THE POLITICAL ECONOMY OF HEALTH SERVICES PROVISION AND ACCESS IN BRAZIL

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1. Introduction

In developing countries, health care is often subsidized by the government. This occurs in part because of the positive externalities associated with disease control, but also to redistribute income and to assure that the poor receive at least some minimum level of health services. A notable example is Brazil's "Unified and Decentralized Healthcare System" (SUS), established in 1988 with the goal of providing access to health care for all citizens, regardless of income. Financed by transfers from the federal government, as well as contributions from states and municipalities, the SUS delivers both basic and more complex health care and is the main source of medical treatment for the poor. Due to the involvement of politicians from various levels of government in running this system, the SUS presents an excellent case in which to examine the impact of politics on how effectively services are delivered to the poor.

This paper addresses two questions that are essential to evaluating the success of public health care provision: (1) What factors influence the distribution of public health services—doctors, nurses and clinics—across municipalities? In particular, what role do politics and government structure play in determining the quantity of public health care provided? (2) How do politics and the decentralization of public health services affect the likelihood that the poor and the uninsured actually receive health care? We answer the first question by estimating a model to explain variation in the number of public clinics and health care workers (doctors and nurses) per capita across municipalities (*municipios*) in Brazil in 1998. To answer the second question we use a large household survey (the 1998 *Pesquisa Nacional por Amostra de Domicilios* (PNAD)) to see whether people who rely on publicly financed health care (people without private health

insurance) are more likely to receive medical attention in municipalities with more public clinics and health care workers per capita. Because political factors and decentralization in the administration of health services may also affect their placement within a municipality and the types of services offered, we examine the impact of these variables on the likelihood that the uninsured receive medical care, in addition to the level of health care services themselves.

The median voter model of local public goods provision suggests that the distribution of public goods across municipalities should depend on variation in median preferences and income (Bergstrom and Goodman 1973; Rubinfeld 1987). That is, we would expect to see higher per capita health services in richer communities and in communities where the median voter desires more publicly provided health care. We would also expect to see greater levels of the public good in communities that receive more grants-in-aid from federal and state governments.

More recent literature has emphasized the role of politics and government structure in local public goods provision. Whereas the median voter model assumes that public goods provision is responsive to community preferences, in reality, how responsive elected officials are to the preferences of citizens may depend on the fraction of various groups in population that vote (Foster and Rosenzweig 2001) and on the degree of political competition (Besley and Burgess 2003). Political variables such as the connections between state and local officials (e.g., whether they are of the same political party) may also influence the size of grants-in-aid that local governments receive.

The extent to which decisions regarding public health are decentralized—i.e., made at the local rather than at the state level—is also likely to play a role in the amount

of health services provided and where they are located within the municipality. The traditional argument in favor of decentralization (Oates 1972) is that local governments are likely to be more responsive to local needs (i.e., to choose allocations that more closely reflect local preferences) than are state governments. This should improve the targeting of public health services (e.g., where clinics are located or the types of services offered). Decentralization may also improve the delivery of health services to those that need them most by promoting greater accountability than provision by higher levels of government (Bardhan and Mookherjee 2000).

To examine the impact of politics and local government structure on health care service delivery and access, we first we first investigate the effects that these factors have on the per capita allocation of public services across municipalities, while controlling for more traditional determinants of public spending. Specifically, our set of explanatory variables includes political participation by constituents, the intensity of political competition between parties competing for office, the extent to which voters in each municipality are politically left-leaning (a measure of the degree of constituents' desire for redistribution), the relative importance of federal or state versus local governments in decision-making, and variables measuring the strength of political connections between local and state government officials. In the second stage of the analysis we study the impact of public service provision—in addition to the same political variables—on individuals' ease of access to health care.

Our model to explain variation in the level of health services across municipalities indicates that greater levels of health services per capita are provided in richer areas, in localities with greater income inequality, and in areas where constituents favor a greater

degree of redistribution (measured by the percent of the population voting for a leftist presidential candidate). In addition, there is evidence that—controlling for per capita income—public service levels are higher when a larger fraction of citizens go to the polls, and in municipalities that are closer to the state capital. Somewhat paradoxically, service provision levels are greater when there is less competition between political parties in local elections, perhaps because this is a sign of a politically stronger mayor who can obtain results "on the ground" more easily. Decentralized municipalities provide more health care services only if decentralization is accompanied by "good governance."

When we examine the probability that an uninsured person is able to receive medical attention when ill, we find that households living in municipalities with more public health service provision are much more likely to be able to see a health professional when they need to. Ethnic minorities, poorer households and households living in rural areas are much less likely to have access. A number of political factors have an additional impact on access, beyond any impact through increased quantities of health services provision. For example, households living in municipalities where the mayor is politically connected to state legislators (i.e. the elected state governor and the elected municipal mayor are from the same party), and where municipal political participation rates are higher report better health care access.

By creating municipality level indicators of political participation, competition and connections, and examining their impacts on local public service provision and individuals' access to health care, this paper contributes to a well developed literature on the impact of democracy on economic performance. In particular, we find that political

patronage and participation matter. Citizens can attract better public services by going to the polls to effectively threaten politicians, while local politicians can provide their constituents better services if they are more "connected" to state legislators. We also add to the literature on decentralization by clarifying the relationships that link governance, decentralization and public service provision. Decentralization is unlikely to result in better service delivery unless municipalities have the required governing capacity.

The next section discusses the administrative structure of the health care system in Brazil and recent reforms. The following section discusses the literature relevant to our empirical models. We then present our data and estimation results.

2. The Healthcare System and Political Context in Brazil

Under the military regime (1964 to 1985), public health care provision in Brazil was heavily concentrated in the rich areas of the South and Southeast, with preferential access openly granted to certain professionals and public sector employees (Lobato 2001). The 1988 "Citizens' Constitution"—which marked the new period of democratic rule and was heavily focused on equity—decreed that all citizens should have "universal and equal access to [health] actions and services" regardless of income or occupation (Vajda et al.1998). To fulfill constitutional requirements, a new system of publicly financed healthcare was set up in 1990. This new "Unified and Decentralized Healthcare System" (SUS) aimed to make health care available free of charge to all users.

Currently, a fully private system co-exists with SUS. It is funded mostly through private health insurance plans and provides much higher quality care than the public SUS system (Alves and Timmins 2001). Premiums for the private insurance plans are

relatively costly for most Brazilians, and only about 25% of the population (mostly those with higher incomes or with employer-provided coverage) had access to this private system in 1998-99 (Alvarez 1998). These richer individuals generally make little use of the SUS system unless they require highly complex health care services that private plans do not cover.

This paper focuses on health care provision through the SUS system, which can be considered public because of the way it is financed. It is convenient to analyze this system along three different but related dimensions: ownership of facilities, administration of the system and financing of health care.[1]

A. Ownership and Administration of Facilities in the SUS System

Although the SUS system is fully publicly financed, many health care establishments providing SUS services are privately owned. The remainder are federal, state and municipal facilities. In 1999 67% of all SUS hospitals were privately owned; the remainder were owned primarily by either state (8%) or municipal governments (23%). Only 27% of clinics were privately owned in 1999, with state and municipal governments owning 3% and 69% of clinics, respectively.[2]

Regardless of ownership, all SUS facilities are administered by either state or municipal governments. The 1988 Constitution required that the *administration* of public health care provision should gradually devolve to municipal governments, with financial and technical assistance provided by the federal and state governments (Lobato and

[1] Much of the discussion of the SUS system is based on Lobato and Burlandy (2001), Lobato (2001), World Bank (1999) and World Bank (2003).
[2] These data are from the 1999 *Pesquisa Assistencia Medico-Sanitaria* survey of all health facilities in Brazil.

Burlandy 2001). Currently, each municipality is classified into one of the following three categories, in order of increasing levels of administrative decentralization: (i) Full State Management; (ii) Basic Assistance Management, where the municipality manages the provision of basic or primary health care,[3] and the state manages more complex types of provision; and (iii) Full Municipal System Management, where the municipality manages the provision of basic as well as complex care.

A municipal government that wishes to attain the Basic Assistance or Full Management status must negotiate this with the federal government. The Full Management status is awarded only if the municipal government asks for it, and if the federal government judges it capable of handling this enhanced administrative role. At the start of 1999, 8% of all municipalities had attained Full Municipal System Management status, while 80% had attained Basic Assistance Management status.

B. Financing of the SUS System

About 70% of health care services provided under SUS are ultimately financed by transfers from the federal government, of which there are two types: those for basic health care and those for complex care. The basic care transfers are administered by those municipal governments with either Basic Assistance or Full Management status. These transfers are divided into two categories: (i) "fixed" population-based transfers where the per capita amount transferred is the same for most municipalities; and (ii) various types of "variable" transfers for primary health programs tailored to the poor, often requiring additional payments or co-financing by states or municipalities.

[3] Visits to family doctors as well as some other types of clinical care are included in this category; complex procedures and visits to specialists are not.

The transfers for complex care are handled by the municipal government only in the case of Full System Municipal Management. These transfers are meant solely for the reimbursement of SUS providers for services rendered. There are two main constraints on these federally financed reimbursements: (i) they have to be done using a fee-for-service schedule maintained by the federal government, and: (ii) there is an annual ceiling on the total amount of transfers that each sub-national government can disburse. The amount of each ceiling is determined by political negotiations between the federal and sub-national governments. Political factors that affect the nature of these negotiations thus may play a key role in determining provision patterns for complex care. For example, SUS allocations may be favorable for municipalities that are politically important or "politically allied" to the state in some form.

Each state and municipal government managing these federal transfers imposes, in turn, a ceiling on transfers to each licensed SUS provider in its jurisdiction. The government in charge also has the right to determine which provider qualifies to participate in the SUS system. The sub-national governments may supplement these federal transfers with their own funds (and, in the case of Full Municipal Management, sometimes also from state funds). About 30% of the transfers to SUS providers come from sub-national government revenues.

3. Related Literature

In Brazil publicly financed health care is, effectively, a local public good. The level of basic health care provision is chosen by the municipality,[4] as is the level of

[4] This is true for 88% of municipalities, i.e., those who have attained Basic Assistance or Full System Management status.

complex health care services in the case of full decentralization (Full System Management). Because municipal officials in Brazil are democratically elected, it is natural to examine voting models of public goods provision, especially as they have been applied to developing countries.

Foster and Rosenzweig (2001) construct a probabilistic voting model to explain the provision of local public goods in India. Two parties compete for the votes of landed and landless voters, who have different preferences for local public goods provision. The probability that a citizen votes for party A over party B is the probability that his utility from the public goods provided by party A exceeds that of the utility of public goods provided by party B. In a voting equilibrium, the levels of public goods provided will reflect the shares of the two groups of citizens in the population and will duplicate the allocation chosen by a planner who maximizes the sum of all citizens' utilities, subject to the public budget constraint.

The Foster-Rosenzweig model has four implications for the provision of public health care: (1) Provision of public health care should increase with average income in the municipality since this raises the level of tax revenues in the public budget constraint; (2) Provision of public health care should be greater in municipalities that are able, through negotiations with the state and federal governments, to receive higher grants (transfers) for health care; (3) If the uninsured receive greater utility from the provision of public health care than the insured, one should expect to see higher levels of public health care in municipalities with a greater share of uninsured persons, *ceteris paribus*; and (4) Since what matters for public goods provision is the share of each group in the population

of *voters*, areas in which a higher percent of the uninsured vote should receive a higher level of public health care services, *ceteris paribus.*

Besley and Burgess (2003) examine the role of political participation and political competition in making state governments more responsive to the needs of citizens in India. They construct a model of elections in which voters balance a desire for government stabilization (in the event of shocks, such as droughts) against ideological preferences. Their empirical work finds that higher voter turnout and greater political competition increase the responsiveness of governments at the margin to decreases in food production. Betancourt and Gleason (2001) also find a positive association between voter turnout and public service provision in rural India.

A somewhat different theme that has been pursued in the literature on local public goods provision is the role of ethnic diversity. Alesina, Baqir and Easterly (1999) suggest that ethnic diversity should, other things equal, reduce the provision of local public goods. They construct a median voter model in which citizens first vote for the type of public good to be provided, and then for the level of the public good. In communities that are ethnically diverse, the type of public good chosen by the median voter will be farther away from the preferred public good type for each ethnic group than in more homogeneous communities. This will result in citizens being less willing to tax themselves (i.e., they will choose lower levels of public good provision) than in more homogenous communities where the type of public good chosen by the median voter would more closely match each group's desired type. This suggests that more ethnically diverse municipalities should have lower levels of public health care, other things equal.

Miguel and Gugerty (2002) find support for Alesina, Baqir and Easterly's argument in studying primary school funding in Kenya.

The literature on the impacts of decentralization on the provision of local public goods (Oates 1972; Besley and Coate 1999) has focused on the optimality of centralized versus decentralized provision of local public goods, rather than on the implications of decentralization for the *level* of public goods provision. In a world of heterogeneous preferences, the decentralization of local public goods decisions should make provision levels more closely approximate the choices of citizens within a municipality.[5] The impact of this on the level of provision is ambiguous; however, it implies that municipalities that have full administrative control over health care decisions may be able to target those services that are provided towards the people who need them the most.

The notion that municipal governments may be more accountable to their citizens than state governments, holding the level of public services constant, has been emphasized by Bardhan and Mookherjee (2000). However, they also consider the possibility that local government officials may be captured by local elites. This implies that citizens may fare better in the provision of public services under decentralization only if the quality of governance is good.

4. Empirical Models

We estimate the impact of political variables and government structure on access to health care in two stages. The first stage models the level of public health services in a

[5] Faguet (2003) finds some support for this argument in Bolivia. He examines patterns of government investment by sector following the transfer of authority to municipal governments and finds that more investment occurs in municipalities that need it most (e.g., there is more investment in education in municipalities with greater illiteracy).

municipality. The second stage models the probability that an uninsured individual receives access to health care when ill, taking into account the amount of health services provided (the dependent variables in the first stage) and political factors that may influence the location of health care facilities. This section describes the variables included in the two sets of models. Further details on the data sources are in the Appendix.

A. Dependent Variables in the Models of Municipal Health Services Provision

The dependent variables in these models are four separate indicators of public health services per 1000 residents in each municipality. The four indicators are: (i) the number of doctors (including specialists), (ii) nurses, (iii) clinics and (iv) clinic consultation rooms in the SUS system.[6] Corresponding measures of private (non-SUS) provision are included as control variables, to allow for possible substitution effects.[7] The data for both the public and private provision variables were obtained from the *Pesquisa Assistencia Medico-Sanitaria*, a survey of all health facilities in Brazil conducted in 1999.

The geographic definition of a municipality is arbitrary from the perspective of the consumers. Residents in any one municipality are permitted to - and often do - use

[6] "Nurses" includes those classified as "nursing auxiliaries" and "nursing technicians". "Clinics" are defined broadly, as all units providing medical care without inpatient facilities (pharmacies and facilities providing purely diagnostic services, such as laboratories, are not included). We do not use hospitals or hospital beds as provision measures because hospitals are "lumpy" units that are located in a limited number of municipalities. They are meant to serve residents from a fairly large geographical area that includes several municipalities. Thus, the municipality is not the appropriate unit of analysis. Doctors, nurses and clinics, by contrast, tend to be much more evenly spread out across municipalities.

[7] If a substitution effect exists, we would expect the coefficient of the private provision variable to be negative. However, in Brazil's two-tiered healthcare system, the market is segmented along rich/poor or private/public lines. If there are omitted variables that affect both private and public provision in a similar manner (e.g. characteristics of a locality that increase demand for healthcare in general) this coefficient may be positive.

health facilities in a neighboring municipality. Thus, the choice of provision levels in a municipality may partly depend on levels in neighboring municipalities. At the same time, unobserved factors affecting service provision may be correlated across space. For example, unmeasured epidemiological factors may increase the demand for health services in a particular region. To account for these effects, we run models with spatially auto-correlated errors and a spatial lag in the dependent variable.[8]

B. Consumer Preferences and the Public Budget Constraint

In democratic models of the provision of local public goods, the amount of a good provided depends on the size of the public budget constraint and on the distribution of consumer preferences within the community. Because public health care is financed in part out of local tax revenues, we expect the quantity of health services provided to increase with per capita income in the municipality. It should also increase with the size of transfers received from state and federal governments. These may depend on political factors (e.g., whether the mayor of the municipality is of the same party as the governor of the state) and on a municipality being awarded Full Management Status, points that are discussed more fully below.

We assume that preferences for publicly provided health care should increase with the percent of uninsured people in the municipality. This should be correlated with the percent of households falling below a given income level. Holding mean income constant, the percent of households below a given income threshold is increasing in the

[8] A spatial autoregressive model allows the dependent variable to be correlated across space. A general spatial model allows both (a) provision of health services in a municipality to be correlated with provision in neighboring municipalities, and (b) spatially autocorrelated errors. Further details are given in section 5. See Anselin (1988) for a treatment of these models.

Gini coefficient for the municipality. It should also be correlated with the percent of households living in slums.

To test Alesina, Baqir and Easterly's (1999) prediction that lower levels of public services will be provided in ethnically diverse jurisdictions we include (i) a measure of ethnic fractionalization in each municipality, calculated using data on the proportion of residents describing themselves as white, black, Oriental, "mulatto" (mixed-color) and indigenous;[9] and (ii) the fraction of each municipality's population that is indigenous.

The effective level of public health care received by residents of a municipality for a given per capita number of doctors, nurses or clinics, depends on the geographic distribution of these services within the municipality. Other things equal, a given number of doctors per person is likely to be less effective the more dispersed is the population. Geographic controls added to capture this phenomenon include (i) the proportion of municipal residents living in urban areas, (ii) population density, (iii) dummy for municipalities officially classified as belonging to a major metropolitan area, and (iv) a dummy for municipalities where agriculture is the predominant economic activity.

C. Variables Measuring Governance and Decentralization

Section 2 highlighted the fact that the government—state or local—in charge of the provision of *complex* health services plays a key role in determining funding allocations and outcomes. For this reason, our measure of decentralization is a dummy variable for municipalities that had Full Municipal Management status (where the

[9] More specifically, our measure of ethnic fractionalization is $1 - \sum_{i}^{5} r_i^2$ where r_1 to r_5 are the population shares of these five ethnic groups in each municipality. This equals the probability that two randomly selected individuals in a municipality are of different ethnicities.

management of both basic and complex care provision has been decentralized to municipal governments) in 1998. No differentiation is made between municipalities with Basic Assistance Management (BAM) status (where the management of only basic care provision has been decentralized) and those under full state management. According to our definition, only 415 of the 4338 municipalities in the sample (9.6%) are decentralized. Unlike decentralization measures used in most of the literature, which are based on the relative sizes of the state versus local government budgets, we construct our measure based on clear information about the government that is in charge of administering health services and regulating health care providers.

Our measure of governance is derived from the *Pesquisa de Informações Basicas Municipais*, which is a questionnaire administered to all Brazilian municipalities in 1999. A number of its questions relate to municipal planning capacity, management ability and organizational structure, typically requiring a "Yes" or "No" response. One question asks whether the municipality has a plan or set of directives for governing , and the length of time that such a directive has been in effect. More specifically, this is defined as an "explicit set of objectives and general line of actions oriented towards local development and improving residents' living conditions." In our base set of regressions, our "good governance" measure is an indicator for whether the answer to this question is "Yes." According to this definition, 36% of all municipalities have "good governance." Although this fraction varies somewhat between decentralized and non-decentralized municipalities (43% and 33% respectively), there is no indication that a strong relationship between decentralization and governance quality exists (the correlation between the two variables is only 0.06).

We present sensitivity results with alternative governance measures constructed on the basis of other survey questions. The two other governance measures constructed were: (i) whether the municipality had a "strategic plan", or a specific plan laying out "strategies for sustainable socioeconomic development", and (ii) whether it had a "community health council"—a body separate from the government consisting of public officials and members of civil society—that specifically oversaw health provision policy in the municipality. It was specified that the health council had to be more than just advisory in nature; it had to have "deliberative" powers, i.e. some control over policies, decisions and funding. Community councils were introduced in Brazil to enhance community participation in decision-making and responsiveness of governments to local needs. When these councils have sufficient control over funding and policy decisions, there is evidence that they can be quite successful (De Souza, 2002). Approximately 50% of all municipalities have health councils, and this fraction is higher for decentralized municipalities (62% versus 49% for centralized). In contrast, only 6% of all municipalities had a strategic plan, and this fraction is again higher for decentralized municipalities (12% versus 5.6%). However, the correlation between decentralization and these alternative measures of governance is again very low (0.08 or lower for both measures of governance).

D. Political Variables

Political factors play a key role in determining provision patterns, especially for complex care where SUS allocations are determined largely by political negotiations. SUS allocations and other transfers from the federal or state governments to

municipalities may be favorable for municipalities that are politically important or that have close ties to the state capital (Lima 2002). These municipalities may also be favored in other ways, for example through special training programs, preferential access to the services of medical staff, and better state-owned health care facilities located in the municipality. As a proxy for this effect, we incorporated as an explanatory variable the distance of each municipality from the state capital. Due to the dispersion in the size distribution of states in Brazil, there is a high degree of variation in this measure.

Local or regional political alliances may influence the degree to which the system favors a particular municipality. An alliance between key officials in the state and municipal government—such as the mayor and governor—may, for example, lead to favors granted to the municipality concerned. Unfortunately, political alliances in Brazil are not easy to analyze; there are several major political parties[10], and a variety of formal as well as informal alliances are often formed at the national, state and local level (Fleischer 1995). The makeup of these alliances often changes, typically reflecting practical considerations rather than party ideology; it can differ substantially at different levels of government, and in different jurisdictions (Fleischer, 1995; US Library of Congress, 2000). In our models we include a political alliance measure that is admittedly limited due to informational constraints: an indicator for whether the mayor of the municipality elected in 1996 and the state governor elected in 1994 were from the same party.[11] This occurred in only 588 (13.6%) of the municipalities in our sample.

[10] According to US Library of Congress (2000), there were seven major political parties in 1997, accounting for 92.6% of all members in the Chamber of Deputies (Brazil's equivalent of the US House of Congress).

[11] We don't use 1998 gubernatorial election results, because the new governor elected in 1998 would take office in 1999. Since our dependent variables are measured in 1998 and 1999, we are allowing for a time lag since we expect political actions to have a delayed rather than immediate impact on final provision. In each election, it is common for candidates from different parties to form and then officially announce a

Although by law voting is compulsory for literates in all elections, in practice the penalties for non-compliance are not large, and average voter turnout (77% in the 1996 elections) is significantly less than 100%. Our measure of political participation is the proportion of residents in each municipality who voted in the 1996 municipal elections. Higher participation in elections may imply more political accountability and, in turn, greater efficiency and equity in the provision of public health care. Because people employed in the informal sector are more likely to be able to escape the penalty for not voting, variation in participation rates is likely a result of variation in the proportion of poor in the municipal population (the segment of the population who is likely to use SUS services). Our participation measure is therefore an important indicator of the "voice" of the clientele of public health services.

Greater political competition in elections—as manifested by more candidates, or a more even distribution of votes across candidates—may have a similar impact as greater political participation, fostering more accountability and leading to better outcomes. On the other hand, political competition may have the opposite relationship with provision; an elected official facing less competition may have more political power, and thus may be better placed to implement strong reforms leading to improved provision. In a system of representative elections, an incumbent may reward a captured constituent base with better services in order to ward off competition from potential challengers within the

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coalition. Often, the composition of these coalitions differs between the municipal and state elections. We have data only on official coalitions, although unofficial coalitions sometimes emerge. We extracted the following information from this data: (i) whether the mayor's party is the same as one of the parties in the governor's coalition (or the governor's party if there is no coalition); (ii) whether the governor's party is the same as one of the parties in the mayor's coalition (or the mayor's party if there is no coalition). We experimented with alternative definitions of political alliance using this coalition information (e.g. the mayor is politically aligned to the governor if either (a) they are both from the exact same party, or (b) one's party was part of a coalition (in the mayor or governor elections) in which the other's party was also a member), but the results are not sensitive to the particular definition.

party. The political competition measure we create is the inverse of a concentration (Herfindahl) index of the vote shares of each mayoral candidate in the 1996 municipal elections.[12] We experimented with the vote share of the winner as an alternate measure but the results do not change significantly.

Local residents' desire for redistribution may also play a role in determining outcomes. If this desire is strong and if governments respond accordingly, provision levels and access—especially for the poor—may be higher. Our (albeit imperfect) measure for this is the proportion of municipal residents who voted for either of the two clearly left-leaning candidates in the 1998 Presidential elections (Lula and Ciro Gomes).[13] These two candidates accounted for about 35% of the votes on average across the sample municipalities. Holding local preferences constant, provision levels and access may also be higher if there is a mayor or governor with a left-leaning ideology or from a left-leaning party. Our regressions include an indicator for municipalities whose elected mayors were from such a party. The classification of which parties are "left-leaning" is based on the description of Brazilian political parties in Fleischer (1995).[14]

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[12] Specifically, our political competition measure is $1 - \sum_{i=1}^{n} v_i^2$ where v_i is the vote share of candidate i, and n is the number of candidates. We opted to use the municipal election data to construct this measure rather than gubernatorial election data, since we required a measure that varies by municipality. A municipality level concentration index of the gubernatorial election data is not directly indicative of the amount of competition the governor faced in winning the state election. The theoretical range for this measure is from 0 (a single candidate gets all the votes) to the inverse of the number of candidates (when all candidates get an equal share of the votes). The average value in our sample is 0.53. In 100 of the sample municipalities (2.3%), a single candidate faced no opponent.

[13] Lula – Brazil's current president – has been a key figure in the Worker's Party, a party that has fashioned itself as left-leaning. Aside from Lula, the only candidate in the 1998 Presidential elections that ran on a clearly leftist platform was Ciro Gomes, of the ex-communist Popular Socialist Party.

[14] The parties classified as left-leaning are Workers' Party, Unified Workers' Socialist Party, Brazilian Communist Party, Popular Socialist Party, Brazilian Socialist Party, Green Party and Communist Party of Brazil.

If state dummies were excluded, one could introduce state level political variables—such as whether the President and governor are from the same party—into the regressions. We experimented with this approach, but found that the regression fit was significantly reduced. There are likely many state-specific factors that cannot be adequately captured by observable state level variables. By introducing state dummies, we are controlling for these factors, and examining solely differences across municipalities within each state.

E. Variables from the PNAD household survey

The models estimated using PNAD data explain whether or not an individual dependent on the SUS had adequate access to health care in 1998. In addition to individual household characteristics, these models include most of the variables used to explain variation in the quantity of public health care across municipalities. This is because these factors may also affect the location of health services within a municipality, or the types of services offered. Politics and governance can therefore affect individual access through channels other than the quantity of service provision. The models also control for the quantity of both public health services (dependent variables in the first stage) and private services.

The individual data are obtained from the 1998 *Pesquisa Nacional por Amostra de Domicilios* (PNAD), a survey of 344,886 individuals from 112,434 households. The survey is representative of all of Brazil except for certain rural areas in the North (see Data Appendix). The survey is conducted annually, and in 1998 a special module was

included to obtain detailed information on the population's health status and usage of health services.

Survey respondents were asked whether they had a health problem during the previous two weeks that required medical attention. Our sample consists of individuals who answered "yes" to this question and who did not have private health insurance, i.e., who are likely to use the SUS system. A subset of these individuals reported that they either were not able to obtain treatment when they sought it (e.g., because the doctor was not available when they visited the health facility) or that they did not bother seeking treatment because of difficulty accessing a health facility (e.g., it was too far away). These individuals are classified as not having access to health care. [Details on the relevant survey questions and responses are provided in the data appendix.] Of the 34,239 individuals in our sample, 24% (8,338) did not have adequate access to healthcare.

The effort that an individual invests in seeking health care is likely to depend on the nature and severity of his illness. We included a number of dummy variables for whether or not the individual suffered from particular afflictions, including diarrhea, respiratory disease and diabetes. For two of these conditions—diarrhea and respiratory disease—an interaction term with the individual's age was included as a separate variable, to account for the fact that these diseases can be much more harmful in children than in adults. Severity of the illness was captured by the number of days within the stated two-week period when the individual could not function properly due to the illness. Other individual and household level controls include measures of per-capita household income, age, sex, household size, education level and race dummies.

5. Empirical Results

A. Sample Characteristics

Tables 1 and 2 present summary statistics for both the first-stage (municipality-level data) and second-stage (individual-level data) samples. The average municipality in our sample has about 1 doctor and 1.36 nursing professionals working at SUS facilities per thousand residents, which are close to average figures typically reported for Brazil. On average, there are over fifteen times as many public health professionals and clinics as there are corresponding services provided by the private sector. The average municipality has a GDP per capita of R$3020, and a Gini coefficient of 0.53, which reflects the high degree of income inequality in the Brazilian population. The average municipality is also ethnically diverse and somewhat urbanized, but located outside a major metropolitan area.

Comparing sample means across survey respondents who report that they did receive medical attention when required with those who did not, people who have health care access are on average a little younger, are from smaller households and are more likely to be female, although these differences are not statistically significant. People with access enjoy significantly higher household per capita income, are more likely to be educated, white and urban, and were seeking treatment for a more severe illness. Comparing municipality level data, people with access lived in municipalities that had greater per capita allocation of both public and private doctors and nurses, but not clinics. These municipalities were on average located closer to the state capital, were more densely populated, more likely to be located in a major metropolitan region, and more likely to have better governance.

B. OLS Estimation of Municipal Public Health Provision Models

Table 2 reports equations for the four indicators of public health provision: doctors, nurses, clinics and clinic consultation rooms, estimated by ordinary least squares. What is notable in this table is the consistency of the results across the four specifications. Typically, each independent variable affects each of the four measures of public health services provision in the same direction.

As expected, more health services per capita are provided in richer municipalities. This probably reflects the larger health-care budgets in richer municipalities. A R$2900 (one standard deviation) increase in GDP per capita increases public doctors by 3%, nurses by 2%, clinics by 2.5%, and clinic consultation rooms by 3.7%. These effects are all statistically significant, but small in magnitude. Holding per capita incomes constant, greater income inequality signifies more poor/uninsured people, or in other words, a larger base of clientele for public health services. We find evidence consistent with this—when the Gini coefficient increases, so does the provision of doctors, nurses and clinic consultation rooms. A one standard deviation increase in the Gini coefficient increases doctors and nurses by 6% each, and clinic consultation rooms by 2.3%. Of the geographic controls included in the regressions, there is some evidence that the relationship between urbanization and public health services is non-linear, and very strong evidence that major metropolitan areas (which are densely populated) receive less services on a per capita basis.

The results indicate that politics matter for public service allocation along many different dimensions. First, political participation (the voting rate) has a strong positive

impact on the provision of health services. A one standard deviation (9 percentage point) increase in the voting rate increases doctors, nurses, clinics and consultation rooms by 9%, 3%, 13% and 12% respectively. The coefficients are also quite precisely estimated. It is possible that the voting rate partly picks up the effect of better education on the demand for health services. However, adding a measure of average years of schooling to the set of explanatory variables (not reported in the tables) does not change the significance of the political participation measure. Since the source of the variation in political participation across municipalities is likely to be the voting behavior of the poor, there is strong evidence that when the poor make their voices heard, governments respond accordingly.

Second, greater preference for redistribution, as proxied by the share of total votes going to leftist candidates in the Presidential election, significantly increases the provision of all types of public health services. A one standard deviation (14 percentage point) increase in this vote share increases doctors and nurses by about 7% each, and clinics and consultation rooms by about 5% each. On the other hand, electing a municipal mayor from a leftist party has no statistically significant impact on service allocation. Third, increase in the intensity of competition between parties over votes has a significant negative impact of service provision. A one standard deviation increase in our Herfindahl-based measure of political competition reduces doctors, clinics and consultation rooms by 4%, 6% and 8.5% respectively. Politicians with a captured constituent base thus reward voters with better services. An alternative explanation for this observed effect could be that local politicians with a strong popularity base have greater political capital to expend in their negotiations with state legislators over fund

transfers to the municipalities. It is probably important for state politicians to keep strong local leaders happy.

Fourth, we speculated above that municipalities with close ties to the state capital receive favorable treatment in funds transfers from the federal and state governments. We approximate this effect in our regressions by measuring the distance of the municipality from the state capital. There is weak evidence that municipalities closer to the state capital provide more public services. This effect is statistically significant in two of the four specifications, and a one standard deviation increase in the distance to the state capital reduces both doctors and clinics by over 4%. Our other measure of political connections between states and municipalities, which is an indicator of whether the state governor is from the same party as the municipal mayor, also has a weak positive impact on health service provision. Municipalities where this connection exists have 7.2% more doctors on average than municipalities where it does not, and this difference is statistically significant at the 90% confidence level. There are similar (but smaller) differences in the other measures of service provision, but those effects are not different from zero at conventional confidence levels.

The regressions also present an interesting set of results on the relationship between decentralization, governance quality and service provision. There is no evidence that decentralized municipalities provide higher levels of public health services. Since the decision to decentralize is endogenous, this effect would be difficult to interpret even if it did exist. However, once the set of decentralized municipalities is subdivided into two groups—those that have a governance plan and those that do not—some interesting results emerge. In each of the four specifications, the coefficient on the indicator for

decentralized municipalities with a plan for governance is more positive than the coefficient on the indicator for decentralized municipalities without a governance plan (non-decentralized municipalities is the omitted category). Further, in the doctors and nurses regressions, the former is positive and statistically significant, while in the consultation rooms regression, the latter is negative and significant. This indicates that decentralized municipalities provide greater health service inputs than other municipalities only if decentralization is accompanied by good governing capacity. When it is not, decentralization actually reduces per capita allocation of some public health services. Decentralized municipalities with the required governing capacity have 13% more of both doctors and nurses compared to others, whereas decentralized municipalities without the required governing capacity have 8% fewer clinic consultation rooms compared to other municipalities.

Table 5a and 5b present some sensitivity results using alternative measures of governance quality. We replace the indicator for "municipality has a governance plan" with two alternative indicators: "municipality has a strategic plan" and "municipality has a health policy council." In either case, the basic pattern of the outcomes does not change, although the significance and size of impacts are slightly different. In both cases, municipalities without governing capacity provide fewer services per capita than other municipalities.

C. Spatial Models of Municipal Health Service Provision

Since the geographic definition of a municipality is essentially arbitrary from the perspective of consumers (a person can easily cross municipal boundaries to seek health

care), provision patterns in neighboring municipalities are likely to be inter-related. The level of health services in a municipality depends not only on its own characteristics, but also on the characteristics of (and especially the level of provision in) neighboring municipalities. In the presence of such spatial effects, OLS estimates can be biased (Anselin 1988).[15] To take the spatial dependence into account explicitly, we estimate a spatial autoregressive model, in which provision of health services in each municipality is determined by provision in neighboring municipalities.

Specifically, we estimate a model of the form: $y = \rho Wy + X\beta + \varepsilon \ ; \varepsilon \sim N(0, \sigma^2 I)$, where y is the provision of health services, X is a matrix of explanatory variables, and W is a matrix that specifies the neighborhood relationship between each pair of municipalities in the sample. To specify W, we use GIS maps of Brazil to identify the set of municipalities that share a border with each municipality in the sample. Only those that share a border are termed "neighbors," and are assigned non-zero weight in the neighborhood matrix. All neighbors are assigned equal weight, and W is row-normalized. The model is solved using maximum likelihood, and yields estimates for the parameters β and ρ.[16] Results are presented in the four columns labeled "SAR" in table 4.

Spatial autocorrelation in errors may also exist if region-specific unobserved factors affect the demand for health services in a similar fashion in municipalities located

[15] For example, if there is positive spatial correlation in both the number of doctors and in GDP per capita, part of the positive impact of GDP per capita on the provision of doctors that we observe is possibly attributable to the fact that GDP per capita in this municipality is positively correlated with GDP per capita in a neighboring municipality, which in turn affects provision of doctors in the neighboring municipality, which in turn is positively correlated with provision of doctors in this municipality. OLS estimation would therefore overestimate the pure effect of GDP per capita on the provision of doctors.

[16] We estimate all spatial models using the sparse matrix algorithms in Matlab developed by Le Sage (1999).

close together. For example, if particular types of diseases are more prevalent in some regions, health care demand may be higher in those regions. To take into account such effects, we estimate a more general form of the spatial model in which the error term is also autocorrelated in space.

Specifically, the model with spatially autocorrelated errors that we estimate is

$y = \rho Wy + X\beta + u$, $u = \lambda W_2 u + \varepsilon$; $\varepsilon \sim N(0, \sigma^2 I)$.

In this formulation, W_2 is another neighborhood matrix that specifies the spatial relationship between municipalities. Since $W = W_2$ can lead to identification problems in the model, we use a second-order spatial contiguity matrix for W_2 ($W_2 = W*W$) in which neighbors of neighbors are also assigned non-zero weight in the neighborhood matrix. Essentially, we are allowing the disturbance structures to exhibit higher order spatial dependence that the dependent variables. Maximum likelihood estimation (results reported in columns labeled "GSM" in table 4) returns estimates for ρ, λ and parameters β.

The main results of the paper concerning the effects of politics and governance on service allocation are qualitatively immune to our treatment of spatial dependence. As expected, the magnitudes of effects become smaller, particularly for explanatory variables such as voting rates, voting patterns in favor of leftist candidates and geographic controls, which are likely to be spatially autocorrelated themselves. In general, most variables remain statistically significant if they were significant in the OLS regressions. Positive ρ parameters in all SAR specifications indicate that for all measures of health services, provision in neighboring municipalities are positively autocorrelated. A 10% increase in health services in neighboring municipalities is associated with

between 1% and 3% increase in provision in each municipality. In GSM specifications where spatial autocorrelation in errors is accounted for, the effects of the explanatory variables of interest become even smaller in absolute value. This set of models assigns a different pattern of spatial dependence in the error terms and dependent variables: ρ is large and positive while λ is large and negative. The overall fit of the models improves substantially in the GSM models.

In the SAR models, political participation remains a statistically significant determinant of public service allocation for all four dependent variables. However, the magnitude of the effect of a one standard deviation (9 percentage point) increase in participation on the provision of doctors, nurses, clinics and consultation rooms are reduced to 8%, 3%, 11% and 10% respectively (compared to 9%, 3%, 13% and 12% in the OLS). In the GSM specifications, these effects are even lower at 3%, 0, 7% and 6% respectively. Although these elasticities are smaller (now less than 1 when computed at the mean in all cases), their magnitudes remain economically significant. Similarly, a standard deviation increase in the vote share of leftist presidential candidates has a uniformly smaller effect on all four measures of public health services. The effects on doctors, nurses, clinics and consultation rooms are reduced to 5.5%, 6.8%, 4% and 3% (compared to 7%, 7%, 5% and 5% in OLS). Effects in GSM specifications are further reduced to 2%, 2.2%, 1.6% and 1.3% respectively. As before, increase in political competition has a significant negative impact on the provision of doctors, clinics and consultation rooms, but the magnitude of the effect is smaller in absolute value. There is still exists a weak effect of distance to the state capital, but our other political connections

measure (indicator for governor and mayor from the same party) is insignificant in the spatial models.

Increases in the Gini coefficient continue to have a statistically significant positive impact on the provision of doctors, nurses and clinic consultation rooms, as do increases in municipal GDP per capita. These effects are just slightly smaller in magnitude compared to the OLS results. The same pattern of effects is observed for the interaction between governance and decentralization. In the spatial models, decentralized municipalities with good governing capacity provide more doctors and nurses per capita than other municipalities, while decentralized municipalities without the governing capacity provide fewer clinic consultation rooms.

D. Probit Models of Individual Access to Health Care

Since greater quantities of doctors, nurses or clinics do not by themselves guarantee that people receive health care when they need it, it is important to determine whether these services reach their target audience. Since SUS services are free of charge, high income individuals with health insurance plans rely on SUS for complex high-cost procedures not covered by their insurance. This can possibly crowd out the basic services that the uninsured poor are more interested in, particularly if local politicians and administrators are not responsive to the needs of the poor. Medici (2002) writes: "*Those who do not have private plans continue to face the scarcity of services available to care for their pathologies, the long lines waiting for medical assistance, public hospitals without funds or drug supply, and the difficulties in accessing basic services.*" It is

therefore important to determine whether the same political variables that affect service provision also have an impact on the access to health care by the uninsured.

Table 3 reports the results of estimating a probit model to explain whether an individual obtains health care when ill as a function of individual and household characteristics and indicators of politics, government structure, and the socio-economics characteristics of the municipalities in which those individuals reside. The second column (eq. 6) adds measures of public and private per capita supplies of doctors and nurses and clinic consultation rooms to the set of explanatory variables. The coefficients of individual characteristics indicate that females, whites, people living in richer, smaller and urban households and people suffering from a more severe illness were significantly more likely to have sought and received health care when ill. These effects are quite large. For example, people living in urban areas have a 36 percentage point higher probability of reporting access than rural people, educated people are about 20 percentage points more likely to report adequate access compared to the uneducated, and whites are 12 percentage points more likely to have access compared to blacks. The effect of household income is non-linear, but a standard deviation increase in income at the mean (increase of about R$210) leads to a 17 percentage point increase in the probability that an individual receives treatment when required. Curiously, people with back/spine problems, arthritis and kidney disease are less likely, while people with heart/blood pressure problems and diabetics are more likely to report seeking and receiving treatment when compared to individuals not suffering from any chronic afflictions.

When the levels of health services are not controlled for, political participation, tastes for redistribution (as measured by the vote share of leftist Presidential candidates)

and state-municipality political connections (indicator for whether the governor and mayor are from the same party) all have significant positive impacts on the probability that an individual receives treatment. A one standard deviation increase in the municipal voting rate increases the probability that an individual residing in that municipality receives health care by 3 percentage points. This effect ceases to be statistically significant once health services supply variables are added, suggesting that political participation affects access only by increasing the quantity of health professionals and clinics provided.

The impact of political connections is much stronger here than in the municipal health service supply models. In municipalities where the elected mayor is from same party as the elected state governor, individuals are 9 percentage points more likely to report adequate access. This difference is reduced to 6 percentage points once the supply variables are added, but the effect remains statistically significant. A one standard deviation (16 percentage point) increase in the vote share of leftist presidential candidates, signifying greater tastes for redistribution in the population, leads to over a 6 percentage point increase in the probability that individuals are treated by a health professional when required. This effect is similar in the specifications with and without health services supply variables.

Measures of the supply of public (SUS) health services have strong positive impacts on individual access. A one standard deviation increase in doctors and nurses (an increase of about 2 health professionals per thousand residents) leads to almost an 8 percentage point increase in the probability that individuals will receive treatment when required. Similarly, a one standard deviation increase in clinic consultation rooms (an

increase of just over one room per thousand residents) increases the likelihood of access by over 10 percentage points. Increases in the non-SUS private provision of health professionals or clinics have no such effect on access. This is not surprising, since our sample consists only of uninsured individuals who typically would not seek private health care.

Individuals living in ethnically fractionalized municipalities are significantly less likely to obtain access to health care. This is a somewhat surprising result, since ethnic fractionalization did not have a negative impact on the supply of SUS health services in our sample of municipalities. Taken together, these two pieces of evidence suggest that ethnic fractionalization does not affect the quantity of public services provided, but does affect either their location or the efficiency with which those services reach the poor. The Alesina et al. (1999) argument linking low provision to ethnic heterogeneity of preferences over types of public goods does not seem to apply to health care. A model of racial conflict over capturing the benefits of the public good, which reduces service quality by diverting some productive resources towards conflict (Rodrik 1999) is more consistent with the evidence presented here.

Decentralization of service delivery improves access only if it is accompanied by good governing capacity. Individuals living in decentralized municipalities that lack the governing capacity are over 12 percentage points less likely to be treated by a health professional than individuals living in municipalities where the administration of SUS is still under state control. This effect remains highly statistically significant even after the supply of health services are held constant. On the other hand, individuals in decentralized municipalities with a governance plan are over 4 percentage points more

likely to report adequate access compared to individuals in centralized municipalities. As shown in tables 5a and 5b, these governance-decentralization interaction results carry over when we replace the governance plan measure with the two alternative indicators of governance (whether the municipality has a strategic plan and whether it has a health policy council). When either alternative indicator is used, living in a decentralized municipality without the requisite governing capacity has a significant negative impact on access.

6. Conclusion

The purpose of this paper is to examine factors that affect (a) the level of public health services provided in municipalities in Brazil, and (b) the probability that people without health insurance receive medical attention when they are ill. The latter may depend on the per-capita supply of clinics and health care workers, but is also likely to depend on how well these services are targeted at people in need of them. We have emphasized the role that political variables—such as the fraction of the electorate that votes and competition among political parties—play in answering these questions. We have also examined the impact of the decentralization of the administration (and, to some extent, the financing) of health services on health care delivery.

Political participation—measured by the percent of the electorate that voted in the 1996 mayoral election—increases both the level of public health care and the probability that the uninsured receive it. The latter effect, however, occurs primarily through the impact of participation on the level of public health services. In contrast, political connections between the mayor of the municipality and the governor of the state in which

the municipality is located (i.e., the fact that they are of the same party), has very little impact on the level of health services but increases the probability that the uninsured receive medical attention, holding the number of clinics and health care personnel constant. Having a strong local leader, and the percent of voters favoring a leftist presidential candidate appear to increase both the quantity of public doctors, nurses and clinics and the percent of uninsured who receive medical attention, holding the supply of services constant.

In Brazil the role of decentralization in the provision of health care services has both an administrative aspect and a fiscal one. One might expect that local control over the administration of health care services would improve the targeting of these services to those who need them the most, holding the level of service provision constant. Decentralization of complex health services might also increase the budget for such services, compared to state management. It appears from our analyses that decentralization, in the absence of a plan for governance, actually decreases the chances that the uninsured receive health care. Further, there is evidence that decentralization, when accompanied by good governance, increases the amount of public health services provided in a municipality.

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Data Appendix

A. Data Sources for Municipal Level Variables

Data on the number of doctors (including specialists), nurses, clinics and clinic consultation rooms (SUS as well as non-SUS) came from the *Pesquisa Assistencia Medico-Sanitaria*, a survey of all health facilities in Brazil conducted in 1999. For municipality-level GDP data, we rely on estimates for the year 1996 constructed by IPEA (2001). These rely on data from the Censuses of Population, Industry, Agriculture and Services to construct municipality total real GDP measures. These censuses are administered by the Brazilian national statistical institute (IBGE).

It should be noted that the geographic boundaries of some municipios do not stay constant over time. The system of transfers from federal to local governments – with a fixed component given to each municipality regardless of size – has created strong incentives for municipalities to split over time and create additional municipalities. We are mindful of this, and normalize all relevant variables by population data (obtained from the national statistical agency IBGE) for the exact time frame for which the numerator was obtained.

The ethnic fractionalization, proportion-of-indigenous and income inequality variables were computed using data from the 1991 Demographic Census. Data on the proportion of residents living in temporary housing or slum areas (for the year 1996) are from the *Base do Informações Municipais (BIM)* produced by IBGE. Data on the proportion of residents living in urban areas and population density of the municipalities come from the same source. The distance from each municipality to the state capital was computed from latitude and longitude coordinates for the "center" of each municipality also taken from *BIM*. It was assumed that each degree of latitude or longitude (with one degree being our unit of measurement) spans the same length of about 110 km. This is approximately correct for a country like Brazil where all points are located less than 20 degrees from the Equator, although the exact correspondence between a degree of longitude or latitude and distance in kilometers differs slightly at different geographical locations (Meeus, 1999).

Our measures of governance are taken from a survey of all municipalities conducted in 1999 by IBGE (*Pesquisa de Informações Basicas Municipais*). The

decentralization dummy variable is calculated based on which municipalities have Full Municipal Management status in 1998, as reported by SUS. All political variables were computed from the database maintained by Brazil's Superior Election Court (TSE). This database reports the names and basic characteristics of all candidates running for office, and the number of votes received by each candidate in each municipality for Presidential, state gubernatorial and municipal mayoral elections held since 1992. Elections are held at four-year intervals, and municipal elections are staggered by two years (1992, 1996, 2000) relative to state and federal elections (1994, 1998). Constrained by the years for which health data are available, we concentrate on the 1994 and 1996 elections.

Our political participation variable is calculated as the number of votes cast in the mayor 1996 elections (excluding null and blank votes) in each municipality, as a fraction of the municipality population. We do sensitivity checks by changing the definition of the denominator to the number of registered voters, and by including null and blank votes in the numerator, but the results do not change qualitatively in response to these alterations.

B. Details on the PNAD Individual and Household Survey Variables

The *Pesquisa Nacional por Amostra de Domicilios* (PNAD) is a household and individual survey conducted almost every year, covering all of Brazil except for sparsely populated rural areas in the Northern states of Rondonia, Acre, Amazonas, Roraima, Para and Amapa. To select the survey sample, municipalities covered by the survey are divided into two groups: key municipalities (including those in the large urban areas) and second-tier ones. Sampling is done from each of the key municipalities; the second-tier municipalities undergo a process of stratification to select a subset of them, and household sampling is then done from each municipality in this chosen subset. The 1998 PNAD included households from 793 out of a total of 5008 Brazilian municipalities.

The PNAD consists of a basic questionnaire that remains more or less the same every year, and an additional module based on a different theme every year. In 1998, the theme was health care and health usage. A total of 112,434 households (344,886 individuals) were surveyed in PNAD 1998. Our regression sample consists of a subset of

those individuals, selected (as explained below) on the basis of their healthcare needs over a two-week recall.

C. Measuring Individual Access to Health Care

The 1998 PNAD survey posed the following set of questions:

(1) "During the past 2 weeks, have you looked for any health service or professional for treatment related to your own health?" (possible responses: "Yes" and "No")

Individuals who responded "yes" to the question above were then asked:

(2) "When you looked for this treatment, were you treated?" (possible responses: "Yes" and "No")

Individual who responded "no" to question 2 were asked:

(3) "… why not?"

The possible multiple choice responses for question 3 were:

(a) There was no available vacancy; (b) there was no attending doctor; (c) the required service or specialized professional was not available; (d) the required equipment was out of order; (e) could not afford payment;[17] (f) waited too long and gave up; and (g) other reasons.

Those who answered "no" to question 1 (i.e. did not seek healthcare over the two-week recall) also had to answer the following question:

(4) "During the past 2 weeks, why did you not look for health services?"

The available multiple choice responses were: (a) It was not necessary; (b) did not have money; (c) the health facility is far away or access is difficult; (d) there were difficulties with transportation; (e) very long waiting time; (f) the necessary specialist was not available at the health facility; (g) nobody was available to accompany you; (h) other reasons; (i) unknown.

Those who answered (a) for Question 4 (286,885) were dropped from the analysis because they did not need healthcare. Those responding with (h) and (i) for question 4

[17] The multiple choice options (e) for Question 1 and (b) for Question 3 – relating to payment for services – were provided because: (i) the survey includes users (or potential users) of non-SUS facilities where services are not free of charge, unlike SUS facilities; (ii) SUS does not provide very good coverage of prescription drugs, and so patients often have to pay for these out-of-pocket; and (iii) option (b) of Question 3 may include necessary payments for transport.

were also dropped, since these responses do not provide adequate information for us to judge their healthcare access status.

Among the remaining respondents (53,584, i.e. all respondents aside from those dropped), the following were classified as not having adequate health care access: those who answered "No" to question 2 (i.e. those who were not treated when they sought healthcare, totaling 1800 individuals), and also those responding with either (b), (c), (e) or (f) for question 3 (i.e. individuals who did not bother seeking care due to difficulties in access, totaling 7985). All remaining individuals (43,799) were classified as having adequate health care access. All individuals with private health insurance were dropped from the analysis. This – as well as exclusion of persons with missing or inadequate responses for other survey questions – resulted in the final sample of 25901 individuals classified as having health care access, and 8338 persons classified as not having it.

Table 1a. Summary Statistics (Continuous Variables)						
	Municipality-Level Regressions (4338 obs.)		***Individual-Level Regressions[1]***			
			Without Health Care Access (8338 obs.)		*With Health Care Access (25901 obs.)*	
	Mean (Standard Deviation)	*Range*	*Mean (Standard Deviation)*	*Range*	*Mean (Standard Deviation)*	*Range*
Public doctors in municipality, per thousand residents	0.97 (0.95)	0 - 21.5				
Private doctors in municipality, per thousand residents	0.07 (0.27)	0 - 7.9				
Public nurses in municipality, per thousand residents	1.36 (1.11)	0 - 16.8				
Private nurses in municipality, per thousand residents	0.04 (0.16)	0 – 2.95				
(Sum of) public doctors and nurses in municipality, per thousand residents			2.86 (1.94)	0 - 21.9	3.32 (2.2)	0 - 21.9
(Sum of) private doctors and nurses in municipality, per thousand residents			0.58 (0.83)	0 - 4.48	0.78 (0.97)	0 - 4.48
Public clinics in municipality, per thousand residents	0.35 (0.26)	0 – 2.67				
Private clinics in municipality, per thousand residents	0.01 (0.04)	0 – 0.56				
Public clinic consultation rooms in municipality, per thousand residents	2.34 (1.47)	0 - 13.02	1.26 (1.03)	0 - 9.61	1.26 (1.14)	0 - 9.61
Private clinic consultation rooms in municipality, per thousand residents	0.10 (0.26)	0 – 2.85	0.19 (0.30)	0 - 2.1	0.24 (0.35)	0 - 2.1
Annual per-capita product of municipality in 1996 (’000s of Reals)	3.02 (2.91)	0.1 - 84.4	3.65 (2.97)	0.21 - 23.2	4.63 (3.28)	0.21 - 23.2
Gini coefficient of household per-capita incomes in municipality	0.54 (0.06)	0.32 - 0.84	0.57 (0.06)	0.35 - 0.75	0.57 (0.06)	0.35 - 0.81
Proportion of municipality residents in temporary or slum housing	0.004 (0.01)	0 – 0.38	0.004 (0.009)	0 - 0.22	0.004 (0.01)	0 - 0.22
Political participation in the 1996 mayor election	0.77 (0.09)	0.34 - 0.96	0.73 (0.07)	0.34 - 0.93	0.74 (0.07)	0.34 - 0.93
Political competition in the 1996 mayor election	0.53 (0.12)	0 – 0.83	0.59 (0.10)	0 - 0.79	0.60 (0.11)	0 - 0.80
Share of the total vote in the 1998 Presidential elections going to a candidate from a party on the left	0.35 (0.14)	0.06 - 0.91	0.42 (0.17)	0.08 - 0.84	0.44 (0.16)	0.08 - 0.84
Distance of municipality from state capital	2.29 (1.51)	0 - 13.3	1.55 (1.62)	0 - 9.3	1.32 (1.59)	0 - 9.3
Proportion of municipality population in urban areas	0.59 (0.22)	0.02 - 1				
Population density in municipality	0.98 (0.53)	0.1 - 12.41	1.03 (1.90)	0.37 - 12.41	1.33 (2.2)	0.37 - 12.41
Ethnic fractionalization in municipality	0.39 (0.14)	0 – 0.66	0.45 (0.12)	0 - 0.68	0.43 (0.13)	0 - 0.68
Proportion of municipality population that is indigenous	0.003 (0.02)	0 – 0.74	0.003 (0.01)	0 - 0.16	0.003 (0.01)	0 - 0.37
Age of individual			35.9 (22.02)	0 - 107	31.4 (22.6)	0 - 98
Number of household members aged 9 or less			1.14 (1.37)	0 - 11	1.03 (1.21)	0 - 12
Number of household members aged 10 or more			3.62 (1.84)	1 - 15	3.54 (1.80)	1 - 16
Household monthly per-capita income (’000s of Reals)			0.10 (0.14)	0 - 2.92	0.16 (0.25)	0 - 10.6
No. of days (if any) in last 2 weeks when respondent could not engage in usual activities due to illness			1.32 (3.16)	0 - 14	1.82 (3.65)	0 - 14

Notes: 1. For the individual-level regressions, the table reports summary statistics separately for observations where the dependent variable (access to health care dummy) takes the value one (with access) and zero (no access).

Table 1b. Summary Statistics (Dummy Variables) *(Reports proportion of all observations taking value 1)*			
	Municipality-Level Regressions (4338 obs.)	***Individual-Level Regressions[1]***	
		Individuals Without Access to Health Care (8338 obs.)	*Individuals With Access to Health Care (25901 obs.)*
Dummy with value 1 if winners of the 1994 state governor election and the 1996 mayor election are from same party	0.14	0.12	0.12
Dummy with value 1 if mayor is from a party on the left	0.13	0.20	0.22
Dummy for municipalities in major metropolitan areas	0.04	0.29	0.37
Dummy if agriculture is main economic activity of municipality	0.69	0.25	0.21
Dummy for municipalities that are fully decentralized	0.10	0.28	0.31
Dummy for municipalities with a plan for governing	0.34	0.49	0.55
Dummy for municipalities with a strategic plan	0.06	0.13	0.16
Dummy for municipalities with a health policy council	0.50	0.62	0.62
Dummy variable for respondent's gender (1 for female, 0 for male)		0.58	0.61
Dummy with value 1 if primary education is respondent's highest educational level completed		0.08	0.12
Dummy with value 1 if secondary education is highest educational level completed		0.09	0.14
Dummy with value 1 if secondary education is highest educational level completed		0.01	0.03
Dummy with value 1 if respondent is black		0.08	0.06
Dummy with value 1 if respondent is colored (but not of Oriental or indigenous origin)		0.54	0.45
Dummy with value 1 if respondent is of Oriental origin		0.002	0.002
Dummy with value 1 if respondent is of indigenous origin		0.003	0.003
Dummy for households in urban areas		0.66	0.82
Dummy variable for respondents unable to engage in usual activities in last 2 weeks due to diarrhoea and/or vomiting		0.02	0.02
Dummy variable for respondents unable to engage in usual activities in last 2 weeks due to respiratory illness		0.03	0.04
Dummy for respondents unable to engage in usual activities in last 2 weeks due to heart or blood pressure problems		0.02	0.04
Dummy for respondents unable to engage in usual activities in last 2 weeks due to mental or emotional problems		0.01	0.01
Dummy variable for respondents with back or spine problems		0.39	0.28
Dummy variable for respondents with arthritis or rheumatism		0.25	0.17
Dummy variable for respondents with diabetes		0.04	0.05
Dummy variable for respondents with chronic kidney disease		0.09	0.06

Notes: 1. See corresponding note for Table 1.

Table 1c. Cross-Tabulations for Governance and Decentralization[1] *(Each cell is the number of municipal observations)*							
Municipalities Fully Decentralized ↓	Municipalities with a plan for governing		Municipalities with a strategic plan		Municipalities with a health policy council		*Total No. Obs.*
	No	Yes	No	Yes	No	Yes	
No	2620	1303	3713	210	1997	1926	3923 (90%)
Yes	234	181	366	49	159	256	415 (10%)
Total No. Obs.	2854 (66%)	1484 (34%)	4079 (94%)	259 (6%)	2156 (50%)	2182 (50%)	4338

Notes: 1. The cells report the number of observations for different combinations of values of the listed dummy variables. For example, the first cell on the top left-hand side says that there are 2620 observations for which the dummy variables for decentralization and whether there is a governing plan both take the value 0.

Table 2. OLS Regressions Explaining Municipal Public Health Provision[1,2]				
	Dependent Variables			
Independent Variables ↓	Public doctors, per thousand residents[1] *(Eq. 1)*	Public nurses, per thousand residents[1] *(Eq. 2)*	Public clinics, per thousand residents[1] *(Eq. 3)*	Public clinic consultation rooms, per thousand residents[1] *(Eq. 4)*
Per-capita GDP of municipality in 1996	0.01** (2.39)	0.01* (1.84)	0.003** (2.01)	0.03** (2.99)
Gini coefficient of household per-capita incomes in municipality	1.01** (4.28)	1.37** (4.95)	0.05 (0.73)	0.906** (2.59)
Proportion of municipality residents in temporary or slum housing	-0.93 (-0.87)	-1.40 (-1.12)	-0.13 (-0.46)	0.489 (0.31)
Political participation in the 1996 mayor election	0.95** (4.55)	0.47* (1.95)	0.51** (9.29)	3.205** (10.49)
Political competition in the 1996 mayor election	-0.32** (-2.62)	-0.16 (-1.11)	-0.18** (-5.61)	-1.668** (-9.25)
Dummy with value 1 if winners of the 1994 state governor election and the 1996 mayor election are from same party	0.07* (1.66)	0.05 (0.88)	0.01 (1.00)	0.068 (1.06)
Dummy with value 1 if mayor is from a party on the left[5]	-0.02 (-0.39)	-0.01 (-0.11)	-0.005 (-0.44)	-0.072 (-1.16)
Share of the total vote in the 1998 Presidential elections going to a candidate from a left-leaning party	0.47** (3.80)	0.72** (4.99)	0.14** (4.29)	0.74** (4.07)
Proportion of municipality population in urban areas	-0.01 (-0.03)	-0.23 (-0.60)	0.13 (1.49)	1.89** (3.87)
Square of proportion of municipality population in urban areas	0.39 (1.34)	0.60* (1.77)	-0.36** (-4.74)	-2.292** (-5.37)
Dummy for municipalities in major metropolitan areas	-0.17** (-2.16)	-0.26** (-2.86)	-0.05** (-2.62)	-0.374** (-3.21)
Population density in municipality	-0.04 (-1.50)	-0.04 (-1.08)	-0.01 (-1.43)	-0.09** (-2.20)
Ethnic fractionalization in municipality	0.01 (0.06)	0.00 (-0.03)	0.11** (3.39)	0.503** (2.70)
Proportion of municipality population that is indigenous	0.07 (0.11)	0.52 (0.70)	0.32* (1.94)	1.184 (1.27)
Distance of municipality from state capital	-0.03** (-2.85)	0.02 (1.46)	-0.01** (-4.61)	-0.01 (-0.66)
Municipalities that are fully decentralized and have no plan for governance (decentralized * bad governance)	0.01 (0.19)	0.06 (0.75)	-0.02 (-1.29)	-0.191** (1.98)
Municipalities that are fully decentralized and have a plan for governance (decentralized * good governance)	0.13* (1.79)	0.17** (2.02)	-0.01 (-0.57)	-0.106 (-0.98)
Dummy for municipalities with a plan for governance (good governance)	-0.01 (-0.28)	0.07** (2.04)	-0.02** (-1.96)	-0.069 (-1.55)
Dummy for municipalities with agriculture as the main economic activity	0.02 (0.66)	0.01 (0.17)	0.06** (6.56)	0.432** (8.29)
Private doctors in municipality, per thousand residents[1]	0.01 (0.22)			
Private nurses in municipality, per thousand residents[1]		0.73** (6.43)		
Private clinics in municipality, per thousand residents[1]			0.23** (2.33)	
Consultation rooms in private clinics in municipality, per thousand residents[1]				-0.11 (-0.17)
State Dummies	Yes	Yes	Yes	Yes
R-Squared	0.20	0.20	0.26	0.28
Number of Observations	4338	4338	4338	4338

Notes:

1. "Public" refers to health services that are a part of the publicly financed SUS system, including those contracted out to private clinics and hospitals. "Private" refers to health services that are not provided as a part of the SUS system.
2. Besides the regressors reported, a dummy variable for each state was also included in all regressions. T-statistics are based on White heteroscedasticity-corrected standard errors. Significance at the 5% and 10% levels are denoted by ** and * respectively.

Table 3. Probit Regressions of Access to Health Services by Individuals[1]		
Independent Variables ↓	*Without provision variables in regression (Eq. 5)*	*With provision variables in regression (Eq. 6)*
Dummy variable for respondent's gender (1 for female, 0 for male)	0.128** (7.95)	0.128** (7.95)
Respondent's age	-0.017** (-13.36)	-0.017** (-13.22)
Square of respondent's age	0.0001** (8.93)	0.0001** (8.83)
No. of inhabitants in household aged 9 or less	-0.049** (-7.02)	-0.049** (-6.96)
No. of inhabitants in household aged 10 or more	0.008* (1.94)	0.008* (1.83)
Dummy with value 1 if primary education is respondent's highest educational level completed	0.164** (6.10)	0.165** (6.11)
Dummy with value 1 if secondary education is highest educational level completed	0.143** (5.26)	0.14** (5.15)
Dummy with value 1 if tertiary education is highest educational level completed	0.239** (3.60)	0.229** (3.43)
Dummy with value 1 if respondent is black	-0.123** (-3.88)	-0.137** (-4.32)
Dummy with value 1 if respondent is colored (but not of Oriental or indigenous origin)	-0.066** (-3.65)	-0.066** (-3.66)
Dummy with value 1 if respondent is of Oriental origin	-0.291 (-1.58)	-0.302 (-1.64)
Dummy with value 1 if respondent is of indigenous origin	-0.178 (-1.28)	-0.177 (-1.26)
Household per-capita income	0.9** (9.80)	0.9** (9.84)
Square of household per-capita income	-0.09** (7.07)	-0.1** (-7.03)
Dummy for households in urban areas	0.36** (18.00)	0.374** (18.61)
No. of days (if any) in last 2 weeks when respondent could not engage in usual activities due to illness	0.033** (12.85)	0.034** (12.91)
Dummy variable for respondents unable to engage in usual activities in last 2 weeks due to diarrhoea and/or vomiting	0.116 (1.45)	0.12 (1.5)
Interaction of age with preceding dummy variable (related to diarrhoea and/or vomiting)	-0.004* (-1.83)	-0.004* (-1.76)
Dummy variable for respondents unable to engage in usual activities in last 2 weeks due to respiratory illness	0.088 (1.38)	0.081 (1.27)
Interaction of age with preceding dummy variable (related to respiratory illness)	0.001 (0.7)	0.001 (0.74)
Dummy for respondents unable to engage in usual activities in last 2 weeks due to heart or blood pressure problems	0.189** (3.92)	0.181** (3.76)
Dummy for respondents unable to engage in usual activities in last 2 weeks due to mental or emotional problems	-0.077 (-1.09)	-0.086 (-1.21)
Dummy variable for respondents with back or spine problems	-0.116** (-5.95)	-0.117** (-6.00)
Dummy variable for respondents with arthritis or rheumatism	-0.143** (-6.30)	-0.145** (-6.38)
Dummy variable for respondents with diabetes	0.16** (4.11)	0.153** (3.92)
Dummy variable for respondents with chronic kidney disease	-0.088** (-2.86)	-0.091** (-2.93)

(continued on next page)

Per-capita GDP of municipality in 1996	-0.5 (-0.1)	-6.9 (-1.37)
Gini coefficient of household per-capita incomes in municipality[2]	-0.193 (-1.22)	-0.655** (-3.90)
Proportion of municipality residents in temporary or slum housing	2.395** (2.56)	1.902** (2.08)
Political participation in the 1996 mayor election, in the municipality	0.431** (2.65)	0.253 (1.54)
Political competition in the 1996 mayor election, in the municipality	-0.043 (0.49)	-0.148* (1.66)
Dummy with value 1 if the winners of the 1994 state governor election and the 1996 mayor election are from same party	0.092** (3.10)	0.064** (2.14)
Share of the total vote in the 1996 mayor elections going to a candidate from a party on the left	0.007 (0.34)	0.016 (0.7)
Share of the total vote in the 1998 Presidential elections going to a candidate from a party on the left	0.402** (5.00)	0.383** (4.63)
Dummy for respondents living in a major metropolitan Region	-0.052* (-1.68)	-0.011 (-0.35)
Population density in municipality	1.49 (0.23)	1.2* (1.66)
Ethnic fractionalization in municipality	-0.619** (-7.41)	-0.647** (-7.64)
Proportion of municipality population that is indigenous	0.804 (1.27)	1.485** (2.29)
Distance of municipality from state capital	-0.001 (-0.15)	-0.004 (-0.6)
Dummy for municipalities that are fully decentralized and have no plan for governance (bad governance)	-0.124** (-4.18)	-0.131** (-4.30)
Dummy for municipalities that are fully decentralized and have a plan for governance (good governance)	0.044* (1.65)	0.009 (0.3)
Dummy for municipalities with a plan for governance (good governance)	-0.009 (-0.43)	-0.02 (-0.93)
Dummy for municipalities with agriculture as the main economic activity	0.08** (3.36)	0.032 (1.31)
(Sum of) public doctors and nurses in municipality, per thousand residents[3]		0.038** (5.22)
(Sum of) private doctors and nurses in municipality, per thousand residents[3]		0.008 (0.38)
Public clinic consultation rooms in municipality, per thousand residents[3]		0.10** (9.44)
Private clinic consultation rooms in municipality, per thousand residents[3]		0.009 (0.31)
State Dummies	Yes	Yes
Pseudo R-squared	0.09	0.09
Number of Observations	34,239	34,239

Notes:

1. Besides the regressors reported, a dummy variable for each state was also included in all regressions. In parentheses are the usual Probit "z-statistics", to test whether each coefficient is statistically different from zero; these are corrected for heteroscedasticity. Significance at the 10% and 5% levels are indicated by * an ** respectively.
2. This Gini coefficient was derived, for each municipality, from the per-capita household incomes of all survey respondents in that municipality, as reported in the 1998 household survey (PNAD) from which the household data come.
3. "Public" refers to health services that are a part of the publicly financed SUS system, including those contracted out to private clinics and hospitals. "Private" refers to health services that are not provided as a part of the SUS system.

Table 4. Spatial Models of Municipal Public Health Provision [1,2]

each regression run using Spatial Autoregressive Model (SAR) and General Spatial Model (GSM)

Independent Variables ↓	Public doctors, per thousand residents[1]		Public nurses, per thousand residents[1]		Public clinics, per thousand residents[1]		Public clinic consultation rooms, per thousand residents[1]	
	SAR (Eq. 1-b)	*GSM (Eq. 1-c)*	*SAR (Eq. 2-b)*	*GSM (Eq. 2-c)*	*SAR (Eq. 3-b)*	*GSM (Eq. 3-c)*	*SAR (Eq. 4-b)*	*GSM (Eq. 4-c)*
Per-capita product of municipality in 1996	0.01** (8.23)	0.01** (19.26)	0.01** (5.09)	0.004** (10.11)	0.004 (5.85)	0.004 (4.82)	0.00003** (7.78)	0.00002** (8.80)
Gini coefficient of household per-capita incomes in municipality	0.96** (4.10)	0.62** (3.39)	1.34** (4.87)	0.93** (4.39)	0.00 (-0.06)	-0.03 (-0.55)	0.63* (1.88)	0.38 (1.40)
Proportion of municipality residents in temporary or slum housing	-0.91 (-0.86)	-0.53 (-0.63)	-1.42 (-1.14)	-0.94 (-0.96)	-0.08 (-0.30)	0.08 (0.33)	0.56 (0.37)	1.39 (1.10)
Political participation in the 1996 mayor election	0.83** (4.06)	0.35** (2.30)	0.43* (1.82)	0.13 (0.78)	0.44** (8.27)	0.27** (6.22)	2.75** (9.19)	1.68** (7.24)
Political competition in the 1996 mayor election	-0.29** (-2.42)	0.20** (2.07)	-0.15 (-1.04)	-0.09 (-0.79)	-0.17** (-5.34)	-0.12** (-4.65)	-1.50** (-8.60)	-1.05** (-7.32)
Dummy with value 1 if winners of 1994 state governor election and 1996 mayor election are from same party	0.08* (1.77)	0.04 (1.16)	0.04 (0.88)	0.02 (0.55)	0.01 (1.01)	0.01 (0.99)	0.06 (1.01)	0.06 (1.10)
Dummy with value 1 if mayor is from a party on the left[5]	-0.01 (-0.24)	-0.01 (-0.37)	-0.01 (-0.12)	0.02 (0.41)	-0.01 (-0.47)	-0.001 (-0.10)	-0.07 (-1.14)	-0.03 (-0.60)
Share of the total vote in the 1998 Presidential elections going to a candidate from a party on the left	0.38** (3.13)	0.14* (1.66)	0.66** (4.64)	0.21** (2.25)	0.11** (3.49)	0.04* (1.65)	0.58** (3.28)	0.23* (1.72)
Proportion of municipality population in urban areas	-0.02 (-0.06)	0.01 (0.02)	-0.27 (-0.70)	-0.29 (-0.96)	0.13 (1.50)	0.11 (1.57)	1.65** (3.50)	1.36** (3.49)
Square of proportion of municipality population in urban areas	0.36 (1.27)	0.24 (1.05)	0.61* (1.83)	0.55** (2.09)	-0.35** (-4.73)	-0.28** (-4.46)	-2.1** (-5.09)	-1.68** (-4.92)
Dummy for municipalities in major metropolitan areas	-0.16** (-2.00)	-0.07 (-1.35)	-0.26** (-2.86)	-0.18** (-2.95)	-0.03 (-1.39)	0.01 (0.66)	-0.18 (-1.61)	0.07 (0.79)
Population density in municipality	-0.04 (-1.32)	-0.02 (-0.88)	-0.04 (-1.18)	-0.03 (-1.29)	-0.01 (-0.77)	0.00 (0.11)	0 .00005 (-1.3)	0.00001 (0.04)
Ethnic fractionalization in municipality	-0.02 (-0.17)	-0.09 (-0.95)	-0.02 (-0.11)	-0.11 (-1.10)	0.09** (2.87)	0.04 (1.44)	0.39** (2.16)	0.14 (1.02)
Proportion of municipality population that is indigenous	0.07 (0.11)	-0.001 (-0.002)	0.52 (0.70)	0.87* (1.65)	0.28* (1.71)	0.36** (2.68)	1.25 (1.39)	1.32* (1.83)
Distance of municipality from state capital	-0.02** (-2.27)	-0.003 (-0.47)	0.02 (1.44)	0.01 (1.12)	-0.01** (-4.05)	-0.01** (-3.09)	-0.02 (-1.21)	-0.03** (-3.15)
Municipalities that are fully decentralized and have no governance plan (decentralized * bad governance)	0.02 (0.26)	0.01 (0.14)	0.06 (0.74)	0.03 (0.52)	-0.02 (-1.27)	-0.02 (-1.10)	-0.16* (-1.74)	-0.10 (-1.34)
Municipalities that are fully decentralized and have a plan for governance (decentralized * good governance)	0.14* (1.89)	0.09 (1.46)	0.18** (2.12)	0.12* (1.76)	-0.01 (-0.52)	0.00 (-0.26)	-0.11 (-1.07)	-0.10 (-1.12)
Dummy for municipalities with a plan for governance (good governance)	-0.01 (-0.41)	-0.01 (-0.30)	0.07* (1.95)	0.05* (1.74)	-0.02** (-2.23)	-0.02** (-2.46)	-0.07 (-1.62)	-0.06* (-1.65)
Dummy for municipalities with agriculture as the main economic activity	0.01 (0.26)	-0.002 (-0.08)	0.00 (-0.08)	-0.01 (-0.46)	0.06** (6.47)	0.05** (5.95)	0.39** (7.75)	0.28** (6.75)
Private doctors in municipality, per thousand residents[1]	0.03 (0.55)	0.03 (0.69)						
Private nurses in municipality, per thousand residents[1]			0.75** (6.76)	0.52** (5.81)				
Private clinics in municipality, per thousand residents[1]					0.23** (2.42)	0.19** (2.39)		
Consultation rooms in private clinics in municipality, per thousand residents[1]							-0.10 (-1.18)	-0.08 (-1.08)
Rho (parameter that multiplies the lagged value of the dependent variable)	0.18** (8.68)	0.85** (65.50)	0.09** (4.70)	0.85** (64.68)	0.26** (13.16)	0.82** (56.29)	0.28** (8.49)	0.85** (66.14)
Lambda (parameter for the spatially auto-correlated errors term)		-0.41** (-24.22)		-0.50** (-28.61)		-0.05** (-3.50)		-0.19** (-12.76)
State Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.20	0.44	0.20	0.43	0.26	0.50	0.27	0.51
Number of Observations	4338	4338	4338	4338	4338	4338	4338	4338

Notes: 1. and 2. Refer to Table 2.

Table 5a. Sensitivity Analysis: Existence of a Municipal Strategic Plan as a Measure of Governance[1]

Independent Variables ↓ *(only a subset reported)*	***Municipality-Level Regressions (OLS)*** [2,3]				***Individual-Level Regressions (Probit)*** [2,3]	
	Dependent Variable ↓ (all per 1,000 residents)				*Without Provision Variables in Regression*	*With Provision Variables in Regression*
	Public Doctors	*Public Nurses*	*Public Clinics*	*Public Clinic Consultation Rooms*		
	Eq. (1-d)	*Eq. (2-d)*	*Eq. (3-d)*	*Eq. (4-d)*	*Eq. (5-d)*	*Eq. (6-d)*
Per-capita product of municipio in 1996	0.01 (1.63)	0.01 (1.33)	0.003* (1.83)	0.03** (2.99)	0.004 (0.92)	-0.005 (-0.97)
Dummy for municipalities that are fully decentralized and have no strategic plan (bad governance)	0.06 (1.38)	0.10 (1.54)	-0.02* (-1.95)	-0.19** (-1.98)	-0.05** (-1.97)	-0.09** (-3.53)
Dummy for municipalities that are fully decentralized and have a strategic plan (good governance)	0.07 (0.78)	0.05 (0.31)	0.004 (0.14)	-0.11 (-0.98)	-0.02 (-0.44)	0.03 (0.71)
Dummy for municipalities with a strategic plan (good governance)	0.01 (0.28)	0.02 (0.26)	-0.03** (-2.17)	-0.07 (-1.55)	0.02 (0.58)	-0.05 (-1.62)
R-Squared or Pseudo R-Squared	0.20	0.20	0.26	0.27	0.09	0.09
Number of Observations	4338	4338	4338	4338	34,239	34,239

Notes: 1. Regressions (1-d), (2-d), (3-d) and (4-d) are exactly the same as regressions (1) to (4) in Table 2, with the only difference being that the governance variable there – a dummy for municipalities with a plan for governing – is replaced here by a dummy for municipal governments with a strategic plan for running the municipality (see main text for more details). The same applies to regressions (5-d) and (6-d) in this table which correspond to regressions (5) and (6) of Table 3.

2. Only a subset of the regressors are reported in this table. The notes in Table 2 apply for regressions (1-d) to (4-d), and the notes for Table 3 apply to regressions (5-d) and (6-d).

3. In parentheses are the t-statistics (for the OLS regressions) or the "z-statistics" for the probit regressions. Significance at the 10% and 5% levels are indicated by * an ** respectively.

Table 5b. Sensitivity Analysis: Existence of a Municipal Health Policy Council as a Measure of Governance[1]

Independent Variables ↓ *(only a subset reported)*	***Municipality-Level Regressions (OLS)*** [2,3]				***Individual-Level Regressions (Probit)*** [2,3]	
	Dependent Variable ↓ (all per 1,000 residents)				*Without Provision Variables in Regression*	*With Provision Variables in Regression*
	Public Doctors	*Public Nurses*	*Public Clinics*	*Public Clinic Consultation Rooms*		
	Eq. (1-e)	*Eq. (2-e)*	*Eq. (3-e)*	*Eq. (4-e)*	*Eq. (5-e)*	*Eq. (6-e)*
Per-capita product of municipio in 1996	0.01** (2.40)	0.01* (1.88)	0.003* (1.81)	0.03** (2.96)	0.004 (1.00)	-0.005 (-1.02)
Dummy for municipalities that are fully decentralized and have no health policy council (bad governance)	0.07 (0.90)	0.08 (0.93)	-0.03** (-2.43)	-0.24* (-2.17)	-0.07** (-2.17)	-0.09** (-2.42)
Dummy for municipalities that are fully decentralized and have a health policy council (good governance)	0.06 (0.97)	0.13* (1.72)	-0.006 (-0.53)	-0.10 (-1.03)	-0.02 (-0.65)	-0.05* (-1.81)
Dummy for municipalities with a health policy council (good governance)	-0.007 (-0.25)	-0.002 (-0.07)	-0.01 (-1.56)	-0.05 (-1.09)	-0.005 (-0.23)	-0.004 (-0.18)
R-Squared or Pseudo R-Squared	0.20	0.20	0.26	0.27	0.09	0.09
Number of Observations	4338	4338	4338	4338	34,239	34,239

Notes: 1. Regressions (1-e), (2-e), (3-e) and (4-e) are exactly the same as regressions (1) to (4) in Table 2, with the only difference being that the governance variable there – is replaced here by a dummy for municipal governments with a health policy council (with some control over policies and funding). The same applies to regressions (5-e) and (6-e) in this table which correspond to regressions (5) and (6) of Table 3.

2. and 3. See corresponding notes for Table 5a (above).