 shows the effect of Colombian decentralisation on municipal infant mortality rates. Columns 1-3 present the estimation over the complete municipality’s sample. The F-test results showed that, taken jointly, the coefficients were significant. The Husman’s specification test was also estimated to determine the appropriateness of the random-effects specification. The test results indicated that a fixed effect model was a better specification in all relationships analysed. Focusing on decentralisation variables, the elasticity of infant mortality with respect to fiscal decentralization was small and statistically significant, at around -0.06. The transfers from central government as a proportion of total health expenditure were not significantly related to infant mortality. By contrast, certification status was associated with higher mortality (see Table 2,
column 2-3). This was mainly explained by the correlation between that status and the year’s dummy variables. Indeed, few municipalities showing this status for more than a year\(^3\). In addition, transfers from central government reduced infant deaths by around 7\% in the certified municipalities, as against those that were not certified; however this was not statistically significant associated with mortality (see Table 2 column 3).

The regression results showed that local socio-economic conditions mainly explain the fall in the infant mortality rate. The estimates suggest that a 1\% increase in the percentage of households with unsatisfied basic needs in the municipalities was associated with an augmentation of infant mortality per 1,000 births of more than 7\% (Table 2 columns 1-3). The parameter of the level of municipal urbanisation was associated with 3.3\% fewer infant deaths. However, the percentage of municipal school enrolment did not have explanatory power for infant mortality.

Given that socioeconomic conditions were high related to infant mortality, further analysis taking into account the municipal level of poverty were carried out. During the years 1998-2007 infant mortality rates were positively correlated to the percentage of households with unsatisfied basic needs (see Graphic 3). This correlation increased over time; it passed from 0.25 in 1998 to 0.75 in 2005. Compared to non-poor municipalities, poor municipalities showed higher infant mortality, 33 as against 48.8 per 1,000 births, respectively. In addition, local health resources were differentiated by municipal levels of poverty. On average, non-poor municipalities showed to expend 1.5 times more local health resources than poor ones, 8.6\% and 5.8\%, respectively (see Graphic 4).

\(^3\) This correlation could have affected the sign of the coefficient of this institutional capacity variable. The Spearman rank correlation test between year variables and certification status was statistically significant and equal to 0.36. In addition, when the years’ dummy variables were excluded from the estimation (1), the certification dummy variable was statistically significant and became strongly negative as it was expected [Robust T statistic= -14.2; IC = -0.087; -0.066].
The relationship between infant mortality and decentralisation variables was also estimated in relation to municipal socio-economic conditions. The Chow test was used to determine whether the coefficients of equation (1) varied according to municipal levels of poverty. The result of this test suggests the pertinence of dividing the sample into two groups of municipalities: poor and non-poor ($\chi^2 = 58.3; \chi^2 < 0.001$). Further statistical analyses are presented in Table 2.

The findings in Table 2 column 4-9 showed that the small coefficient of locally controlled health expenditure as a proportion of health expenditure estimated over all municipalities translated into a differentiated effect by poor and non-poor municipalities\(^4\). Comparing column 6 with column 9 of Table 2, the results suggested that fiscal decentralization decreased infant mortality by 12.6% in non-poor municipalities, while this effect was just 6.4% in the poor ones.

The transfers from central government as a proportion of total health expenditure was associated with reducing infant deaths in non-poor municipalities (see Table 2, column 4). However, this effect was not longer statistically significant when the interaction between municipal certification status and transfers was included in the estimation (see Table 2, columns 4 and 6). In terms of local variables, on the other hand, the infant mortality rate was only statistically positively related to the percentage of families

\(^4\) The same results were found when we defined the poor and non-poor municipalities according to the first and fourth quartile defined by the percentage of households with unsatisfied basic needs at municipal level in 1993. In addition, it was also estimated (1) for the non-poor municipalities sample excluding the capital and the four most important and developed Colombian cities (Cali, Cartagena, Medellín, and Barranquilla), and the same results were obtained. All of these estimations, available upon request, were also robust.
living with inadequate housing conditions within poor municipalities (see Table 2 columns 7-9).

DISCUSSION

Based on the results of this study, we can say that fiscal decentralisation reduced infant mortality rates in Colombia. Devolving responsibilities for the provision of primary health services to municipalities seemed to lead to more efficient allocation of resources. The gains in efficiency were translated into an improvement in the health of the Colombian people. This efficiency notion is supported by the idea that different localities have different demands for type and levels of services (Oates, 1972). These differences come from cultural, economic, political, demographic and geographic aspects that define heterogeneity across municipalities. For example, Colombia has more than thousands of municipalities, 25.7% of them are rural and more than 74.3% of the population lives in the main urban cities (DANE, 2005). Some municipalities show persistence or resurgence of infectious and parasitic diseases such as malaria and tuberculosis, while others municipalities show an increasing incidence of chronic and degenerative diseases (Pinto and Hsiao, 2006). These differences across the country and among others encouraged decentralization as a policy tool in Colombia since it was assumed that local authorities knew their community needs, and therefore local decision-making could be responsive to the people for whom the services were intended (Faghet and Sánchez, 2006). The positive consequence of decentralisation in the Colombian context was consistent with the results obtained in previous studies, which used subnational health expenditure as determinant of health outcomes, such as infant mortality (Jiménez-Rubio, 2010; Cantero and Pascual, 2008).
However, our sample stratification according to level of poverty showed that the influence of decentralisation depends greatly on socio-economic conditions in municipalities. The magnitude of the effect of the locally controlled health expenditure as a proportion of total health expenditure on infant mortality rates was twice as large in non-poor municipalities as in poor ones. The non-poor municipalities included the municipalities which started the decentralization process with low percentage of households living in poverty conditions. These municipalities also had more capacity to fund local health policies. This situation poses a serious question in terms of equity, despite the fact that the effect of fiscal decentralization on infant mortality was positive on both non-poor and poor municipalities, this effect was highly differentiated between these municipalities at the end. In line with this, Montero-Granados and Juan de Dios Jiménez (2007) found that during the process of decentralization of healthcare management in Spanish, the provinces with worst indicators of infant mortality at the start of the period under study grew faster than the rest. However, a changed of role of provinces seemed to be occurred, that is the final dispersion of infant mortality between provinces was greater than at the start.

By contrast our results, Robalino et al (2001) found that the effect of fiscal decentralisation on infant mortality rates was higher in poor-income countries than in middle-income countries. However, in comparison with those results, our study has two advantages in its empirical analysis. Firstly, we used more accurate measures of fiscal decentralisation in the health sector than the other authors used. Secondly, the analysis based on cross-country analysis rather than on comparing the experience of different countries makes it possible to estimate the effect of decentralisation more objectively, as
all municipalities within the country have been exposed to the same historical, cultural, political, and institutional elements linked to the decentralisation process (Bonet, 2006). Nonetheless, those contrasting results open the window to additional empirical studies.

On the whole, decentralisation is a tool for improving health outcomes, although its effect is closely linked to socio-economic conditions. Although local authorities know the needs of their communities, the initial socio-economic context may restrict decentralised performance. Poor municipalities are likely to have weak local institutions that work against the identification of vulnerable groups; this can negatively affect the efficiency of service provision (Larranga, 1996). Weak institutions, corruption, and low levels of community participation would also reduce the potential effect on provision of decentralisation, and in turn, its ability to achieve better results on health outcomes. (Boadway and Shah, 2009; Saltman et al, 2006; Enikolopov and Zhuravskaya, 2003).

Likewise, our findings indicate the importance of examining local management of health resources. Transfers from central government showed a positive and small influence on decreasing infant mortality rates, but only in non-poor municipalities. It may be that poor municipalities have been having problems adjusting local budgets properly to population needs and achieving better results. Central government should design a type of transfer which generates incentives for local authorities to undertake specific provision of health services to reduce infant deaths. This type of transfers encourages local governance to be accountable to central government in the management of resources (Boadway and Shah, 2009). In addition, local incentives might be created to achieve national goals as reducing infant mortality at determined level.
On the other hand, certified municipalities are assumed to have an adequate infrastructure and health plans adapted to the local context. Surprisingly, the estimation results showed that this municipal status increased infant mortality rates during the period analysed. This result is mainly explained by the strong correlation of this indicator with time variables. This fact limits the scope of the conclusions on the effect of local institutional capacity on infant mortality rates from our econometric estimation. However, previous studies have analysed the same indicator of institutional capacity in health and the results were not conclusive about what measure this indicator. Pinto et al (2005) evidenced the inexistence of local health planning in the municipalities that were defined as certified ones by the Health Minister. Thus, this variable seems to be an imprecise indicator of health institutional capacity at municipal level. Bossert and Mitchell (2011) pointed out that institutional capacities should involve resources such as adequacy of infrastructure or staff, and processes such as whether localities conducted monitoring and evaluation of the activities. Colombian law established that municipalities defined as certified ones by Colombian Health Minister should meet all the administrative, technical and political requirements for holding this status. However, the fact that some of certified municipalities did not fulfil all the requirements claims to central government to improve the evaluation and monitoring instruments to grant this municipal status.

This study measured the influence of decentralisation on infant mortality rates in Colombia. However, the results and the conclusions should be approached with some caution. Firstly, we analysed here one dimension of the multiple and complex processes involved in decentralisation: the fiscal one. Secondly, although infant mortality is a
widely used indicator of health status, it does not fully reflect the level of health in the population. Other health outcomes, such as maternal mortality and life expectancy, could also be analysed.

CONCLUSION

This paper contributes to the empirical literature on fiscal decentralisation and infant mortality. The findings showed that subnational health resources had a positive effect on the decrease of infant mortality rates across the Colombian municipalities. However, this result was highly dependent on socio-economic conditions at municipal level. The results suggest that the benefits of fiscal decentralisation are greater in non-poor municipalities than in poor ones. Therefore, even when municipal governments know the needs of their communities, the level of local development is a key condition for reaching better results in improving infant mortality rates. The policy instrument used by Health Minister to determine the municipal institutional capacities in health sector claim to carry out an evaluation of the validity of this instrument.

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REFERENCES


FIGURES AND TABLES

Graphic 1. Infant mortality rate per 1000 births, Colombia 1986-2008


Graphic 2. Scatter plot of infant mortality rate per 1000 births (IMR) and percentage of households with unsatisfied basic need (UBN) at municipal level. Colombia 1998 and 2005
Graphic 4. Average locally controlled health expenditure as a proportion of total health expenditure by quartile of households with unsatisfied basic needs
Colombian municipalities 1998-2007

Graphic 5. Municipal Infant Mortality Rate per 1000 births (IMR) by certified municipal status
Colombia 1998-2007
**Table 1. Variable names and summary statistics.**

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<td>Urban school enrolment (%)</td>
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<td>53.0</td>
<td>21.9</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Municipality population</td>
<td>10340</td>
<td>41890</td>
<td>232281</td>
<td>678</td>
<td>7050228</td>
</tr>
</tbody>
</table>
Table 2. Infant Mortality Rates (Ln) in Colombia 1998 – 2007. Results of Fixed Effect Panel.

<table>
<thead>
<tr>
<th>Variables</th>
<th>All Municipalities</th>
<th>Sample according to municipal level of poverty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Fiscal decentralisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locally controlled health expenditure (Ln) t-3</td>
<td>-0.058</td>
<td>-0.062</td>
</tr>
<tr>
<td>[1.93]**</td>
<td>[2.04]**</td>
<td>[2.08]**</td>
</tr>
<tr>
<td>Transfers from central government as a proportion of total health expenditure (Ln) t-3</td>
<td>-0.045</td>
<td>-0.048</td>
</tr>
<tr>
<td>[1.50]</td>
<td>[1.59]</td>
<td>[1.11]</td>
</tr>
<tr>
<td>Municipal certification status</td>
<td>0.036</td>
<td>0.055</td>
</tr>
<tr>
<td>[5.00]**</td>
<td>[2.05]**</td>
<td>[4.27]**</td>
</tr>
<tr>
<td>Transfers from central government as a proportion of total health expenditure (Ln) t-3 * Municipal certification status t</td>
<td>-0.033</td>
<td>-0.057</td>
</tr>
<tr>
<td>[0.78]</td>
<td>[0.83]</td>
<td></td>
</tr>
<tr>
<td>Local Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households with unsatisfied basic needs (UBN) (%)</td>
<td>0.073</td>
<td>0.075</td>
</tr>
<tr>
<td>[2.44]**</td>
<td>[2.49]**</td>
<td>[2.50]**</td>
</tr>
<tr>
<td>Urban school enrolment (%)</td>
<td>-0.027</td>
<td>-0.023</td>
</tr>
<tr>
<td>[0.80]</td>
<td>[0.67]</td>
<td>[0.66]</td>
</tr>
<tr>
<td>Municipality population (Ln)</td>
<td>-0.033</td>
<td>-0.033</td>
</tr>
<tr>
<td>[2.50]**</td>
<td>[2.50]**</td>
<td>[2.51]**</td>
</tr>
<tr>
<td>Years</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>10467</td>
<td>10339</td>
</tr>
<tr>
<td>Number of municipalities</td>
<td>1080</td>
<td>1080</td>
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<tr>
<td>R-squared</td>
<td>0.13</td>
<td>0.13</td>
</tr>
<tr>
<td>Hausman test</td>
<td>Fixed Effect</td>
<td>Fixed Effect</td>
</tr>
<tr>
<td>404.54***</td>
<td>448.51***</td>
<td>405.14***</td>
</tr>
</tbody>
</table>

Robust t statistics in brackets
significant at 10%; ** significant at 5%; *** significant at 1%

° Municipalities which showed in 1998 a percentage of households with UBN at least equal to 49.5 % (% UBN households -census year 1993)
+ Municipalities which showed in 1998 a percentage of households with UBN higher than 49.5 % (% UBN households - census year 1993)